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CP-202200350
TXX-22077
October 3, 2022

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Ref 10 CFR 54

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 1 AND 2
DOCKET NUMBERS 50-445 AND 50-446
FACILITY OPERATING LICENSE NUMBERS NPF-87 and NPF-89
LICENSE RENEWAL APPLICATION

REFERENCE: Letter TXX-20077 dated August 31, 2020, from Steven K. Sewell to the NRC, submitting Comanche Peak Nuclear Power Plant License Renewal Application Submittal Schedule Revision (ADAMS Accession No. ML20244A274)

Dear Sir or Madam:

Pursuant to 10 CFR Part 54, Vistra Operations Company LLC ("Vistra OpCo") submits an operating license renewal application (LRA) for Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 to extend the current operating licenses an additional 20 years beyond their current expiration dates. With renewal, the following would ensue:

- CPNPP Unit 1 (NPF-87) operating license would be extended from midnight on February 8, 2030, to midnight on February 8, 2050 and
- CPNPP Unit 2 (NPF-89) operating license would be extended from midnight on February 2, 2033, to midnight on February 2, 2053.

Vistra OpCo also requests renewal of the source, special nuclear material, and by-product licenses under 10 CFR Parts 30, 40, and 70 that are subsumed in or combined with the current operating licenses.

The LRA contains the information required by 10 CFR Part 54 for the contents of the application. The application contains technical information required by 10 CFR 54.21 and includes an environmental report prepared in accordance with 10 CFR 54.23 and Subpart A of 10 CFR 51.

In accordance with 10 CFR 54.21(b), each year following submittal of the LRA and at least 3 months before the scheduled completion of the staff's review, VistraOpCo will submit an LRA amendment identifying any current licensing basis changes that materially affect the contents of the LRA, including the FSAR supplement.

CPNPP LRA Appendix A, Section A.4, "License Renewal Commitments List", provides a summary of the commitments made in the application. This summary will be updated as required throughout the LRA review process.

In accordance with 10 CFR 50.91, a copy of this application is being provided to the designated Texas State Official.

Direct any questions regarding this submittal to Todd Evans at (254) 897-8987 or Todd.Evans@Luminant.com.

I state under penalty of perjury that the foregoing is true and correct.

Executed on October 3, 2022

Sincerely,

Steven K. Sewell

Enclosures:

1. License Renewal Application
2. Appendix A – Final Safety Analysis Report Supplement
3. Appendix B – Aging Management Programs
4. Appendix C – Not Used
5. Appendix D – Technical Specification Changes
6. Appendix E –Applicant's Environmental Report

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Comanche Peak Nuclear Power Plant

Units 1 and 2

License Renewal Application

October 2022

(1,608 Total Pages, including cover sheets)

Comanche Peak Nuclear Power Plant
Units 1 and 2
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1.0. ADMINISTRATIVE INFORMATION

Pursuant to Title 10, Part 54, of the "Code of Federal Regulations (10 CFR Part 54), Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (Reference 1.7.1), this license renewal application (LRA) seeks renewal for an additional 20-year term of the facility operating licenses for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1 (NPF-87) (Reference 1.7.2) and Unit 2 (NPF-89) (Reference 1.7.3). The LRA includes renewal of the source, special nuclear, and byproduct materials licenses that are combined in the Unit 1 and Unit 2 licenses.

The LRA is based on the guidance provided by the U.S Nuclear Regulatory Commission (NRC) in Nuclear Regulatory Commission Regulation (NUREG)-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (Reference 1.7.4), Regulatory Guide (RG) 1.188, Revision 2, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses" (Reference 1.7.5), and the guidance provided by Nuclear Energy Institute (NEI) in NEI 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule" (Reference 1.7.6).

The LRA is intended to provide sufficient information for the NRC to complete its technical and environmental reviews pursuant to 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" (Reference 1.7.7). The LRA is provided to meet the standards required by 10 CFR 54.29 in support of the issuance of the renewed operating licenses for CPNPP Units 1 and 2.

1.1. GENERAL INFORMATION – 10 CFR 54.17 and 10 CFR 54.19

The following is general information required by 10 CFR 54.17 and 10 CFR 54.19.

1.1.1. Name of Applicant

Vistra Operations Company LLC (Vistra OpCo) (operator) is acting on its own behalf and for Comanche Peak Power Company LLC (CP PowerCo) (owner) by submitting this application. Vistra OpCo hereby applies for renewed operating licenses for CPNPP Units 1 and 2.

1.1.2. Address of Applicant

Vistra Operations Company LLC (operator)
P O Box 1002
Glen Rose, TX 76043

Comanche Peak Power Company LLC (owner)
P O Box 1002
Glen Rose, TX 76043

1.1.3. Description of Business or Occupation of Applicant

Vistra OpCo (operator) is acting on its own behalf and for Comanche Peak Power Company LLC ("CP PowerCo") (owner) by submitting this application. Vistra OpCo is a Delaware limited liability company, which in turn is wholly owned by Vistra Intermediate Company LLC, a Delaware limited liability company, which in turn is wholly owned by Vistra Corp. (Vistra), a corporation formed under the laws of the State of Delaware with principal executive offices in Irving, TX. Vistra OpCo is the current licensed operator of CPNPP Units 1 and 2, which are the subject of the LRA. The current operating licenses will expire as follows:

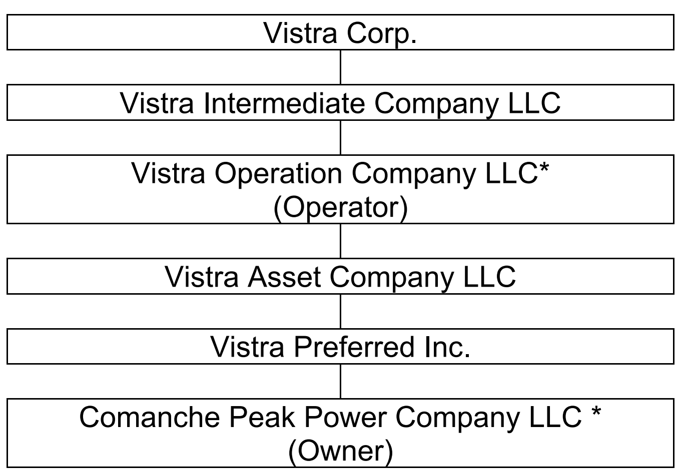
- At midnight on February 8, 2030 for Unit 1 (Facility Operating License (FOL) No. NPF-87)
- At midnight on February 2, 2033 for Unit 2 (FOL No. NPF-89)

Vistra OpCo will continue as the licensed operator for the renewed operating licenses and CP PowerCo will continue as the owner.

1.1.4. Organization and Management of Applicant

CP PowerCo is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. All executive personnel, directors, and managers of Vistra OpCo and CP PowerCo are citizens of the United States. A simplified Corporate / Licensee organization diagram and the names and business addresses of Vistra OpCo and CP PowerCo executive personnel, directors, and managers are provided below (including their respective ultimate parent and intermediate parents).

Corporate / Licensee(s)
(Simplified Organization Diagram)



* Denotes NRC Licensee

Condition 3 of NRC Order dated May 6, 2016, (Reference 1.7.8) (approving transfer of licenses and conforming amendments) stated "The Reorganized TCEH (Vistra Corp) Board of Directors shall adopt resolutions that any non-U.S. citizens or foreign-appointed U.S. citizens serving as either directors or executive officers of Reorganized TCEH (Vistra Corp), the ultimate parent, and intermediate parents of CP LLC (CP PowerCo) and OpCo LLC (Vistra OpCo) shall not seek access to any classified information or to special nuclear material in the custody of the CPNPP licensees and shall not participate in or seek to influence operational decisions by the licensees regarding nuclear safety or security matters."

TXX-16108 dated October 13, 2016, (Reference 1.7.9) notified the NRC that at the first meeting of TCEH Corp. (Vistra Corp), Board of Directors, the Board adopted resolutions in compliance with Condition 3 of NRC Order dated May 6, 2016.

On November 14, 2016, TEX Operations Company LLC changed the company name of "TEX Operations Company LLC" to "Vistra Operations Company LLC". This was done as part of a companywide "re-branding" effort by Vistra Energy Corp. (the ultimate parent) to conform with the Vistra brand. The NRC-approved the administrative name change to Vistra Operations Company LLC in license amendment 169 (Reference ML17129A024).

The rebranding effort in the fall of 2016 also changed the names of the ultimate parent and intermediate parent(s) as reflected in the simplified organizational chart above. In July 2020, as part of a corporate re-branding, "Vistra Energy Corp." was changed to "Vistra Corp." This was an editorial change only and had no impact to CPNPP and was reflected in an update to Figure 13.1-1 of Certified Final Safety Analysis Report (FSAR) Amendment 110 (References ML20226A417 and ML20315A098).

The names and business addresses of Vistra Corp., Vistra Intermediate Company LLC, Vistra Operations Company LLC, Vistra Asset Company LLC, Vistra Preferred Inc., and CP PowerCo directors and officers are provided below:

Directors and Executive Personnel (Vistra Corp.)		
Name	**Title**	**Address**
James A. Burke	Director, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Executive Vice President and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039
Hilary Ackermann	Director	6555 Sierra Drive Irving, TX 75039
Arcilla Acosta	Director	6555 Sierra Drive Irving, TX 75039
Gavin Baiera	Director	6555 Sierra Drive Irving, TX 75039
Paul Barbas	Director	6555 Sierra Drive Irving, TX 75039
Lisa Crutchfield	Director	6555 Sierra Drive Irving, TX 75039
Brian Ferraiola	Director	6555 Sierra Drive Irving, TX 75039

Directors and Executive Personnel (Vistra Corp.)		
Name	**Title**	**Address**
Jeff Hunter	Director	6555 Sierra Drive Irving, TX 75039
John R. Sult	Director	6555 Sierra Drive Irving, TX 75039

Managers and Executive Personnel (Vistra Intermediate Company LLC)		
Name	**Title**	**Address**
James A. Burke	Manager, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Manager, Executive Vice President, and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Carla A. Howard	Manager	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039

Managers and Executive Personnel (Vistra Operations Company LLC)		
Name	**Title**	**Address**
James A. Burke	Manager, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Manager, Executive Vice President, and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039
Ken Peters	Chief Nuclear Officer*	6555 Sierra Drive Irving, TX 75039
Tom McCool	Site Vice-President*	6555 Sierra Drive Irving, TX 75039
Alan Marzloff	Plant Manager*	6555 Sierra Drive Irving, TX 75039
Steven Sewell	Senior Director Engineering and Regulatory Affairs*	6555 Sierra Drive Irving, TX 75039
Heather Winn	Director Nuclear Oversight*	6555 Sierra Drive Irving, TX 75039

Managers and Executive Personnel (Vistra Asset Company LLC)		
Name	**Title**	**Address**
James A. Burke	Manager, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Manager, Executive Vice President, and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039

Directors and Executive Personnel (Vistra Preferred Inc.)		
Name	**Title**	**Address**
James A. Burke	Director, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Director, Executive Vice President, and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039

Managers and Executive Personnel (Comanche Peak Power Company LLC)		
Name	**Title**	**Address**
James A. Burke	Manager, President, and Chief Executive Officer	6555 Sierra Drive Irving, TX 75039
Kristopher E. Moldovan	Manager, Executive Vice President, and Chief Financial Officer	6555 Sierra Drive Irving, TX 75039
Stephanie Zapata Moore	General Counsel	6555 Sierra Drive Irving, TX 75039
Ken Peters	Chief Nuclear Officer*	6555 Sierra Drive Irving, TX 75039
Tom McCool	Site Vice-President*	6555 Sierra Drive Irving, TX 75039

* “Dual-hatted” personnel (as officers and/or senior manager of Vistra OpCo and Luminant Generation Company LLC (”Luminant”) as described by letters TXX-16109 dated September 16, 2016 (Reference 1.7.10) and TXX-16108 dated October 13, 2016.

1.1.5. <u>Class of License, Use of the Facility, and the Period of Time for which the License is Sought</u>

Vistra OpCo requests renewal of the Class 103 operating licenses for CPNPP Units 1 and 2 for a period of 20 years beyond the expiration of the current licenses to allow continued use of the facilities for the commercial generation of electricity. CPNPP Unit 1 license (NPF-87) expires at midnight on February 8, 2030, and the Unit 2 license (NPF-89) expires at midnight on February 2, 2033. Extension of the renewed licenses would cause NPF-87 to expire at midnight on February 8, 2050, and NPF-89 to expire at midnight on February 2, 2053.

In this LRA, Vistra OpCo also requests renewal of the source, special nuclear material, and by-product licenses under 10 CFR Parts 30, 40, and 70 that are subsumed in or combined with the current operating licenses.

1.1.6. Earliest and Latest Dates for Alterations, If Proposed

No physical plant alterations or modifications have been identified as necessary in order to implement the provisions of the LRA. The current licensing basis (CLB) will be continued and maintained throughout the period of extended operation (PEO).

1.1.7. Listing of Regulatory Agencies Having Jurisdiction and News Publications

Regulatory Agencies

Electric Reliability Council of Texas
7620 Metro Center Drive
Austin, TX 78744

Public Utility Commission of Texas
1701 N. Congress Avenue
PO Box 13326
Austin, TX 78711-3326

Local News Publications

News publications which circulate in the area surrounding CPNPP Units 1 and 2 that are considered appropriate to give reasonable notice of the LRA to those municipalities, private utilities, public bodies, and cooperatives that might have a potential interest are as follows:

Hood County News
1501 S. Morgan
PO Box 879
Granbury, TX 76048

Glen Rose Reporter
PO Box 2009
Glen Rose, TX 76043

1.1.8. Conforming Changes to Standard Indemnity Agreement

10 CFR 54.19(b) requires that LRAs include “conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” The current Indemnity Agreement B-96 for CPNPP state in Article VII that the Agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the Agreement). Item 3 of the Attachment to the Indemnity Agreement, as revised through Amendment No. 14 (References ML17129A024 and ML17276A337), lists CPNPP

operating license numbers NPF-87 and NPF-89. Vistra OpCo has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for operating license numbers NPF-87 and NPF-89. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license numbers be changed by NRC upon issuance of the renewed licenses, Vistra OpCo requests that NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

1.1.9. Restricted Data

With regard to the requirements of 10 CFR 54.17(f), this LRA does not contain any "Restricted Data," as that term is defined in the Atomic Energy Act of 1954, as amended, or other defense information, and it is not expected that any such information will become involved in these licensed activities.

In accordance with the requirements of 10 CFR 54.17(g), Vistra OpCo will not permit any individual to have access to, or any facility to possess Restricted Data or classified National Security Information until the individual and/or facility has been approved for such access under the provisions of 10 CFR Parts 25 and/or 95.

See Section 1.1.4 for resolutions regarding directors, managers or executive officers of the ultimate parent and intermediate parents of CP PowerCo and Vistra OpCo.

1.2. GENERAL LICENSE INFORMATION

1.2.1. Application Updates, Renewed Licenses, and Renewal Term Operation

In accordance with 10 CFR 54.21(b), during NRC review of the LRA, an annual update to the application to reflect any change to the CLB that materially affects the content of the LRA will be provided.

In accordance with 10 CFR 54.21(d), Vistra OpCo will maintain a summary list in the Final Safety Analysis Report (FSAR) of activities that are required to manage the effects of aging for the systems, structures, or components within the scope of LR during the PEO and summaries of the time-limited aging analyses evaluations.

1.2.2. Incorporation by Reference

There are no documents incorporated by reference as part of the application. Any document references, either in text or in Section 1.7 are listed for information only.

1.2.3. Contact Information

Any notices, questions, or correspondence in connection with this filing should be directed to:

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1.3. PURPOSE

This document provides information required by 10 CFR Part 54 to support the LRA for renewal of the operating licenses. The LRA contains technical information required by 10 CFR 54.21 and environmental information required by 10 CFR 54.23. The information contained herein is intended to provide the NRC with an adequate basis to make the findings required by 10 CFR 54.29.

1.4. DESCRIPTION OF THE PLANT

CPNPP is located on the Squaw Creek Reservoir (SCR) in Somervell County, Texas about 4.5 miles north-northwest of Glen Rose, Texas, and approximately 65 miles southwest of Dallas-Fort Worth in north-central Texas. The site area is approximately 7,700 acres, and the Exclusion Area is approximately 4,170 acres. In addition to the two CPNPP reactors, the site includes the SCR and dam; the SCR, built for station cooling, extends northward into Hood County. Each unit includes a four-loop, pressurized light-water reactor (LWR) Nuclear Steam Supply System (NSSS) supplied by Westinghouse Electric Corporation and associated equipment.

Commercial operation began for CPNPP Unit 1 on August 13, 1990 and began for Unit 2 on August 3, 1993. Each reactor was initially operated at a rated thermal power of 3411 Megawatt thermal (MWt). In 1999, Unit 2 was uprated to 3445 MWt (an increase of 1.0 percent) through the use of use of leading edge flow-meter (LEFM) technology (Reference 1.7.11). In 2001, both units were uprated to 3458 MWt (1.4 percent for Unit 1 and an additional 0.4 percent for Unit 2) using LEFM technology (Reference 1.7.12). In 2008, both units were uprated to 3612 MWt as a result of a Stretch Power Uprate (SPU), which was a 4.5 percent increase from the previous uprate (Reference 1.7.13). The 2008 SPU implemented or took credit for several modifications: setpoint changes for several systems and components, replacement of the Units 1 and 2 high-pressure turbines in order to pass the additional volumetric steam flow, replacement of the heater drain pump third-stage impellers and heater drain pump motors, re-rating of the main generators from 1350 to 1410 megavolt amperes, replacement of the hydrogen and exciter air coolers, replacement of the isophase bus duct coolers, replacement of the main transformers, and nine Unit 1 pipe support modifications.

CPNPP also operates an independent spent fuel storage installation (ISFSI) at the site. The ISFSI is operated under a general license issued pursuant to the provisions of 10 CFR Part 72 (Reference 1.7.14). Therefore, the ISFSI is not in scope for LR.

1.5. APPLICATION STRUCTURE

This LRA is structured in accordance with RG 1.188, "Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses," and NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule". NUREG-1800 references NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (Reference 1.7.15), which was used to determine the adequacy of existing and new aging management programs (AMPs) and which existing programs should be augmented for LR. The results of the aging management review (AMR), using NUREG-1801, have been documented and are illustrated in table format in Section 3, "Aging Management Review Results" of this application.

The application is divided into the following major sections:

Section 1 – Administrative Information

This section provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19. It describes the plant and states the purpose for this application. Included in this section are the names, addresses, business descriptions, and organization and management descriptions of the applicant, as well as other administrative information. This section also provides an overview of the structure of the application, general references, and a listing of acronyms used throughout the application.

Section 2 – Structures and Components Subject to Aging Management Review

This section describes and justifies the methods used in the integrated plant assessment (IPA) to identify those structures and components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(2). These methods consist of 1) scoping, which identifies the systems, structures, and components (SSCs) that are within the scope of 10 CFR 54.4(a) and 2) screening under 10 CFR 54.21(a)(1), which identifies those in-scope structures and components that perform their intended function without moving parts or a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period.

Additionally, the results for systems and structures are described in this section. Scoping results are presented in Section 2.2, "Plant Level Scoping Results." Screening results are presented in Sections 2.3, 2.4, and 2.5.

The screening results consist of lists of components or component groups and structures that require an AMR. Brief descriptions of mechanical systems and structures within the scope of LR are provided as background information. Mechanical system and structure intended functions are provided for in-scope systems and structures. For each in-scope system and structure, components requiring an AMR are identified, associated component intended functions are identified, and appropriate reference to the Section 3 Table providing the AMR results is made.

Selected components, such as equipment supports, structural items (e.g., penetration seals, structural bolting, insulation), and passive electrical components, were more effectively scoped and screened as commodities. Under the commodity approach, these component groups were evaluated based upon common environments and materials. Commodities requiring an AMR are presented in Sections 2.4 and 2.5. Component intended functions and references to the applicable Section 3 Table are provided. Component intended functions are also tabulated in Sections 2.3, 2.4 and 2.5 and listed in the AMR Tables in Sections 3.1.2, 3.2.2, 3.3.2, 3.4.2, 3.5.2, and 3.6.2.

Section 3 – Aging Management Review Results

10 CFR 54.21 (a)(3) requires a demonstration that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the PEO. Section 3 presents the results of the AMRs. Section 3 is the link between the scoping and screening results provided in Section 2 and the AMPs provided in Appendix B.

AMR results are presented in tabular form, in a format in accordance with NUREG-1800, "Standard Review Plan for Review of License Renewal Applications." For mechanical systems, AMR results are provided in Sections 3.1 through 3.4 for the Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System, Engineered Safety Features, Auxiliary Systems, and Steam and Power Conversion Systems, respectively. AMR results for Structures and Component Supports are provided in Section 3.5. AMR results for Electrical Commodities are provided in Section 3.6.

Tables are provided in each of these sections in accordance with NUREG-1800, which provide AMR results for components, materials, environments, and aging effects which are addressed in NUREG-1801, and information regarding the degree to which the proposed AMPs are consistent with those recommended in NUREG-1801.

Section 4 – Time-Limited Aging Analyses

Time-limited aging analyses (TLAAs), as defined by 10 CFR 54.3, are listed in this section. This section includes each of the TLAAs identified in NUREG-1800 and in plant-specific analyses. This section includes a summary of the time-dependent aspects of the analyses. A demonstration is provided to show that the analyses remain valid for the PEO, the analyses have been projected to the end of the PEO, or that the effects of aging on the intended function(s) will be adequately managed for the PEO, consistent with 10 CFR 54.21(c)(1)(i) -(iii).

Appendix A –Final Safety Analysis Report Supplement

As required by 10 CFR 54.21(d), the FSAR supplement contains a summary of activities credited for managing the effects of aging for the PEO. In addition, summary descriptions of time-limited aging analyses evaluations are provided. Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," from Revision 2 of NUREG-1800 was used as guidance for the content of the applicable AMP summaries.

Appendix B – Aging Management Programs

Appendix B describes the programs and activities that are credited for managing aging effects for components or structures during the PEO based upon the AMR results provided in Section 3 and the time-limited aging analyses results provided in Section 4.

Sections B.2.2 and B.2.3 discuss those programs that are contained in Chapter X and Chapter XI, respectively, of NUREG-1801. A description of the AMP is provided, and a conclusion based upon the results of an evaluation against each of the ten elements provided in NUREG-1801 is drawn. In some cases, exceptions, and justifications for managing aging, are provided for specific NUREG-1801 elements. Additionally, operating experience (OE) related to the AMP is provided.

Appendix C – Additional Plant-Specific Information (Optional)

This is an optional Appendix for the LRA; for CPNPP this Appendix is not used.

Appendix D – Technical Specification Changes

This Appendix satisfies the requirement in 10 CFR 54.22 to identify technical specification (TS) changes or additions necessary to manage the effects of aging during the PEO. There were no TS Changes identified necessary to manage the effects of aging during the PEO.

Appendix E – Environmental Information

This Appendix satisfies the requirements of 10 CFR 54.23 to provide a supplement to the environmental report that complies with the requirements of subpart A of 10 CFR 51 for CPNPP Units 1 and 2. A separate environmental report supplement is provided for the site.

1.6. ACRONYMS

Table 1.6-1: Acronyms

Acronyms	Meaning
1/4T	Quarter Thickness
3/4T	Three-Quarter Thickness
ΔRT_{NDT}	Increase in Reference Temperature – Nil Ductility Transition (RT_{NDT})
AB	Auxiliary Building
AC	Alternating Current
ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
AERM	Aging Effect Requiring Management
AFWS	Auxiliary Feedwater System
AISC	American Institute of Steel Construction
ALE	Adverse Localized Environment
AMP	Aging Management Program
AMR	Aging Management Review
AMSAC	ATWS Mitigation Actuation Circuitry
ANSI	American National Standards Institute
AOP	Abnormal Operating Procedure
AOR	Analysis of Record
ARC	Alternate Repair Criteria
ART	Adjusted Reference Temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers

Table 1.6-1: Acronyms

Acronyms	Meaning
ASR	Alkali-Silica Reaction
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transient Without Scram
AVB	Antivibration Bar
A600TT	Thermally Treated Alloy 600
A690TT	Thermally Treated Alloy 690
B&PV	Boiler And Pressure Vessel
BAC	Boric Acid Corrosion
BEA	Break Exclusion Area
BIT	Boron Injection Tank
BMI	Bottom-Mounted Instrumentation
BRS	Boron Recycle System
BTP	Branch Technical Position
BTRS	Boron Thermal Regeneration System
BWR	Boiling Water Reactor
CA	Service Air System
CAP	Corrective Action Program
CAS	Compressed Air System
CASS	Cast Austenitic Stainless Steel
CAT	Chemical Additive Tank
CC	Concrete Components
CCP	Centrifugal Charging Pump

Table 1.6-1: Acronyms

Acronyms	Meaning
CCW	Component Cooling Water
CE	Combustion Engineering
CETNA	Core Exit Thermocouple Nozzle Assembly
CF	Chemistry Factor
Cfm	Cubic-Feet per Minute
CFR	Code Of Federal Regulations
CFS	Chemical Feed
CGS	Argon Gas Supply System
CGCS	Combustible Gas Control Systems
CIS	Containment Isolation System
CISI	Containment Inservice Inspection
CLB	Current Licensing Basis
CLS	Chlorination System
CMAA	Crane Manufacturers Association of America
CMTR	Certified Material Test Report
COLR	Core Operating Limits Report
CP PowerCo	Comanche Peak Power Company LLC
CPNPP CPSES	Comanche Peak Nuclear Power Plant (Aka) Comanche Peak Steam Electric Station
CPS	Condensate Polishing System
CR	Condition Report
CRD	Control Rod Drive
CRE	Control Room Envelope

Table 1.6-1: Acronyms

Acronyms	Meaning
CRDM	Control Rod Drive Mechanism
CRGT	Control Rod Guide Tube
CSB	Core Support Barrel
CSS	Containment Spray System
CST	Condensate Storage Tank
CUF	Cumulative Usage Factor
CUF_{adj}	Adjusted Cumulative Usage Factor
CUF_{EN}	Environmentally Adjusted Cumulative Usage Factor
CUI	Corrosion Under Insulation
CVCS	Chemical And Volume Control System
CVS	Condenser Vacuum And Waterbox Priming System
CW	Circulating Water
CWS	Circulating Water System
DA	Degradation Assessment
DBA	Design Basis Accident or Design Basis Assurance
DBD	Design Basis Document
DBE	Design Basis Event
DC	Direct Current
DG	Diesel Generator
DGA	Diesel Generator Area
DGAIES	Diesel Generator Combustion Air Intake and Exhaust System
DGB	Diesel Generator Building

Table 1.6-1: Acronyms

Acronyms	Meaning
DGFOSTS	Diesel Generator Fuel-Oil Storage and Transfer System
DGJWS	Diesel Generator Cooling Water System
DGLOS	Diesel Generator Lube Oil System
DGRVS	Diesel Generator Room Ventilation Sub-System
DGSAS	Diesel Generator Starting System
DMW	Dissimilar Metal Weld
DNBR	Departure from Nucleate Boiling Ratio
DRMWS	Demineralized and Reactor Makeup Water System
EAF	Environmentally Assisted Fatigue
ECB	Electrical and Control Building
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EEQ	Environmental Equipment Qualification
EEQSP	Environmental Equipment Qualification Summary Package
EFPY	Effective Full Power Year
EIC	Electrical and I&C
EOC	Extent of Condition
EOLE	End-of-License Extension
EPR	Ethylene Propylene Rubber
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
EQMM	Environmental Qualification Maintenance Manual

Table 1.6-1: Acronyms

Acronyms	Meaning
ESF	Engineered Safety Feature
ESFAS (SIAS)	Engineered Safety Features Actuation System (Safety Injection Actuation System)
EVT	Enhanced Visual Examination
F (°F, degF)	Degrees Fahrenheit
FAC	Flow-Accelerated Corrosion
F_{adj}	Adjusted Environmentally Assisted Fatigue Correction Factor
FB	Fuel Building
FD	Flow Diagram
FDS	Filter/Demineralizer System
FE	Further Evaluation
F_{en}	Environmentally Assisted Fatigue Correction Factor
FHA	Fire Hazards Analysis
FIBV	Feedwater Isolation Bypass Valve
FIV	Flow-Induced Vibration
FLR	Full Life Rate
FME	Foreign Material Exclusion
FOL	Facility Operating License
FOSAR	Foreign Object Search and Retrieval
FOST	Fuel Oil Storage Tank
FP	Fire Protection
FPR	Fire Protection Report
FPS	Fire Protection System

Table 1.6-1: Acronyms

Acronyms	Meaning
FSAR	Final Safety Analysis Report
FW	Feedwater
FWIV	Feedwater Isolation Valve
FWST	Fire Water Storage Tank
ft-lb	Foot-Pound
GALL	Generic Aging Lessons Learned (NUREG-1801)
GALL-SLR	Generic Aging Lessons Learned for Subsequent License Renewal (NUREG-2191)
GL	Generic Letter
GPM	Gallons per Minute
GSI	Generic Safety Issue
HBS	Hydrogen Bottled Gas Supply
HDPE	High Density Polyethylene
HDS	Heater Drains System
HELB	High Energy Line Break
HEPA	High Efficiency Particulate Air
HGS	Hydrogen Gas Supply System
HPCFVS	High-Pressure Chemical Feed Ventilation System
HPSI	High-Pressure Safety Injection
HVAC	Heating, Ventilation, and Air Conditioning
IASCC	Irradiation Assisted Stress Corrosion Cracking
IEB	Inspection and Enforcement Bulletin

Table 1.6-1: Acronyms

Acronyms	Meaning
IEEE	Institute of Electrical and Electronics Engineers
IER	INPO Event Report
IGSCC	Intergranular Stress Corrosion Cracking
ILRT	Integrated Leak Rate Test
IN	Information Notice
INPO	Institute of Nuclear Power Operations
IOPR	Improved Operational Performance Rate
IPA	Integrated Plant Assessment
IR	Insulation Resistance
ISFSI	Independent Spent Fuel Storage Installation
ISG	Interim Staff Guidance
ISI	Inservice Inspection
ISO	International Organization for Standardization
IST	Inservice Testing Program Plan
ksi	Thousand (Kilo)-Pounds per Square-Inch
LBB	Leak-Before-Break
LCP	Lower Core Plate
LEFM	Leading Edge Flow-Meter
LER	Licensee Event Report
LLC	Limited Liability Corporation
LLRT	Local Leak Rate Test
LOCA	Loss Of Coolant Accident

Table 1.6-1: Acronyms

Acronyms	Meaning
LOOP	Loss Of Offsite Power
LR	License Renewal
LRA	License Renewal Application
LRBD	License Renewal Boundary Drawing (Highlighted System Flow Diagrams)
LTOP	Low Temperature Overpressure Protection
LTOPS	Low Temperature Overpressure Protection System
LWR	Light-Water Reactor
MC	Metal Containment
MCC	Motor Control Center
MDAFW	Motor-Driven Auxiliary Feedwater
MEL	Master Equipment List (Maximo Work Control Database)
MELB (MELC)	Moderate Energy Line Break (Crack)
MIC	Microbiologically Influenced Corrosion
MRP	Materials Reliability Project
MS	Main Steam
MSIP	Material Stress Improvement Process
MSIV	Main Steam Isolation Valve
MSRV	Main Steam Relief Valve
MT or MPI	Magnetic-Particle Inspection
MeV	Million (Mega) Electron Volts
MWt	Megawatts-Thermal
n/cm^2-sec	Neutrons per Square Centimeter per Second (Flux)

Table 1.6-1: Acronyms

Acronyms	Meaning
n/cm^2	Neutrons per Square Centimeter (Cumulative Flux = Fluence)
NACE	National Association of Corrosion Engineers
NaOH	Sodium Hydroxide
NDE	Nondestructive Examination
NDT	Nil-Ductility Transition or Non-Destructive Testing
NDTT	Nil-Ductility Transition Temperature
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NNS	Non-Nuclear Safety Related
NPS	Nominal Pipe Size
NPSH	Net Positive Suction Head
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSSS	Nuclear Steam Supply System
NUREG (NUREG/CR)	Nuclear Regulatory Commission Regulation (Prepared by NRC Contractors)
OAR	Owners Activity Report
OBE	Operational Basis Earthquake
O.D.	Outer diameter
ODCM	Offsite Dose Calculation Manual
ODSCC	Outer Diameter Stress Corrosion Cracking
OE	Operating Experience
OEM	Original Equipment Manufacturer

Table 1.6-1: Acronyms

Acronyms	Meaning
OGS	Oxygen Gas Supply System
PCP	Process Control Program
PEO	Period Of Extended Operation
PRMS	Process Radiation Monitoring System
PRT	Pressurizer Relief Tank
PM	Preventive Maintenance
PMF	Probable Maximum Flood
PORV	Power-Operated Relief Valve
ppb	Parts per Billion
ppm	Parts per Million
psig	Pounds per Square-Inch Gauge
PTS	Pressurized Thermal Shock
P-T curves PTLR	Pressure-Temperature Limit Curves Pressure-Temperature Limits Report
PVC	Polyvinyl Chloride
PW	Potable And Sanitary Water System
PWR	Pressurized Water Reactor
PWROG	Pressurized Water Reactor Owners Group
PWRVI	Pressurized Water Reactor Vessel Internals
PWSCC	Primary Water Stress Corrosion Cracking
PSW	Primary Shield Wall
PZR	Pressurizer
QA	Quality Assurance

Table 1.6-1: Acronyms

Acronyms	Meaning
RAI	Request for Additional Information
RCB (CB)	Reactor Containment Building
RCI	Request For Confirmatory Information
RCL	Reactor Coolant Loop
RCPB	Reactor Coolant Pressure Boundary
RCP	Reactor Coolant Pump
RFO	Refueling Outage
RG	Regulatory Guide
RHR	Residual Heat Removal
RHRS	Residual Heat Removal System
RHUT	Recycle Hold-Up Tank
RIS	Regulatory Issue Summary
RMS	Radiation Monitoring System
RMW	Reactor Makeup Water
RMWP	Reactor Makeup Water Pump
RMWST	Reactor Makeup Water Storage Tank
RRVCH	Replacement Reactor Vessel Closure Head
RSG	Replacement Steam Generator
RT_{NDT} (ART)	Reference Temperature – Nil Ductility Transition (Adjusted Reference Temperature)
RT_{PTS}	Reference Temperature For Pressurized Thermal Shock
RV (RPV)	Reactor (Pressure) Vessel
RVCH	Reactor Vessel Closure Head

Table 1.6-1: Acronyms

Acronyms	Meaning
RVH	Reactor Vessel Head
RVI	Reactor Vessel Internals
RVLMA	Reactor Vessel Level Measuring System
RWST	Refueling Water Storage Tank
SAMR	Screening and Aging Management Review
SBO	Station Blackout
SCC	Stress Corrosion Cracking
SCR	Squaw Creek Reservoir
SE	Safety Evaluation
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SFS	Spent Fuel Pool Cooling and Cleanup System
SG	Steam Generator
SGB	Safeguards Building
SI	Safety Injection
SIS	Safety Injection System
SLR	Subsequent License Renewal (60 to 80 Years)
SLRA	Subsequent License Renewal Application
SPU	Stretch Power Uprate
SRP	Standard Review Plan (NUREG-1800)
SRP-SLR	Standard Review Plan For Subsequent License Renewal (NUREG-2192)
SSA	Safe Shutdown Analysis

Table 1.6-1: Acronyms

Acronyms	Meaning
SSC(s)	System(s), Structure(s), And Component(s)
SSDS	Shield Shutdown Seal
SSE	Safe Shutdown Earthquake
SSI	Safe Shutdown Impoundment
SSW	Secondary Shield Wall
SWIS	Service Water Intake Structure
SWOL	Structural Weld Overlay
TDAFW	Turbine-Driven Auxiliary Feedwater
TLAA	Time-Limited Aging Analysis
TB	Turbine Building
TID	Total Integrated Dose
TRM	Technical Requirements Manual
TRMB	Technical Requirements Manual Bases
TS	Technical Specifications
TSB	Technical Specifications Bases
TSP	Tube Support Plate
U1 (TBX)	Unit 1
U2 (TCX)	Unit 2
UHS	Ultimate Heat Sink
USE	Upper-Shelf Energy
UT	Ultrasonic Testing
VCT	Volume Control Tank

Table 1.6-1: Acronyms

Acronyms	Meaning
VT	Visual Testing
WCAP	Westinghouse Commercial Atomic Power
WEC	Westinghouse Electric Corporation
WO	Work Order
WOG	Westinghouse Owners Group (now PWROG)
WWF	Welded Wire Fabric
XGS	Miscellaneous Gas System

1.7. GENERAL REFERENCES

1.7.1 10 CFR Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants.

1.7.2 NPF-87, Comanche Peak Nuclear Power Plant Unit No. 1 Facility Operating License, ADAMS Accession No. ML053180521, April 17, 1990.

1.7.3 NPF-89, Comanche Peak Nuclear Power Plant Unit No. 2 Facility Operating License, ADAMS Accession No. ML053180525, April 6, 1993.

1.7.4 NUREG-1800, Revision 2, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, ADAMS Accession No. ML103490036.

1.7.5 Regulatory Guide 1.188, Revision 2, Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses, ADAMS Accession No. ML20017A265.

1.7.6 NEI 95-10, Revision 6, Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, June 2005, ADAMS Accession No. ML051860406.

1.7.7 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.

1.7.8 Order Approving Transfer of Licenses and Conforming License Amendments (CPNPP Unit 1 Operating License (NPF-87) and CPNPP Unit 2 Operating License (NPF-89)), ADAMS Accession No. ML16096A266.

1.7.9 TXX-16108, CPNPP and ISFSI, Docket Nos. 50-445, 50-446, 72-74 Information Regarding NRC Order Approving Transfer of Licenses and Conforming License Amendments (CPNPP Unit 1 Operating License (NPF-87) and CPNPP Unit 2 Operating License (NPF-89)), ADAMS Accession No. ML16288A834.

1.7.10 TXX-16109, CPNPP and ISFSI, Docket Nos. 50-445, 50-446, 72-74 Information Regarding NRC Order Approving Transfer of Licenses and Conforming License Amendments (CPNPP Unit 1 Operating License (NPF-87) and CPNPP Unit 2 Operating License (NPF-89)), ADAMS Accession No. ML16263A292.

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1.7.12 Comanche Peak Steam Electric Station, Units 1 & 2 - Issuance of Amendments RE: Increase in Allowable Thermal Power to 3458 MWT and Deletion of Texas Municipal Power Agency from the Operation Licenses (TAC MB1625 & MB1626), ADAMS Accession No. ML012890389.

1.7.13 Comanche Peak, Units 1 and 2 - Issuance of Amendment Nos. 146 and 146, Stretch Power Uprate, Revision to TS 1.0, "Use and Application," to Revise Rated Thermal

Power from 3458 to 3612 MWt (TAC Nos. MD6615 and MD6616), ADAMS Accession No. ML081510157.

1.7.14 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste.

1.7.15 NUREG-1801, Revision 2, Generic Aging Lessons Learned (GALL) Report, ADAMS Accession No. ML103490041.

1.7.16 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities.

1.7.17 Regulatory Guide 1.70, Revision 2, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants.

1.7.18 LR-ISG-2011-01, Revision 1, Aging Management of Stainless Steel Structures and Components in Treated Borated Water, ADAMS Accession No. ML12286A275.

1.7.19 LR-ISG-2011-02, Aging Management Program for Steam Generators, ADAMS Accession No. ML11297A085.

1.7.20 LR-ISG-2011-05, Ongoing Review of Operating Experience, ADAMS Accession No. ML12044A215.

1.7.21 LR-ISG-2012-01, Wall Thinning Due to Erosion Mechanisms, ADAMS Accession No. ML12352A057.

1.7.22 LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation, ADAMS Accession No. ML13227A361.

1.7.23 LR-ISG-2013-01, Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks, ADAMS Accession No. ML14225A059.

1.7.24 LR-ISG-2015-01, Changes to Buried and Underground Piping and Tank Recommendations, ADAMS Accession No. ML15125A377.

1.7.25 LR-ISG-2016-01, Changes to Aging Management Guidance for Various Steam Generator Components, ADAMS Accession No. ML16237A383.

1.7.26 SLR-ISG-2021-01-PWRVI, Updated Aging Management Criteria for Reactor Vessel Internals Components for Pressurized Water Reactors, ADAMS Accession No. ML20217L203.

1.7.27 NEI 97-06, Revision 3, Steam Generator Program Guidelines, ADAMS Accession No. ML111310708.

1.7.28 MRP-227, Revision 1-A, Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines, ADAMS Accession No. ML19339G350.

1.7.29 NUREG-2191, Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, Volumes 1 and 2, United States Nuclear Regulatory Commission, July 2017, ADAMS Accession Nos. ML16274A389 and ML16274A399.

1.7.30 NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants, United States Nuclear Regulatory Commission, July 2017, ADAMS Accession No. ML16274A402.

1.7.31 SLR-ISG-2021-02-MECHANICAL, Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance, ADAMS Accession No. ML20181A434.

1.7.32 SLR-ISG-2021-03-STRUCTURES, Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance, ADAMS Accession No. ML20181A381.

1.7.33 SLR-ISG-2021-04-ELECTRICAL, Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance, ADAMS Accession No. ML20181A395.

1.7.34 Generic Letter 85-06, Quality Assurance Guidance for ATWS Equipment That Is Not Safety-Related, April 16, 1985.

1.7.35 NUREG-0800, Standard Review Plan, Revision 1, Section 9.5.1 Appendix B, Leak-Before-Break Evaluation Procedures, March 2007.

1.7.36 Generic Letter 81-12, Fire Protection Rule, February 20, 1981.

1.7.37 Regulatory Guide 1.97, Revision 3, Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and following an Accident.

1.7.38 NUREG-0933, Resolution of Generic Safety Issues, Supplement 35, Published December 2011.

1.7.39 WCAP-17072-NP, Revision 0, H*: Alternate Repair Criteria for the Tubesheet Expansion Region in Steam Generators with Hydraulically Expanded Tubes (Model D5), May 2009.

1.7.40 EPRI 1013475, Rev. 1 License Renewal Electrical Handbook, February 2007.

1.7.41 WCAP-18630-NP, Revision 0, “Comanche Peak Units 1 and 2 Time Limited Aging Analysis on Reactor Vessel Integrity,” May 2021.

1.7.42 WCAP-9475, Revision 0, “Texas Utilities Comanche Peak Unit No. 1 Reactor Vessel Radiation Surveillance Program,” April 1979.

2.0. SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AMR, AND IMPLEMENTATION RESULTS

This section describes the process for identifying and determining the CPNPP SSCs that are included in the scope of LR. Passive, long-lived SSCs in the scope of LR are subject to AMR in the CPNPP IPA. For those SSCs within the scope of LR, 10 CFR 54.21(a)(1) requires the LR applicant to identify and list the structures and components subject to AMR. Furthermore, 10 CFR 54.21(a)(2) requires that the methods used to identify these structures and components be described and justified. The information in this section satisfies these requirements.

Scoping is the process of identifying the plant systems and structures that are determined to be in the scope of LR in accordance with 10 CFR 54.4. The intended functions that are the bases for including the systems and structures within the scope of LR are also identified during the scoping portion of the LRA process. Screening is the process of determining which components associated with the in-scope systems and structures are subject to AMR in accordance with 10 CFR 54.21(a)(1) requirements.

A description of the CPNPP scoping and screening process is provided in Section 2.1. The plant level scoping results which identify the systems and structures within the scope of LR are provided in Section 2.2. The screening results which identify components subject to AMR for mechanical systems, structures, and Electrical and I&C (EIC) systems in the scope of LR are provided in Sections 2.3, 2.4, and 2.5, respectively.

2.1. SCOPING AND SCREENING METHODOLOGY

2.1.1. Introduction

The LR rule (10 CFR Part 54) defines the scope of LR using three criteria. 10 CFR 54.4(a) requires SSCs to be within the scope of LR if they are —

(1) Safety related systems, structures, and components, which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) (Reference 1.7.16) to ensure the following functions --

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter, as applicable.

(2) All non-safety related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (1)(i), (ii), or (iii) of this section.

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

NEI 95-10, Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Revision 6, provides industry guidance for determining what SSCs are in the scope of LR. The process, used to determine the systems and structures in the scope of LR for the CPNPP units, follows the recommendations of NEI 95-10.

The initial step in the scoping process was to define the entire plant in terms of systems and structures. Each of these systems and structures were evaluated against the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3) to determine if the system or structure should be considered in the scope of LR. The intended function(s) that are the basis for including each system and structure within the scope of LR were also identified.

A mechanical system or structure is included within the scope of LR if any portion of the system or structure meets one or more of the scoping criteria of 10 CFR 54.4. Structural commodities associated with mechanical systems, such as pipe hangers and supports, are evaluated with the structural bulk commodities along with insulation on mechanical system piping and components. All EIC systems are included within the scope of LR under an in-scope bounding approach (ISBA) except for the Meteorological Instrumentation and Security Systems which were specifically scoped out. Mechanical systems which contain EIC components are included in the evaluation of EIC components, regardless of whether the mechanical system is included within scope. The bases for EIC systems to be included within scope of LR are not identified since the bounding approach makes it unnecessary to determine if an EIC system meets any of the criteria of 10 CFR 54.4. The mechanical, structural and EIC systems and components within scope of LR were then further evaluated to determine the system components that support the identified system intended function(s).

Figure 2.1-1 provides a flowchart of general scoping and screening processes used for mechanical systems, structures, and EIC systems.

Figure 2.1-2 provides a further flowchart of the various aspects of the process for evaluating the non-safety affecting safety scoping criterion, 10 CFR 54.4(a)(2).

Figure 2.1-1 CPNPP Scoping and Screening Flow Chart

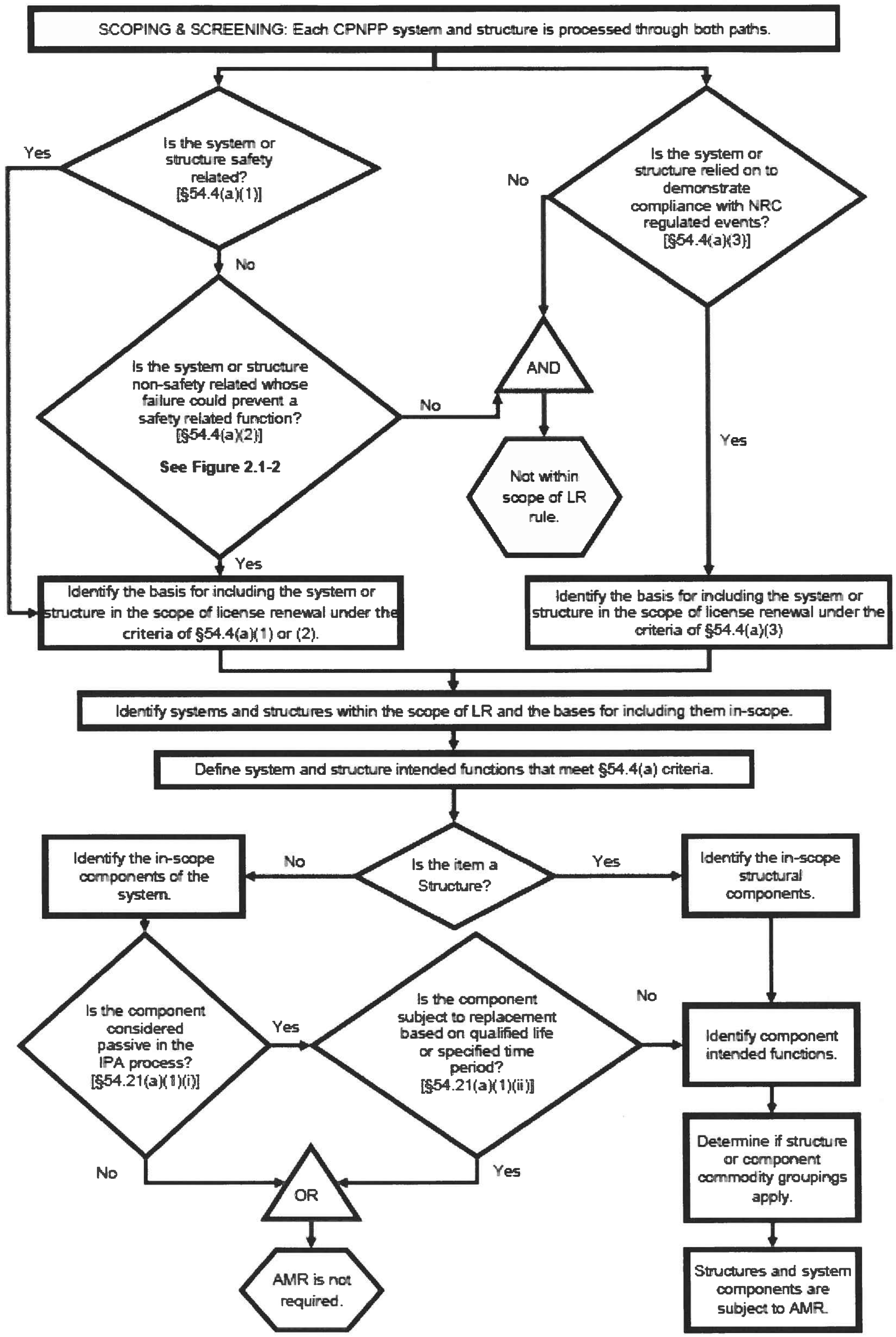


Figure 2.1-2 CPNPP 10 CFR 54.4(a)(2) Evaluation Methodology

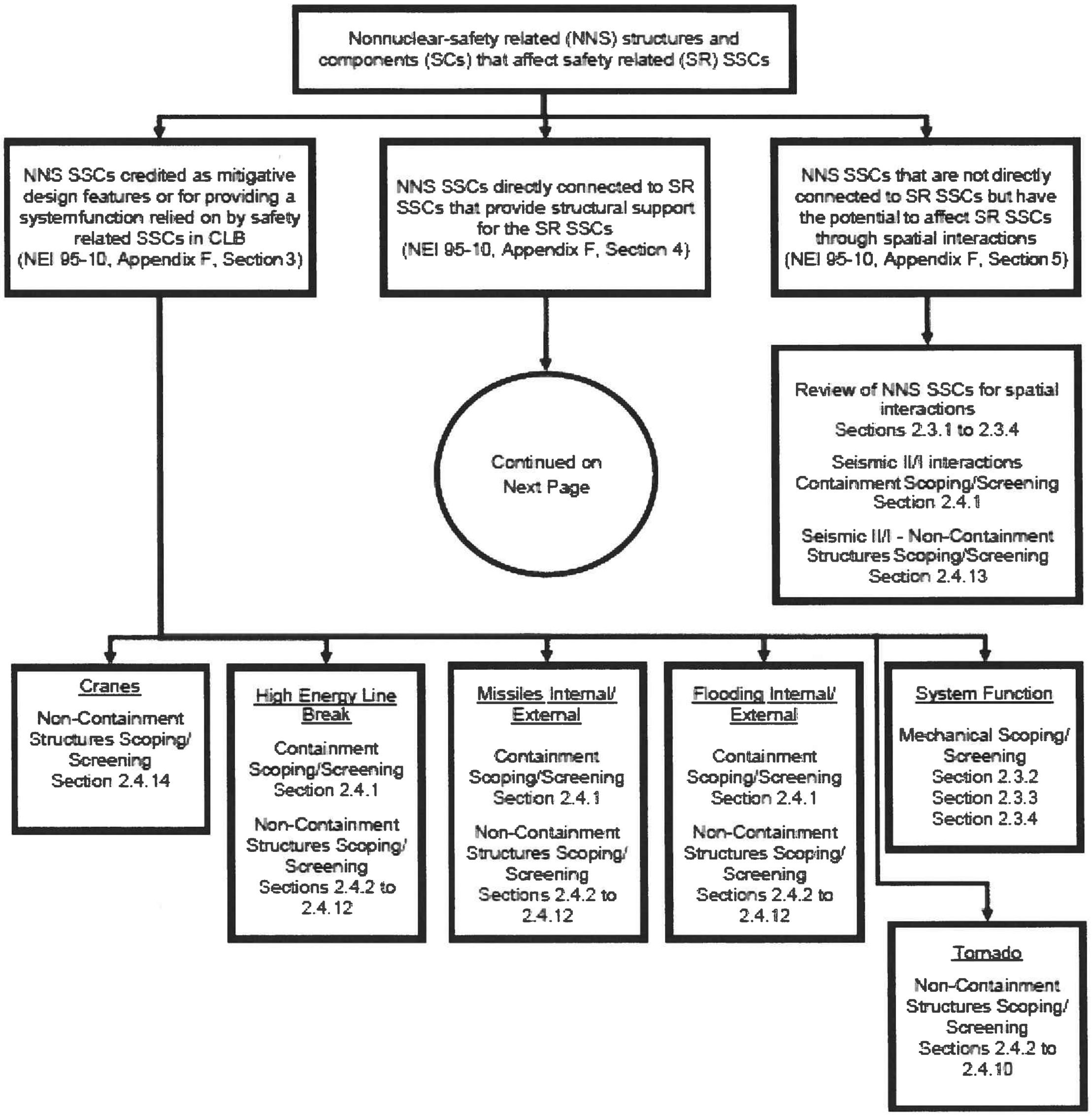
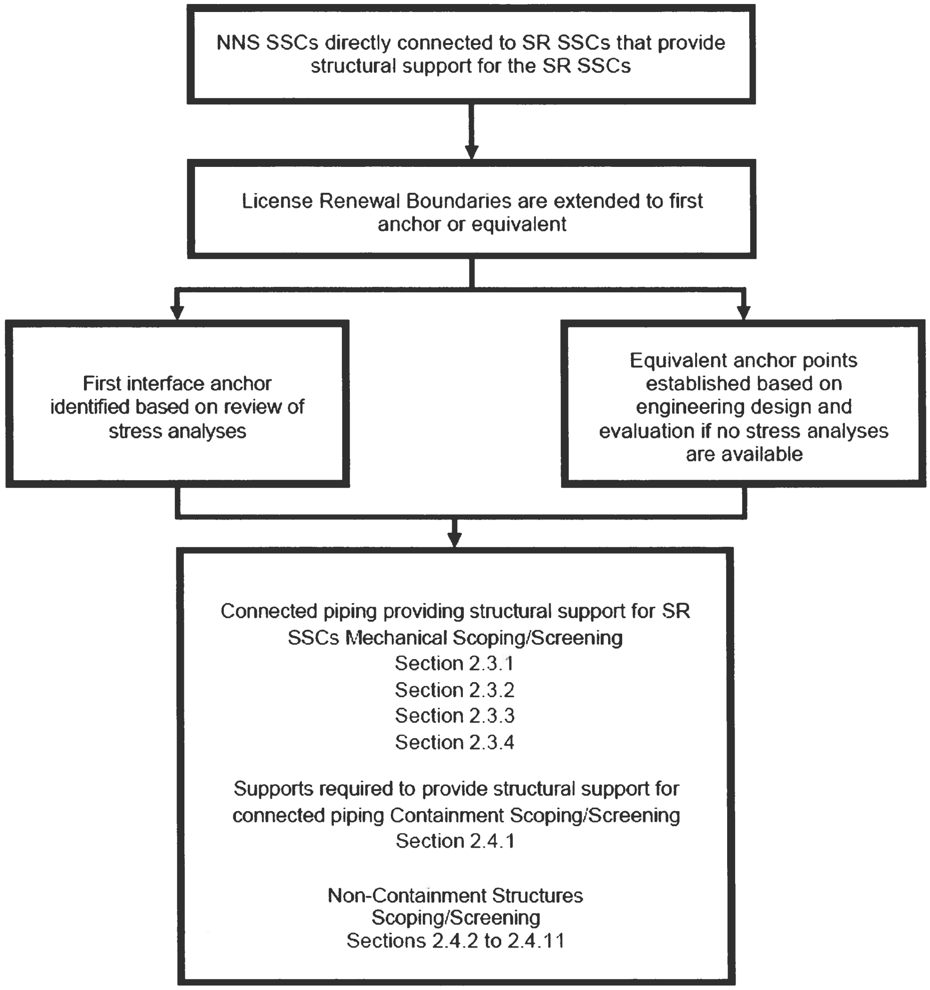


Figure 2.1-2 CPNPP 10 CFR 54.4(A)(2) (Continued)



2.1.2. Information Sources Used for Scoping and Screening

Various current licensing bases (CLB) and design basis information sources for CPNPP were utilized in the scoping process and screening process. These sources were used to determine if there was a basis for including each CPNPP system and structure in the scope of LR. The CLB for CPNPP is consistent with the definition provided in 10 CFR 54.3.

These source documents are available in hard copy or electronic format. Document records such as licensing correspondence and NRC Safety Evaluation Reports (SERs) are available in a searchable database, such that applicable documents can be identified and located by searching the appropriate topic.

2.1.2.1. Final Safety Analysis Report

The Final Safety Analysis Report (FSAR) used for the scoping process describes the design, construction, and operation of a two-unit nuclear power plant designated as the CPNPP, Operating Licenses NPF-87 and NPF-89 for Units 1 and 2, respectively. This report follows the format recommended by RG 1.70, Revision 2, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (Reference 1.7.17). The FSAR provided significant input for the system and structure scoping process.

2.1.2.2. Fire Protection Report

The Fire Protection Report (FPR) documents the comprehensive study of the fire protection (FP) features and fire safe shutdown capabilities for CPNPP Units 1 and 2. The overall approach for FP considers preventing, detecting, and suppressing fires along with maintaining plant ability to perform fire safe shutdown functions. The FPR includes the Fire Hazards Analysis Report and the Fire Safe Shutdown Analysis Report.

2.1.2.3. Master Equipment List

The CPNPP Master Equipment List (MEL) is a comprehensive list of the components contained within each system. The MEL, combined with information in the CPNPP FSAR, was used to develop the total list of systems and structures included within the scope of LR.

2.1.2.4. Maintenance Rule Database

The Maintenance Rule Database documents the results of Maintenance Rule scoping for CPNPP systems and structures. The Maintenance Rule Database provided an additional source of information to identify bases for including systems and structures within the scope of LR.

2.1.2.5. Engineering Drawings

Engineering drawings at CPNPP provide SSC configuration details and safety classification information. These drawings were used to determine SSC functional requirements to determine if there was a basis for including the SSCs in the scope of LR.

2.1.2.6. Design Basis Documents

Design basis documents (DBDs) provide the design intent of a given system or structure where they exist. These DBDs were utilized to determine intended functions of a system and structure and provided significant input to the scoping process.

2.1.2.7. Other CLB References

NRC SERs and Supplements include NRC staff review of CPNPP licensing submittals. Some of these documents may contain licensee commitments.

Licensing correspondence includes relief requests, Licensee Event Reports (LERs), and responses to NRC communications such as NRC Inspection and Enforcement Bulletins (IEBs), generic letters (GLs), or enforcement actions. Some of these documents may contain licensee commitments.

2.1.3. Technical Reports

Technical reports were prepared in support of the CPNPP LRA. Engineers experienced in nuclear plant systems, programs, and operations prepared the reports. Reports contain technical evaluations and bases for decisions or positions associated with LR requirements. Reports are prepared, reviewed, and approved in accordance with controlled project procedures, and are based on the CPNPP CLB source documents described in Section 2.1.2.

2.1.3.1. License Renewal Systems and Structures List

One of the first steps necessary to begin the LR scoping process was to identify a comprehensive list of systems and structures to be evaluated for a LR scoping determination. Review of a variety of document sources that identify systems and structures at CPNPP was conducted and a comprehensive list of LR systems and structures was prepared using the CPNPP FSAR, CPNPP system and structure DBDs, and the CPNPP MEL. The list in the MEL was evaluated against the CPNPP FSAR, plant design drawings, the Maintenance Rule database, CPNPP systems and structure DBDs, and other plant CLB documents. Plant systems and structures were arranged into groupings for scoping reviews. Components evaluated as commodity groups were also identified. This list is the first step in the CPNPP LRA scoping process and assures all plant structures and components included in the scoping review are associated with a system, structure, or commodity group.

2.1.3.2. License Renewal Scoping

The scoping process and evaluations associated with the CPNPP LRA are documented in a CPNPP technical report. The CPNPP systems and structures list discussed in Section 2.1.3.1 were evaluated to determine if there was a basis for including each system or structure in the scope of LR, per the criteria described in 10 CFR 54.4(a)(1), (a)(2), or (a)(3) as depicted in Figures 2.1-1 and 2.1-2. During this process, the CPNPP systems and structures were grouped into the following categories:

- Reactor Vessel, Internals, and Reactor Coolant System
- Engineered Safety Features
- Auxiliary Systems
- Steam and Power Conversion Systems
- Containments, Structures, and Component Supports
- Electrical and Instrumentation and Control Systems

The grouping of systems and structures into these categories is based on the intended functions of the system and structure as described in the CPNPP FSAR and CPNPP system DBDs, and consistent with guidance of NUREG-1801.

Each mechanical system and structure was evaluated to determine if the individual system and structure was in the scope of LR (and the basis). If the individual system or structure did not meet any of the criteria of 10 CFR 54.4(a)(1), (a)(2), or (a)(3) then a justification for the exclusion of the system or structure from the scope of LR was provided.

All EIC Systems (except Meteorological Instrumentation and Security Systems) are automatically considered in scope. Additionally, all EIC components that are contained within mechanical systems are automatically in scope, regardless of whether the mechanical system is determined to be in scope. Since this bounding approach is utilized, no bases are provided for including EIC systems and components in the scope of LR.

Certain structures and equipment were excluded at the outset because they are not considered to be SSCs that are part of the CLB and/or do not have design or functional requirements related to the 10 CFR 54.4(a)(1), (a)(2), or (a)(3) scoping criteria. These SSCs include driveways and parking lots, temporary equipment, health physics equipment, portable measuring and testing equipment, tools, and motor vehicles.

2.1.3.3. License Renewal Operating Experience

Site and industry OE associated with CPNPP LR are documented in CPNPP technical reports. Site and industry OE is used primarily to confirm the applicability of typical material and environment based aging effects to CPNPP and ensure any aging effects specific to CPNPP are evaluated. Also, the lessons-learned from recent applicants for LR or subsequent LR (SLR) may provide OE germane to CPNPP LR and are considered. Any such lessons-learned pertinent to system and structure scoping or SSC screening are addressed in the technical reports described in Section 2.1.3.2 above, and Section 2.1.3.4 below, respectively.

2.1.3.4. License Renewal Screening and Aging Management Review

For the systems and structures in the scope of CPNPP LR, the determination of passive, long-lived components and commodities, their function(s), and the associated AMRs are documented in CPNPP technical reports for individual or a collection of systems, structures, or bulk (EIC) and structural commodities. The methodology for screening, determining passive and long-lived components and their intended functions, is described in Section 2.1.6 below. AMR considerations generically applicable to CPNPP SSCs are addressed in Section 3.0 below.

2.1.3.5. License Renewal Aging Management Programs

The effectiveness of existing or new site programs identified in Section 3, Aging Management Review Results, as AMPs for LR, in managing the identified effects of aging are documented in individual technical reports that serve as AMP basis documents. These AMP basis documents also consider site and industry OE as part of the effectiveness demonstration. The demonstration of effectiveness for each credited AMP is summarized in Appendix B, "Aging Management Programs".

2.1.4. INTERIM STAFF GUIDANCE DISCUSSION

NRC staff LR guidance documents pertinent to CPNPP LR include:

- NUREG-1800, Revision 2, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants; and
- NUREG-1801, Revision 2, Generic Aging Lessons Learned (GALL) Report.

In addition, Interim Staff Guidance (ISG) documents issued by the NRC after the above guidance documents constitute an update or clarification of the guidance contained in those documents. The following is a listing of issued ISG updates/clarifications of NUREG-1800 and/or NUREG-1801:

LR-ISG-2011-01 Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1 (Reference 1.7.18)

LR-ISG-2011-02 Aging Management Program for Steam Generators (Reference 1.7.19)

LR-ISG-2011-05 Ongoing Review of Operating Experience (Reference 1.7.20)

LR-ISG-2012-01 Wall Thinning Due to Erosion Mechanisms (Reference 1.7.21)

LR-ISG-2012-02 Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation (Reference 1.7.22)

LR-ISG-2013-01 Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (Reference 1.7.23)

LR-ISG-2015-01 Changes to Buried and Underground Piping and Tank Recommendations (Reference 1.7.24) (replaces LR-ISG-2011-03)

LR-ISG-2016-01 Changes to Aging Management Guidance for Various Steam Generator Component (Reference 1.7.25)

SLR-ISG-2021-01-PWRVI Updated Aging Management Criteria for Reactor Vessel Internals Components for Pressurized Water Reactors (supersedes in total the previous guidance in LR-ISG-2011-04) (Reference 1.7.26)

Other NRC guidance documents for SLR (60 to 80 years of operation) are not directly applicable to CPNPP LR (40 to 60 years of operation). However, these guidance documents, including approved SLR-ISGs, contain OE that may be applicable to CPNPP LR and are, therefore, considered in Section 2.1.4.10.

The following sections summarize how each of the LR-ISGs are addressed in the CPNPP LRA.

2.1.4.1. LR-ISG-2011-01, Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1

This LR-ISG provides one acceptable approach to managing the aging effects of stainless steel structures and components exposed to treated borated water, that includes physical verification of the effectiveness of preventive programs. The updated guidance has been considered in the CPPNP IPA as reflected in Section 3, “Aging Management Review Results”, and in Appendix B, “Aging Management Programs”. The One-Time Inspection (B.2.3.19) AMP, when appropriate, is credited to verify the effectiveness of the Water Chemistry (B.2.3.2) AMP for managing aging effects of stainless steel structures and components within the scope of LR that are exposed to treated borated water. The One-Time Inspection AMP is addressed in Section B.2.3.19 and the Water Chemistry (B.2.3.2) AMP is addressed in Section B.2.3.2.

2.1.4.2. LR-ISG-2011-02, Aging Management Program for Steam Generators

This LR-ISG recommends the adoption of Revision 3 of NEI 97-06, “Steam Generator Program Guidelines” (Reference 1.7.27). CPNPP has considered the updated guidance in the IPA as reflected in Section 3.1, “Aging Management of Reactor Vessel, Internals, and Reactor Coolant System,” and in Appendix B, “Aging Management Programs”. The Steam Generators AMP is addressed in Section B.2.3.10.

2.1.4.3. LR-ISG-2011-05, Ongoing Review of Operating Experience

This LR-ISG revises the NUREG-1800 acceptance criteria and review procedure to better address the ongoing review of OE with respect to LR AMP effectiveness. CPNPP incorporates the guidance presented in this LR-ISG. Ongoing review of OE is addressed in Appendix A, Final Safety Analysis Report Supplement, Section A.1.4 and Appendix B, Aging Management Programs, Section B.1.4, “Operating Experience”.

2.1.4.4. LR-ISG-2012-01, Wall Thinning Due to Erosion Mechanisms

This LR-ISG provides an acceptable approach to manage the effects of wall-thinning due to mechanisms other than Flow-Accelerated Corrosion (B.2.3.8) (FAC), i.e., various forms of erosion that have caused problems in the past and continue to be encountered in some operating reactor systems. The updated guidance has been considered in the CPNPP IPA as reflected in the aging management results presented in Section 3 and the AMP descriptions presented in Appendix B, Section B.2.3.8. CPNPP Flow-Accelerated Corrosion (B.2.3.8) AMP addresses similar wall-thinning mechanisms and will adopt the guidance of this LR-ISG relative to erosion mechanisms.

2.1.4.5. LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation

This LR-ISG provides an acceptable approach for managing the aging of components that are a) internal surfaces not managed by another program, b) elastomers, c) above ground metallic tanks, d) susceptible to blockage in fire water systems, e) insulated surfaces, or f) susceptible to recurring internal corrosion. The updated guidance has been considered in the CPNPP IPA as reflected in the AMR results presented in Section 3, and in the corresponding AMP descriptions in Appendix B, Section B.2.3.12, "Closed Treated Water Systems", Section B.2.3.16, "Fire Water System", Section B.2.3.22," External Surfaces Monitoring of Mechanical Components", and Section B.2.3.24, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components".

2.1.4.6. LR-ISG-2013-01, Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

This LR-ISG provides guidance on an acceptable approach to the management of coatings/linings internal to mechanical components in the scope of LR. The updated guidance has been considered in the CPNPP IPA as reflected in the AMR results in Section 3 and the AMP description in Appendix B, Section B.2.3.28, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers and Tanks".

2.1.4.7. LR-ISG-2015-01, Changes to Buried and Underground Piping and Tank Recommendations (LR-ISG-2011-03 has been replaced by LR-ISG-2015-01)

This LR-ISG provides guidance on an acceptable approach to managing the aging on external surfaces of buried components and for managing the aging of components that are "underground." Below-grade tunnels, pits, manholes, valve boxes, and vaults comprise "underground." The updated guidance has been considered in the CPNPP IPA as reflected in the AMR results in Section 3, and the AMP description in Appendix B. The Buried and Underground Piping and Tanks Inspection program is described in Section B.2.3.27.

2.1.4.8. LR-ISG-2016-01, Changes to Aging Management Guidance for Various Steam Generator Components

This LR-ISG provides changes relative to managing of cracking due to primary water stress corrosion cracking (PWSCC) of nickel alloy sub-components on the primary side of the steam generators (SGs), such as the divider plate. This updated guidance has been considered in the CPNPP IPA as reflected in the AMR results in Section 3.1, "Aging Management of Reactor Vessel, Internals, and Reactor Coolant

System", and in Appendix B, "Aging Management Programs". The Steam Generators AMP is addressed in Section B.2.3.10.

2.1.4.9. SLR-ISG-2021-01-PWRVI Updated Aging Management Criteria for Reactor Vessel Internals Components for Pressurized Water Reactors

This SLR-ISG provides a framework to ensure that age-related degradation and aging of pressurized water reactor (PWR) reactor vessel internal (RVI) components are adequately addressed and recommends the adoption of EPRI Materials Reliability Program (MRP) document MRP-227, Revision 1-A, Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (Reference 1.7.28) for management of PWR RVI components. This framework supersedes in total the previous guidance in LR-ISG-2011-04, which is related to NUREG-1800 Revision 2 and NUREG-1801 Revision 2. The updated guidance has been considered in the CPNPP IPA as reflected in Section 3.1, "Aging Management of Reactor Vessel, Internals, and Reactor Coolant System", and in the PWR Vessel Internals AMP in Section B.2.3.7.

2.1.4.10. Operating Experience in Subsequent License Renewal Guidance

Other SLR (60 to 80 years of operation) guidance documents are not applicable to CPNPP LR. However, these documents are treated as OE that may be relevant to CPNPP LR. This OE has been considered in the CPNPP IPA and utilized as appropriate, on a limited basis. The AMR results in Section 3 include a plant-specific note for line items that include clarification from SLR OE. Similarly, AMP descriptions in Appendix B indicate when an element(s) of the program is clarified by SLR OE.

The SLR guidance documents that contain potential OE applicable to CPNPP include:

- NUREG-2191, Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) (References 1.7.29);
- NUREG-2192, Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (References 1.7.30);
- SLR-ISG-2021-02-MECHANICAL, *Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance* (Reference 1.7.31);
- SLR-ISG-2021-03-STRUCTURES, *Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance* (Reference 1.7.32); and
- SLR-ISG-2021-04-ELECTRICAL, *Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance* (Reference 1.7.33).

2.1.5. SCOPING PROCEDURE

The scoping process is the systematic process used to identify the CPNPP systems and structures within the scope of the LR rule. The scoping process was performed at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). Bases for determining if a system or structure is in the scope of LR, the intended functions, were identified from a review of the pertinent CLB and design documents. System and structure scoping evaluations are documented and have been retained in the CPNPP LR technical reports. The system and structure scoping results are provided in Section 2.2.

The CPNPP scoping process began with the development of a comprehensive list of plant systems and structures as described in LR technical reports. These systems and structures were grouped into the following categories to support further evaluation (FE) and the screening process:

- Reactor Vessel, Internals, and Reactor Coolant System
- Engineered Safety Features
- Auxiliary Systems
- Steam and Power Conversion Systems
- Containments, Structures, and Component Supports
- Electrical, Instrumentation and Control Systems

Each CPNPP system and structure was then evaluated to determine if it fell within the scope of LR, using the criteria of 10 CFR 54.4(a). These criteria are briefly identified as follows:

- 10 CFR 54.4(a)(1) – Nuclear Safety Related or Safety Related
- 10 CFR 54.4(a)(2) – Non-Nuclear Safety Related (NNS) affecting Nuclear Safety Related
- 10 CFR 54.4(a)(3) – Regulated Events
    - Fire Protection (FP) (10 CFR 54.48)
    - Environmental Qualification (EQ) (10 CFR 54.49)
    - Pressurized Thermal Shock (PTS) (10 CFR 50.61)
    - Anticipated Transient Without Scram (ATWS) (10 CFR 50.62)
    - Station Blackout (SBO) (10 CFR 50.63)

2.1.5.1. Nuclear Safety Related – 10 CFR 54.4(a)(1)

In accordance with 10 CFR 54.4(a)(1), the SSCs within the scope of LR include:

> *Safety related systems, structures, and components, which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions—*
>
> *(i) The integrity of the reactor coolant pressure boundary;*
>
> *(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or*

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.

The CPNPP definitions of nuclear safety related and safety related (which are synonymous at CPNPP) SSCs do not address the exposure guidelines referred to in 10 CFR 50.67(b)(2).

Section 50.67(b) reads,

(1) A licensee who seeks to revise its current accident source term in design basis radiological consequence analyses shall apply for a license amendment under §50.90. The application shall contain an evaluation of the consequences of applicable design basis accidents previously analyzed in the safety analysis report.…

CPNPP has retained its original accident source term in radiological consequence analyses and the offsite dose limits discussed in Subpart A of 10 CFR 100 are applicable to CPNPP, whereas a revised accident source term is not. Furthermore, 10 CFR 50.34(a)(1)(i) is applicable to CPNPP as the construction permit was issued before January 10, 1997. 10 CFR 50.34(a)(1)(i) indicates "special attention should be directed to the site evaluation factors in part 100 of this chapter" (10 CFR Part 50). Therefore, the extent to which these limits affect the CPNPP definitions of nuclear safety related and safety related SSCs are consistent with the definition of a SR SSC in 10 CFR 54.4(a)(1) and with the definition of design basis events (DBEs) in 10 CFR 50.49(b)(1).

As described in FSAR Section 3.2.2, "Fluid system components important to safety are classified in accordance with the American National Standards Institute (ANSI) N18.2-1973, Nuclear Safety Criteria for the Design of Stationary PWR Plants classification except as described below. This classification system is compatible with requirements of NRC RG 1.26 and is submitted as an alternate acceptable method of meeting the intent of NRC RG 1.26."

As described in FSAR Section 3.2.1.1, "The plant structures, Reactor Coolant System, engineered safety features, and safety related systems and components are identified and classified in accordance with the seismic requirements of General Design Criterion 2 of Appendix A to 10 CFR Part 50, General Design Criteria for Nuclear Power Plants. NRC RG 1.29 designates those structures, systems, and components which must remain functional during the safe shutdown earthquake (SSE) as Seismic Category I items."

FSAR Table 17A-1, along with the MEL, identifies safety related SSCs. Safety related CPNPP systems and components, consistent with their function, are designated as Safety Class 1, 2, 3 with components or their portions designed to the ASME B&PV Code, Section III, and subject to QA programs. Some demineralizers, heat exchangers and other components that are Safety Class 3 do not expressly meet the 10 CFR 54.4(a)(1) criteria yet are included in the scope of license renewal (LR). These components are described in FSAR Table 17A-1 and include:

- Mixed Bed Demineralizer;
- Cation Bed Demineralizer;
- Moderating Heat Exchanger;
- Letdown Chiller Heat Exchanger (Tube side);
- Letdown Reheat Heat Exchanger (Shell side);
- Thermal regeneration demineralizers;
- Associated piping, valves, etc.; as well as
- Burnable poison rod assemblies and Primary source rods.

Mechanical systems with components that perform a safety function are classified as nuclear safety related, meet 10 CFR 54.4(a)(1), and are included in the scope of LR. Likewise, Seismic Category I structures meet the 10 CFR 54.4(a)(1) criteria and are in the scope of LR. EIC systems, and EIC portions of other systems, are included within the scope of LR under an ISBA as described in Section 2.1.1.

Safety functions that are the basis for including an SSC in scope are identified by reviewing the FSAR, DBDs, engineering drawings, the MR basis document, and other CLB and design documents.

2.1.5.2. Non-Nuclear Safety Related Affecting Nuclear Safety Related – 10 CFR 54.4(a)(2)

In accordance with 10 CFR 54.4(a)(2), the SSCs within the scope of LR include:

- *All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of this section.*

This scoping criterion required an assessment of non-nuclear safety related (NNS) SSCs with respect to the following categories:

- Functional support for nuclear safety related SSC 10 CFR 54.4(a)(1) functions
- Connected to and provide structural support for nuclear safety related SSCs
- Potential for spatial interactions with nuclear safety related SSCs

Each of these categories is discussed below:

Functional Support for Nuclear Safety Related SSC 10 CFR 54.4(a)(1) Functions

At CPNPP, non-structural SSCs that perform a function that supports a safety function are classified as nuclear safety related, with few exceptions. Safety Class 3 fluid system pressure boundary components include those that are necessary to provide or support a safety system function. Multiple systems supporting safety functions are identified as nuclear safety related in FSAR Table 17A-1.

SSCs that are NNS and in scope per 10 CFR 54.4(a)(2) with a function credited in the CLB include the protective (mitigative) features installed in Seismic Category I structures to protect nuclear safety related SSCs from (external or internal) flooding, tornadoes, or pipe ruptures or excess temperatures that might occur, or in non-seismic structures to prevent/mitigate flooding of adjacent Seismic Category I structures. These mitigative features are NNS commodities and have a credited function described in the FSAR, such as:

- tornado protection design features including tornado vents (FSAR Sections 2.3.1.2, 2.3.2.3, 3.3.2, & 3.5.1.4),
- watertight doors, water stops, curbs, stop gates and sumps for flood protection (discussed in FSAR Section 3.4.1),
- missile barriers inside and outside Containment (RCB) (FSAR Sections 3.5.1.2.3, 3.5.1.1.2, respectively),
- high energy line break (HELB), moderate energy line break/crack (MELB/MELC) barriers and shields and pipe whip restraints (FSAR Section 3.6B); as well as
- insulation on components in nuclear safety related and engineered safety feature pump rooms credited for the heat removal capability of area room coolers during pump operation (FSAR 9.4.5.1), and
- insulation on Reactor Coolant System piping and in high temperature penetration assemblies that are implicitly credited with maintaining Containment and biological shield wall local concrete temperatures at acceptable levels (FSAR 3.8.3.4.8).

The CPNPP FSAR and other CLB documents were reviewed to identify NNS SSCs that are credited with supporting satisfactory accomplishment of a nuclear safety related function. NNS SSCs credited in CLB documents to support a nuclear safety related function are included within the scope of LR, and the function is listed as an intended function for 10 CFR 54.4(a)(2) for the system.

The following were identified as a system function performed by NNS components whose failure could prevent satisfactory accomplishment of a safety function:

- NNS backwater valves within the floor drain system prevent water from backing up through drain lines and possibly impairing the function of nuclear safety related equipment (FSAR Section 9.3.3.2),
- NNS ball float devices within the floor drain system prevent steam propagation or unfiltered air inleakage to other interconnecting areas and are provided as necessary for the protection of essential systems and components (FSAR Section 9.3.3.2),
- Circulating Water System (CWS) pumps trip prior to overflowing the TB pit, in order to prevent flooding of nuclear safety related equipment in the adjacent ECB (FSAR Section 10.4.5.3),
- The Reactor Coolant Pipe Penetration Cooling in Primary Shield Wall system (a Containment Ventilation subsystem) is designed to dissipate heat conducted to the supports by the reactor coolant lines utilizing forced convection to prevent dehydration of concrete (FSAR 9.4A.1.7),
- Additionally, Fire Protection System (FPS) hose stations and components in the spent fuel area can also supply makeup water in excess of the boil-off rate to the spent fuel pools (SFPs) if normal sources are unavailable (FSAR 9.5.1.4.2.d). These components are in the scope of LR per 10 CFR 54.4(a)(3).

Connected to and Provide Structural Support for Nuclear Safety Related SSCs

Based on the guidance in NEI 95-10, systems containing NNS SSCs that are directly connected to nuclear safety related SSCs (typically piping), and the associated structural supports (anchors) satisfy the criterion of 10 CFR 54.4(a)(2) and are within the scope of LR.

NNS piping and process tubing directly connected to (and providing structural support for) nuclear safety related piping and components satisfy the 10 CFR 54.4(a)(2) criterion and are in the scope of LR up to and including the first seismic restraint, which provide restraint in each of three orthogonal (X/Y/Z) directions beyond the nuclear safety related/NNS interface (safety class extension), or in limited instances to equivalent anchor (such as a wall penetration, large equipment connection or a series of supports).

NNS piping and tubing attached to nuclear safety related components are considered to meet the 10 CFR 54.4(a)(2) criterion up to a free end of NNS drain or vent piping: up to a flexible connection; between ends of nuclear safety related piping; and attached to large, floor mounted equipment as appropriate; or up to a transition from piping to ductwork. Only those safety class extensions that provide a boundary for scoping are of particular focus. Liquid filled piping downstream of the NNS piping included in a safety class extension satisfy the 10 CFR 54.4(a)(2) criterion for spatial interactions. Where the LR evaluation boundary of a system only extends up to a seismic (or equivalent) anchor, the extent of piping included in the scope of LR is determined.

Component supports in buildings and areas in the scope of LR, both Seismic Category II and non-seismic, are in the scope of LR as a bulk commodity that satisfies the 10 CFR 54.4(a)(2) criterion.

Potential for Spatial Interactions with Nuclear Safety Related SSCs

Spatial interactions can occur downstream of nuclear safety related/NNS interfaces or between nuclear safety related and NNS SSCs within the same vicinity. Spatial interactions may include physical impact, pipe whip, jet impingement, spray, flooding, or harsh environments such as caused by HELB. Spatial interactions may also include spray or leakage, such as caused by MELB/C or leakage from low energy SSCs.

A combination of mitigative and preventive options are used to determine which NNS systems or NNS portions of nuclear safety related systems and structures are in scope for 10 CFR 54.4(a)(2) due to the potential for spatial interaction. NNS protective (mitigative) features include structural commodities that have a credited function to protect nuclear safety related SSCs described in the FSAR and are in-scope per 10 CFR54.4(a)(2), as described above. Industry OE has shown that age-related pipe failures can and do occur at locations other than postulated locations. Therefore, the preventive option is also used to ensure the NNS piping and components with the potential for spatial interaction with nuclear safety related SSCs are included. The types of spatial interactions that satisfy the 10 CFR 54.4(a)(2) criterion are described further below.

Physical Impact

This category concerns potential spatial interaction of NNS SSCs falling on or otherwise physically impacting nuclear safety related SSCs such that safety functions may not be accomplished.

NNS overhead handling systems whose failure could result in damage to nuclear safety related SSCs that could prevent the accomplishment of a safety function are within the scope of LR based on the criterion of 10 CFR 54.4(a)(2).

Seismic Category II as well as other, non-seismic supports, enclosures (e.g., panels, cabinets, terminal/junction boxes), and miscellaneous structural components located in or, in the case of lines extending from the Seismic Category I Safeguards Building over the roof of the non-seismic Switchgear Building, adjacent to Seismic Category I structures are structural commodities that meet the 10 CFR 54.4(a)(2) criterion.

Flooding, Pipe Whip, Jet Impingement, or Harsh Environments

Dynamic effects associated with high-energy piping ruptures, HELBs at CPNPP are addressed in FSAR Section 3.6B. High-energy lines are listed in FSAR Table 3.6B-1 along with the pertinent FSAR Figure and Building. The buildings that house high-energy lines whose failure could impact nuclear safety related components include Auxiliary, Containment, Electrical and Control, and Safeguards Buildings. High energy lines located outdoors in the vicinity of these buildings are also included. The high-energy lines located in the non-seismic TB are attached to a Seismic Category I structure and also meet the 10 CFR 54.4(a)(2) criterion. It was shown by analysis to remain undamaged by the non-seismic building, structures, and components during a seismic event, as described in FSAR Section 3.7B.2.8.

High-energy systems are fluid systems that, during normal plant conditions, are either in operation or maintained pressurized under conditions where either or both of the following are met:

1. Maximum operating temperature exceeds (>) 200°F,

2. Maximum operating pressure exceeds (>) 275 pounds per square inch gauge (psig).

NNS portions of high-energy systems whose degradation could impact nuclear safety related component functions due to their location in or adjacent to Seismic Category I structures meet the 10 CFR 54.4(a)(2) criterion. Postulated break points and restraint locations are depicted in FSAR Figures. These figures do not postulate failure along the entire length or assume that a high-energy line does not fail. Therefore, the entire length of NNS high energy lines whose failure could impact nuclear safety related SSCs meet the 10 CFR 54.4(a)(2) criterion.

Spray or Leakage

Moderate and low energy systems have the potential for spatial interactions of spray and leakage (NEI 95-10 Appendix F). NNS systems and NNS portions of nuclear safety related systems with the potential for spray or leakage that could prevent nuclear safety related SSCs from performing their required safety function are in the scope of LR per 10 CFR 54.4(a)(2).

Low-energy systems are those standby, process, or drainage systems whose pressure is approximately atmospheric. Moderate-energy systems are fluid systems that, during normal plant conditions, are either in operation or maintained pressurized where both of the following are met:

1. Maximum operating temperature is 200°F or less (≤) and

2. Maximum operating pressure is above (>) atmospheric and is 275 psig or less (≤).

Components that do not contain liquids or steam cannot adversely affect nuclear safety related SSCs due to leakage or spray, as confirmed by OE. An NNS system or component containing only air or gas is not in the scope of LR based on the potential for spray or leakage but may be within scope if part of an NNS/nuclear safety related interface as described above.

Spaces approach to address potential spatial interactions

The review for potential age-related spatial interactions utilizes a “spaces” approach for license renewal scoping of liquid or steam-filled NNS systems or NNS portions of NSR systems with the potential for spatial interaction with NSR SSCs. This approach is consistent with other recent applicants for LR or subsequent license renewal (SLR) and focuses on the interaction between NNS and NSR SSCs that are located in the same space.

A "space" is defined as a room, cubicle or area that is separated from other spaces by substantial objects (such as wall, floors, or ceilings). Areas and rooms within the same building and elevation are considered a “space” unless it is verified that configuration and mitigative features are sufficient to limit communication between areas/rooms or to lower elevations via pipe routing, cable routing, vents, etc.

NNS systems or NNS portions of NSR systems that contain water, oil, or steam are located inside structures containing NSR SSCs. Some high-energy components adjacent to a Seismic Category I structure can potentially impact NSR SSCs in that structure. The FSAR indicates that NSR SSCs are Seismic Category I and located inside Seismic Category I structures. The Class 5 designation is assigned to NNS piping, plumbing, and process tubing located in Seismic Category I structures.

All Class 5 lines were evaluated for their capability to reduce the functioning of Seismic Category I systems and components. The focus of this evaluation was related to failure during a seismic event or high/moderate energy line break reducing the function of Seismic Category I systems and components to an unacceptable level.

Pertinent CLB documents address seismic considerations and pipe break postulations. NSR targets in these evaluations have been generally identified. However these targets do not constitute all NSR mechanical, EIC or structural SSCs in Seismic Category I structures or consider leakage onto a pipe or cable tray that communicates between areas, rooms, or elevations.

As such NNS systems and NNS portions of NSR systems that include Class 5 piping, tubing and in-line components, containing water, oil or steam meet the 10 CFR 54.4(a)(2) criterion for spatial interaction unless they are confirmed to have no potential for leakage or spray onto NSR SSCs. Notes are added to LRBDs in such instances.

Areas/rooms are generally defined by room number within the MEL. NNS systems or NNS portions of nuclear safety related systems are within scope per 10 CFR 54.4(a)(2), if fluid-filled portions of those systems are located within the same room, area or elevation or higher elevation as NSR components.

Although some MEL fields, in Maximo, are not verified/controlled, component location (room) is a design controlled field. The location of NNS fluid filled components and comparison to a search of safety class components in that location provides reasonable assurance of a potential for spatial interaction or lack thereof. If Maximo identifies NNS and NSR components in the same space, then the potential for spatial interaction exists.

Further determination relative to whether an NNS system or NNS portion of a nuclear safety related system is in scope based on spatial interaction is through review of FDs, and in certain instances architectural or area drawings or isometric drawings, as these documents show building/room boundaries. No credit was taken for separation by distance alone without a mitigative feature capable of preventing the spatial interaction. The mitigative features are included in the scope of license renewal. In addition, walkdowns are performed as warranted for confirmation of the determinations. However, these walkdowns and detailed reviews are limited to determining whether a mechanical system includes any components with a potential for spatial interaction with nuclear safety related SSCs.

Each CPNPP TB contains Class 1E cables. These cables are associated with instruments that actuate anticipatory reactor trip on turbine trip and are procured as Class 1E but are not NSR (FSAR Section 7.2.1.1.2 Item 6). GL 85-06 (Reference 1.7.34) states that the QA program for the NNS ATWS equipment does not need to meet the requirements of 10 CFR Part 50 Appendix B nor would compliance be judged in terms of the Appendix. Their function is anticipatory, not essential, and age related degradation of this redundant trip cannot prevent a reactor trip from occurring. No credit is taken in any of the FSAR safety analyses (Chapter 15) for this trip. Therefore, portions of NNS systems within the turbine building that could interact spatially with these Class 1E cables are not considered in scope per 10 CFR 54.4(a)(2), as spatial interaction will not prevent credited 10 CFR 54.4(a)(1) functions.

Structures within the scope of LR based on the criterion of 10 CFR 54.4(a)(1), Seismic Category I, provide support and protection to NSR equipment and are considered to meet the criterion of 10 CFR 54.4(a)(2) as support and protection is also provided for NNS components which prevent spatial interaction with nuclear safety related components.

2.1.5.3. Regulated Events – 10 CFR 54.4(a)(3)

The scope of LR includes those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48), EQ (10 CFR 50.49), PTS (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63). This section discusses the approach used to identify the systems and structures within the scope of LR based on this criterion. The systems and structures that perform intended functions in support of these regulated events are identified in the system/structure descriptions in Sections 2.3, 2.4, and 2.5.

Fire Protection

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48) are included within the scope of LR.

The systems and structures required for the FP program to comply with the requirements of 10 CFR 50.48 include:

- Systems and structures required to demonstrate post-fire safe shutdown capabilities.
- Systems and structures required for fire detection and suppression.

- Systems and structures required to meet commitments made to Appendix A of Branch Technical Position (BTP) APCSB 9.5-1.

NRC guidance, including NUREG-0800 Section 9.5.1, Appendix B (Reference 1.7.35) states that the scope of 10 CFR 50.48 goes beyond the protection of nuclear safety related equipment, and also includes Fire Protection SSCs needed to minimize the effects of a fire and to prevent the release of radioactive material to the environment.

FSAR Section 9.5.1 references the FPR for the description of the Fire Protection Systems and Fire Protection program. The Fire Protection program has been developed to satisfy the requirements of 10 CFR Part 50 and BTP APCSB 9.5-1, Appendix A, and to meet Sections III.G, J, L or O of 10 CFR Part 50 Appendix R. Key sections of the FPR, detailing compliance with the subject requirements and forming the basis of the Fire Protection program, include the following:

- Section II, Fire Hazards Analysis Report
- Section III, Fire Safe Shutdown Analysis Report
- Section IV, FP Equipment/Systems Operational Administration
- Section V, Appendix C, Deviations

Section II of the FPR, Fire Hazards Analysis Report, contains the fire hazards analysis of CPNPP which includes a description by building of the: plant design, maximum permissible fire load, fire hazard classification, and FP and detection features. The impact of these factors on the fire safe shutdown equipment in the area and the overall effect on the plant's fire safe shutdown capability are also summarized.

Section III of the FPR, Fire Safe Shutdown Analysis Report, contains the fire safe shutdown assessment of CPNPP which includes a description of the design implementation and a list of the fire safe shutdown systems and components.

Section IV of the FPR, FP Equipment/Systems Operational Administration, contains the FP program administrative control requirements for the FPSs and equipment at CPNPP, which includes a description of the operability, testing, and surveillance requirements.

Section V, Appendix C of the FPR, Deviations, lists the deviations to Appendix R and exemptions from BTP APCSB 9.5-1, Appendix A.

Based on the review of the CPNPP current licensing bases for FP, systems were determined to be in the scope of LR on the basis of their support of 10 CFR 50.48 requirements. Section 2.3 contains the results of the review of the CPNPP passive mechanical components that support at least one of the following required functions:

- required to function to supply fire suppression in accordance with BTP APCSB 9.5-1, Appendix A, and 10 CFR 50.48, including 10 CFR Part 50 Appendix R (such as FPS);

- required to meet the guidance in 10 CFR Part 50, Appendix R, Section III.G, J, L, or O; or

- required to meet the guidance in GLs 81-12 (Reference 1.7.36) and 86-10.

Structures providing support, shelter, or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.48 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the review for the CPNPP structures and structural components that provide support, shelter, protection, or fire protection.

As described in Section 2.1.1, a bounding approach to scoping is used for EIC systems. All EIC Systems (except Meteorological Instrumentation and Security Systems) are automatically considered within the scope of LR. Additionally, all EIC components that are contained within mechanical systems are automatically within scope, regardless of whether the mechanical system is included within scope. Consequently, EIC components that support the requirements of 10 CFR 50.48 are included within the scope of LR.

Environmental Qualification

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49) be included within the scope of LR.

As described in the CPNPP Seismic and EQ administrative procedure, equipment located in a potentially harsh environment that is Class 1E equipment, certain non-class 1E, electrical equipment, and certain Non 1E RG 1.97 (Reference 1.7.37) instrumentation which are required to function during or following the DBEs are subject to EQ. The CPNPP Maximo Equipment List administrative procedure controls the maintenance of the list of EQ components contained within the MEL. Components identified as EQ in the MEL satisfy the 10 CFR 54.4(a)(3) criterion and are included within the scope of LR.

As described in Section 2.1.1, a bounding approach to scoping is used for EIC systems. All EIC Systems (except Meteorological Instrumentation and Security Systems) are automatically considered within the scope of LR. Additionally, all EIC components that are contained within mechanical systems are automatically within scope, regardless of whether the mechanical system is included within scope. Consequently, EIC components that support the requirements of 10 CFR 50.49 are included within the scope of LR.

Indication of which mechanical systems include EQ components is provided in Section 2.3.

Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.49 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the scoping and screening review for the CPNPP structures.

Pressurized Thermal Shock

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the

Commission's regulations for PTS (10 CFR 50.61) be included within the scope of LR.

PTS is a potential PWR event or transient causing vessel failure due to severe overcooling (thermal shock) concurrent with, or followed by, significant pressure in the reactor vessel (RV). The requirements in 10 CFR 50.61 include specific operational limits for PTS pertaining to the belt-line region of the RV.

The only system currently relied upon to meet the PTS regulation is the reactor coolant system (RCS), which contains the RV. There are no electrical systems or structures relied upon to meet the PTS regulation.

Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.61 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the scoping review for the CPNPP structures.

Anticipated Transient Without Scram

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62) be included within the scope of LR.

An ATWS is a postulated operational transient that generates an automatic scram signal, accompanied by a failure of the reactor protection system to automatically shut down the reactor. The ATWS rule (10 CFR 50.62) requires improvements in the design and operation of light-water cooled water reactors to reduce the likelihood of failure to automatically shut down the reactor following anticipated transients, and to mitigate the consequences of an ATWS event.

In response to NRC requirements, CPNPP Unit 1 and Unit 2 include ATWS mitigation system actuation circuitry (AMSAC), described in Section 7.8 of the FSAR. The AMSAC System for each unit provides backup to the Reactor Trip System (RTS) and Engineered Safety Features (ESF) Actuation System (ESFAS) for initiating turbine trip and auxiliary feedwater flow in the event of an anticipated transient. The AMSAC System is independent of and diverse from the RTS and the ESFAS with the exception of the analog SG level and turbine first stage pressure inputs, and the final actuation devices. It is a highly reliable, microprocessor-based, non-safety related circuitry system.

Because the AMSAC System uses existing sensors and actuation devices that are not unique to the ATWS function, no mechanical systems include components credited for ATWS. Note that AMSAC consists of different CPNPP electrical systems and is not a standalone EIC system.

Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.62 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the scoping review for the CPNPP structures.

As described in Section 2.1.1, a bounding approach to scoping is used for EIC systems. All EIC Systems (except Meteorological Instrumentation and Security Systems) are automatically considered within the scope of LR. Additionally, all EIC components that are contained within mechanical systems are automatically within scope, regardless of whether the mechanical system is included within scope. Consequently, EIC components that support the requirements of 10 CFR 50.62 are included within the scope of LR.

Station Blackout

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63) be included within the scope of LR.

A SBO event is a complete loss of alternating current (AC) electric power to the essential and nonessential switchgear buses in a nuclear power plant (i.e., loss of the offsite electric power system concurrent with generator trip and unavailability of the onsite emergency AC power sources). SBO does not include the loss of available AC power to buses fed by station batteries through inverters or by alternate AC sources, nor does it assume a concurrent single failure or design basis accident (DBA). The objective of this requirement is to assure that nuclear power plants are capable of withstanding a SBO and maintaining adequate reactor core cooling and appropriate containment integrity for a required duration.

CPNPP capabilities, commitments and analyses that demonstrate compliance with 10 CFR 50.63 are documented in NRC SERs and correspondence related to the SBO rule, as well as the SBO DBD. CPNPP has developed a four-hour AC independent coping approach to address the requirements of 10 CFR 50.63; however, credit is taken for the operation of selected nuclear safety related systems which are common to Units 1 and 2.

Based on the CPNPP current licensing bases for SBO, systems were determined to be in the scope of LR on the basis of their support of 10 CFR 50.63 requirements. Section 2.3 identifies the CPNPP mechanical systems that contain mechanical components that support SBO requirements.

Based on the current licensing bases for SBO, system intended functions performed in support of 10 CFR 50.63 requirements were determined. Individual system scoping evaluations in Section 2.3 contain the results of the review for CPNPP mechanical systems.

NUREG-1800 and NRC staff guidance on scoping of equipment relied on to meet the requirements of the SBO rule (10 CFR 50.63) for LR has been incorporated into the CPNPP scoping methodology. In accordance with NUREG-1800, the SSCs required to cope with a SBO event are included within the scope of LR. Upon loss of all offsite AC power, station standby power sources, consisting of four onsite diesel generators (DGs) (two per unit) are provided to satisfy the loading requirements of the AC nuclear safety related loads at CPNPP. System redundancy precludes loss of all onsite power as a result of any single failure. The 138 kV switchyard is the preferred source of offsite power for restoration of offsite power following a SBO event. Startup transformer XST1 and alternate startup transformer XST1A are connected to a common overhead line from the 138 kV switchyard. This power path includes power out to the first set of switchyard breakers in the 138 kV switchyard. Transformer XST1 is connected to the nuclear safety related 6.9 kV safeguard buses of each unit. Transformer XST1A serves as an alternate transformer in this power path. The 345 kV switchyard is the back-up source of offsite power for restoration of offsite power following a SBO event when the 138 kV switchyard is unavailable. Startup transformer XST2 and alternate startup transformer XST2A are connected to a common overhead line from the 345 kV switchyard. This power path includes power out to the first set of switchyard breakers in the 345 kV switchyard. Transformer XST2 is also connected to the nuclear safety related 6.9 kV safeguard buses of each unit. Transformer XST2A serves as an alternate transformer in this power path. There are no interconnections between the 138 kV switchyard and the 345 kV switchyard at the CPNPP site. The 138 kV switchyard is physically and electrically independent of the 345 kV switchyard.

Figure 2.5-1 identifies the major components or commodities associated with restoration of offsite power following a SBO event.

Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.63 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the scoping review for the CPNPP structures.

As described in Section 2.1.1, a bounding approach to scoping is used for EIC systems. All EIC Systems (except Meteorological Instrumentation and Security Systems) are automatically considered within the scope of LR. Additionally, all EIC components that are contained within mechanical systems are automatically within scope, regardless of whether the mechanical system is included within scope. Consequently, EIC components that support the requirements of 10 CFR 50.63 are included within the scope of LR.

2.1.5.4. System and Structure Intended Functions

For the systems and structures within the scope of LR, the intended functions that are the bases for including them within scope are identified and documented in the scoping evaluation. The system and structure intended functions are based on the applicable CLB and other reference documents or drawings. The component level intended functions are the passive component functions that are necessary to support the system or structure intended functions. The structure and component intended functions are further described in Section 2.1.6.2.

2.1.5.5. Scoping Boundary Determination

Systems and structures that are included within the scope of LR are further evaluated to determine the population of in scope mechanical and structural components. This part is also a transition from the scoping process to the screening process. Mechanical systems are depicted primarily on the FDs that show the system components and their functional relationships, while structures are depicted on physical drawings. All EIC systems and components (except Meteorological Instrumentation and Security Systems) are in-scope and are placed into commodity groups and are evaluated as commodities. Scoping boundaries for mechanical systems, structures, and EIC are, therefore, described separately.

Mechanical Systems

For mechanical systems, mechanical components that support the system intended functions are included within the scope of LR and are depicted on the applicable system FDs. Mechanical system FDs were highlighted to create LR boundary drawings (LRBDs) showing the in-scope components that are subject to AMR. Components that are required to support a nuclear safety related function, or a function that demonstrates compliance with one of the LR regulated events, are identified on the LRBDs by green highlighting, and in the case of components in the reactor coolant pressure boundary (RCPB), by blue highlighting. NNS components that are connected to nuclear safety related components and are required to provide structural support at the nuclear safety related/NNS interface, non-commodity NNS components with a credited NNS function, and NNS components whose failure could prevent satisfactory accomplishment of a nuclear safety related function due to spatial interaction with nuclear safety related SSCs are identified on the LRBDs by magenta highlighting. A computer sort and download of associated system components from the CPNPP MEL confirms the scope of components in the system. Mechanical system boundaries are further discussed in Section 2.1.6.1 below.

Structures

For structures, the structural components that are required to support the intended function(s), as described in the CLB, are included within the scope of LR. The structural components are identified from a review of applicable information sources in Section 2.1.2 which includes plant design drawings of the structure. Component listings from the CPNPP MEL were reviewed to determine structure level intended functions. Structural components such as structural bolting required to support the structure proper are evaluated with the structure. Structural bolting supporting the intended function of a component support, or a bulk commodity is evaluated with the component support or bulk commodity. A site plan layout drawing is highlighted for CPNPP to create an LRBD showing the structures within the scope of LR. Structural boundaries are further discussed in Section 2.1.6.1 below.

Electrical

EIC systems and components within mechanical systems, did not require further system evaluations to determine which components were required to perform or support the identified intended functions. A bounding scoping approach is used for electrical equipment. Under this approach, all electrical components were included within the scope of LR. This bounding approach is consistent with the electrical scoping results for previous LRAs, as well as approved SLRAs. In scope electrical components were placed into commodity groups and then evaluated as commodities during the screening process as described in Section 2.1.6.1 below.

2.1.6. SCREENING PROCEDURE

Once the SSCs within the scope of LR have been determined, the next step is to determine which structures and components are subject to an AMR.

2.1.6.1. Identification of Structures and Components Subject to AMR

The requirement to identify structures and components subject to AMR is specified in 10 CFR 54.21, which states:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must:

(1) For those SSCs within the scope of this part, as delineated in 10 CFR 54.4, identify and list those structures and components subject to an AMR. Structures and components subject to an AMR shall encompass those structures and components--

(i) That perform an intended function, as described in Sec. 54.4, without moving parts or without a change in configuration or properties. These structures and components include, but are not limited to, the reactor vessel, the reactor coolant system pressure boundary, steam generators, the pressurizer, piping, pump casings, valve bodies, the core shroud, component supports, pressure retaining boundaries, heat exchangers, ventilation ducts, the containment, the containment liner, electrical and mechanical penetrations, equipment hatches, seismic Category I structures, electrical cables and connections, cable trays, and electrical cabinets, excluding, but not limited to, pumps (except casing), valves (except body), motors, diesel generators, air compressors, snubbers, the control rod drive, ventilation dampers, pressure transmitters, pressure indicators, water level indicators, switchgears, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies; and

(ii) That are not subject to replacement based on a qualified life or specified time period.

(2) Describe and justify the methods used in paragraph (a)(1) of this section.

Structures and components that perform an intended function without moving parts or without change in configuration or properties are defined as passive for LR. Passive structures and components that are not subject to replacement based on a qualified life or specified time period are defined as long-lived for LR. The screening process is used to identify passive, long-lived structures, and components within the scope of LR that are subject to AMR.

NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” and NEI 95-10, Industry Guidelines for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule, Appendix B provide guidance for the identification of passive structures and components and on the exclusion of active components from AMR. Components, or assemblies, that perform their function with moving parts or a change in configuration or properties which includes a ‘change of state’ are active and are not subject to AMR. Most passive structures and components are long-lived. If a passive component is determined not to be long-lived, such a determination is documented within the screening evaluation.

The CPNPP structures and components subject to AMR have been identified in accordance with the requirements of 10 CFR 54.21 described above. The process and methodology to meet these requirements for mechanical systems, structures, and electrical commodities is described as follows:

Mechanical Systems

The mechanical systems screening process began with the results from the scoping process. For in-scope mechanical systems, system FDs were highlighted to create LRBDs. These LRBDs were reviewed to identify passive, long-lived components subject to AMR. Component listings from the MEL were also reviewed to confirm that all system components were considered. Plant walkdowns were performed when required for confirmation. Finally, the identified list of passive, long-lived system components was benchmarked against previous LRAs, as well as approved SLRAs, containing similar systems.

Some mechanical components, when combined, are considered a complex assembly. A complex assembly is a predominately active component where the performance of its components is closely linked to that of the intended function of the entire assembly, such that testing and monitoring of the assembly is sufficient to identify degradation of these components. Examples of complex assemblies include diesel engines, instrument air compressors, and chiller units. Complex assemblies are considered active and can be excluded from the requirements of AMR. However, to the extent that complex assemblies include piping or components that interface with external equipment, or components that cannot be adequately tested or monitored as part of the complex assembly, those components are identified and subject to AMR. This follows the screening methodology for complex assemblies as described in Table 2.1-2 of NUREG-1800.

Mechanical components are screened with the system in which they are scoped (assigned in MEL and shown on FDs). The CPNPP system boundaries, are shown on FDs by system breaks or component location number (first two alphabetic characters designate the assigned system) and are carried forward to the IPA evaluations and LRBDs. Related systems are grouped as appropriate for evaluation. For example, a) ASME Class 1 portions of the Chemical and Volume Control, Residual Heat Removal (RHR), and Safety Injection Systems are addressed with the RCS, b) Boron Recycle and Boron Thermal Regeneration Systems are addressed with the related Chemical and Volume Control System (CVCS), c) ventilation and cooling systems are addressed together, and d) Breathing Air, Instrument Air, Service Air and Plant Gas (Nitrogen Supply) systems are evaluated together.

Structures

The structure screening process also began with the results from the scoping process. If only selected portions of a structure are in scope, the in-scope portions are described in the scoping evaluation. The associated structure drawings were reviewed to identify the passive, long-lived structures, and components. Plant walkdowns were performed when required for confirmation. Finally, the identified list of passive, long-lived structures and components was benchmarked against previous LRAs, as well as approved SLRAs.

Electrical Commodities

The screening of EIC components in EIC and mechanical systems used a bounding approach as described in NEI 95-10. EIC components for in-scope systems were assigned to commodity groups consistent with Table 2.1-5 of NUREG-1800. The commodities subject to an AMR were identified by applying the “passive” screening criteria of 10 CFR 54.21(a)(1). This method provides the most efficient means for determining the electrical commodities subject to an AMR since many EIC components and commodities are active. Active components and commodities may be eliminated from AMR per 10 CFR 54.21(a)(1).

The sequence of steps and special considerations for identification of electrical commodities that require an AMR is as follows:

1. EIC components and commodities in systems within the scope of LR at CPNPP were identified and listed. The listing provided in Table 2.1-5 of NUREG-1800, is the basis for this list. EIC components and commodities were organized into groups such as circuit breakers, switches, and cables. Individual specific components were not identified.

2. Following the identification of the electrical commodities, the criterion of 10 CFR 54.21(a)(1)(i) was applied to identify commodities that perform their functions without moving parts or without a change in configuration or properties (referred to as “passive” components). These commodities were identified utilizing the guidance of NEI 95-10 and Table 2.1-5 of NUREG-1800.

3. The screening criterion found in 10 CFR 54.21(a)(1)(ii) excludes those commodities that are subject to replacement based on a qualified life or specific time period from the requirements of an AMR. The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to those commodities that were not previously eliminated by the application of the 10 CFR 54.21(a)(1)(i) screening criterion. Components and commodities included in the plant Environmental Equipment Qualification (EEQ) AMP are replaced on a specified interval based on a qualified life. Components and commodities in the Environmental Qualification of Electric Components (B.2.2.2) AMP do not meet the “long-lived” criterion of 10 CFR 54.21(a)(1)(ii) and are considered “short-lived” per the regulatory definition and are, therefore, not subject to an AMR.

4. EIC components and commodities were not evaluated to determine if they perform a LR intended function during the scoping of systems. At this point in the screening process, the remaining passive electrical commodities are reviewed to determine if the commodity performs a LR intended function. If

an electrical commodity does not perform a LR intended function, it is not considered further and, therefore, is not subject to an AMR.

5. Components and commodities which support or interface with electrical components and commodities (for example, cable trays, conduits, instrument racks, panels, and enclosures) are evaluated as structural components in Section 2.4.

The electrical commodities that require an AMR are the separate electrical commodities that are not a part of a larger active component. The passive commodities that are not subject to replacement based on a qualified life or specified time period are subject to an AMR. For CPNPP, the electrical commodities that require an AMR are identified in Section 2.5.

EIC components whose primary function is electrical can also have a mechanical pressure boundary function. These components include elements, resistance temperature detectors (RTDs), sensors, thermocouples, transducers, and electric heaters. According to Appendix B of NEI 95-10, the electrical portions of these components are active per 10 CFR 54.21(a)(1)(i) and are therefore not subject to AMR. Only the pressure boundary of such an in-scope component is subject to AMR, and the pressure boundary function for these EIC components is addressed in the mechanical review.

2.1.6.2. Intended Function Definitions

The intended functions that the components and structures must fulfill are those functions that are the bases for including them within the scope of LR. A component intended function is defined as a passive component function that must be performed in order for the system or structure to be able to perform the system or structure intended function(s). For example, pressure boundary failure of a component would cause loss of inventory from the system, and the system would subsequently be unable to perform its intended function(s). Structures and components may have multiple intended functions. CPNPP has considered multiple intended functions where applicable, consistent with the staff guidance provided in Table 2.1-3, 2.1-4(a), and 2.1-4(b) of NUREG-1800 Revision 2.

Table 2.1-1 provides expanded definitions of structure and component passive intended functions identified in this application.

Table 2.1-1
Structure and Component Intended Functions

Intended Function	Definition
Absorb neutrons	Absorb neutrons.
Diaphragm integrity	Maintain integrity of diaphragm to prevent interference with a nuclear safety related component function.
Direct flow	Provide spray shield or curbs for directing flow or provide means of fluid flow diversion within a component (as seen in divider plates, heat exchanger coil shields, vortex diffusers, etc.).

Table 2.1-1
Structure and Component Intended Functions

Intended Function	Definition
Electrical continuity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals.
Filter	Provide filtration.
Fire barrier	Provide rated fire barrier to confine or retard a fire from spreading between adjacent areas of the plant.
Flood barrier	Provide flood protection barrier for internal or external flooding.
Flow distribution	Maintain flow distribution.
Heat sink	Provide heat sink during SBO or design basis accidents.
Heat transfer	Provide heat transfer.
HELB shielding	Provide shielding against HELBs.
Insulate (electrical)	Insulate and support an electrical conductor.
Leakage boundary (spatial)	NNS components that maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of nuclear safety related SSCs.
Limit leakage	Maintain leakage within acceptable levels.
Maintain adhesion	Provides adhesion to the substrate.
Missile barrier	Provide missile barrier (internally or externally generated).
Mechanical closure	Provide closure of components. Typically used with bolting.
Pipe whip restraint	Provide pipe whip restraint.
Pressure boundary	Provide pressure-retaining boundary or essentially leak tight barrier so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary, or provide containment isolation for fission product retention.
Pressure relief	Provide over-pressure protection.
Shelter, protection	Provide shelter/protection for structures and components.
Shielding	Provide shielding against radiation.
Spray	Convert fluid into spray.
Structural integrity (attached)	NNS components that maintains mechanical and structural integrity to provide structural support to attached nuclear safety related SSCs.
Structural support	Provide structural and/or functional support to nuclear safety related and/or NNS SSCs.
Thermal insulation	Control of heat loss to preclude overheating of nearby nuclear safety related SSCs.
Thermal insulation jacket integrity	Prevent moisture absorption and provide physical support of thermal insulation.
Throttle	Provide flow restriction.
Water retaining boundary	Provide an essentially leak-tight boundary.

Table 2.1-1
Structure and Component Intended Functions

Intended Function	Definition
Withstand thermal stresses	Operate without loss or degradation of function as designed within installed environment.

2.1.6.3. Stored Equipment

In the event of a fire, repairs are allowed in order to perform the transition from hot standby to cold shutdown and to maintain cold shutdown. Repair activities include replacement of damaged components to restore operability of equipment and fuse removal and replacement for a control circuit to recover from the effects of a fire. Stored components that are replaced in the event a repair is needed, as described in the CPNPP FPR, following a fire are within the scope of LR. The tools needed to complete these repairs are not in the scope of LR.

The nuclear safety related Fuel Building (FB) Wonderhoist Crane is within the scope of LR and is addressed in Section 2.4. It is stored in the warehouse when not in use. This crane performs its nuclear safety related function within the FB where it handles the SFP swing gates. The warehouse which stores this crane is not considered within the scope of LR. The crane performs no nuclear safety related functions while stored in the warehouse and is inspected prior to use within the FB.

Note: As scoping is performed at the system and structure level, determination of stored equipment is performed during screening to determine which components within the system/structure are subject to AMR.

2.1.6.4. Abandoned Components

Abandoned equipment that has not been verified to be permanently isolated, e.g., lines cut and capped, leads lifted and drained that is located in a space with nuclear safety related equipment is included within the scope of LR in accordance with 10 CFR 54.4(a)(2). The abandoned equipment in the scope of LR was determined from discussions with site personnel and from reviews of the site MEL and relevant documents, such as design change notices, system and structure scoping results, and FDs that denote abandoned equipment using hash marks and notes. The abandoned equipment includes:

- The Electric Hydrogen Recombiners are abandoned in place (FSAR 6.2.5.1.2, 6.2.5.2.1, 6.2.5.3.3). These abandoned components do not contain a liquid or perform a nuclear safety related function and are not credited for a regulated event. The potential for a component within this system to impact a nuclear safety related component through spatial interaction is evaluated in Section 2.3.2.1.

- Boron Concentration Measurement System is abandoned in place (FSAR 7.7.1.10, 9.3.4.1.21). This abandoned system and associated components do not perform a nuclear safety related function and is not credited for a regulated event. The potential for a component within this system to impact a nuclear safety related component through spatial interaction is evaluated in Section 2.3.3.1.

- The jockey fire pump and diesel driven fire pump located in the SWIS have been abandoned in place (FSAR 9.2.1.10.1, Table 8.3-11). Fire protection requirements are met by the fire pumps located in the Fire Pump House. The potential for these NNS components to impact a nuclear safety related function is addressed in the FPS screening evaluation in Section 2.3.3.7.

- The Reverse Osmosis System portion of the Liquid Waste Processing System is not used at CPNPP and many of the systems associated components have been abandoned in place (FSAR 11.2.2.4.2). This system and associated components do not perform a nuclear safety related function and are not credited for a regulated event. The potential for any component, including abandoned components, within this system to impact a nuclear safety related component is evaluated during screening as part of the Liquid Waste Processing System in Section 2.3.3.14.

- The Waste Baling System is part of the Solid Waste Management System. The waste baler located inside the Unit 1 RCB is abandoned in place (FSAR 11.4). This portion of the system and associated components do not perform a nuclear safety related function and are not credited for a regulated event. The potential for any component, including abandoned components, within this system to impact a nuclear safety related component is evaluated in Section 2.3.3.14 as part of the Solid Waste Management System. Note that the Waste Baling System within the FB has not been abandoned.

- Portions of the Potable and Sanitary Water System (PW) are abandoned in place and no longer used (FSAR Table 17A-1, Potable Water System Flow Diagrams). This system and associated components do not perform a nuclear safety related function and are not credited for a regulated event. The potential for any component, including abandoned components, within this system to impact a nuclear safety related component is evaluated in Section 2.3.3.9 as part of the Potable and Sanitary Water System.

- Some exhaust dampers considered to be part of the Safeguards Building (SGB) Ventilation system are abandoned in place in the open position (FSAR 9.4.5.3). These exhaust dampers are evaluated in Section 2.3.3.8 as part of the Primary Plant Ventilation System.

- The Chemical Feed System for the Unit 1 SGs was removed from service when the new SGs were installed. The remaining Unit 1 chemical feed recirculation components (i.e., pumps, piping, pipe supports, and instrumentation) have been disconnected, capped, and abandoned in place. The ability of these recirculation lines to impact a nuclear safety related function through spatial interaction is addressed in the Chemical Feed System screening evaluation in Section 2.3.4.4.

Note: As scoping is performed at the system and structure level, determination of abandoned equipment is performed during screening along with system LR boundary determination.

2.1.6.5. Consumables

The evaluation process for consumables is consistent with the guidance provided in NUREG-1800, Table 2.1-3. Consumables have been divided into the following four (4) groups for the purpose of LR: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs.

- Group (a) subcomponents (packing, gaskets, component seals, and O-rings): Based on ANSI B31.1 and the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section III, the subcomponents of pressure retaining components are not pressure-retaining parts. Therefore, these subcomponents are not relied on to perform a pressure-retaining function and are not subject to AMR.

- Group (b) structural sealants: Structural sealants are within the scope of LR and are reviewed in structural Section 3.5.

- Group (c) subcomponents (oil, grease, and component filters): These subcomponents are short-lived and are periodically replaced. Various plant procedures are used in the replacement of oil, grease, and filters in components that are in scope for LR. Therefore, these subcomponents are not subject to an AMR.

- Group (d) consumables (system filters, fire extinguishers, fire hoses, and air packs): System Ventilation filters are replaced in accordance with plant procedures based on vendor manufacturers' requirements and system testing. Fire extinguishers, self-contained breathing apparatuses, and fire hoses are within the scope of LR but are not subject to aging management because they are replaced based on condition. These components are periodically inspected in accordance with National Fire Protection Association (NFPA) standards. These standards require replacement of equipment based on their condition or performance during testing and inspection. Other equipment such as portable fans and smoke exhausters are periodically inspected for condition and replaced if warranted. These components are not long-lived and are subject to replacement based on NFPA standards; therefore, an AMR is not required.

2.1.7. GENERIC SAFETY ISSUES

In accordance with the guidance in NEI 95-10 and Appendix A.3 of NUREG 1800, review of NRC generic safety issues (GSIs) as part of the LR process is required to satisfy 10 CFR 54.29.

GSIs designated as active or unresolved in NUREG-0933, Appendix B (Reference 1.7.38), that involve aging effects for structures and components subject to an AMR or TLAA evaluations are to be addressed in the LRA. GSIs designated as active or unresolved were reviewed to determine if they involve aging effects for structures and components subject to an AMR or time-limited aging analysis evaluations.

2.1.7.1. GSI-163

GSI-163, Multiple Steam Generator Tube Leakage, has been incorporated into the CPNPP Steam Generator Program. The issue involves inspection requirements for SG tubes, which are addressed in Appendix B, Section B.2.3.10.

2.1.7.2. GSI-186

GSI-186, Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants, involves issues related to crane design and operation. Aging effects are not central to these issues. The issue does not involve TLAA evaluations, including typical crane related TLAAs such as cyclic loading analyses. However, crane rails, bridges, etc. for cranes and hoists with the potential for heavy load drops are in the scope of LR and are subject to AMR as described in Section 2.4.14.

2.1.7.3. GSI-189

GSI-189, Susceptibility of Ice Condenser and Mark III containments to Early Failure from Hydrogen Combustion During a Severe Accident, required PWR ice condensers and boiling water reactor (BWR) Mark IIIs designed containments to be equipped with a supplemental hydrogen control system to deal with large quantities of hydrogen for postulated recoverable degraded core events. This issue is not applicable to CPNPP.

2.1.7.4. GSI-190

GSI-190, Fatigue Evaluation of Metal Components for 60-year Plant Life, concluded that licensees should address the effects of reactor coolant environment on component fatigue life as AMPs are formulated in support of LR. Accordingly, the issue of environmental effects on component fatigue life is addressed in Section 4.3.4.

2.1.7.5. GSI-191

GSI-191, Assessment of Debris Accumulation on PWR Sump Performance, addresses the potential for blockage of containment sump strainers that filter debris from cooling water supplied to the safety injection (SI) and containment spray pumps following a postulated loss of coolant accident (LOCA). The issue is based on the identification of new potential sources of debris, including failed containment coatings, which may block the sump strainers. Containment coatings are addressed in Section 2.4.1, Section 4.7.6, and in Appendix B, Section B.2.3.36.

2.1.7.6. GSI-193

GSI-193, BWR Emergency Core Cooling Systems (ECCS) Suction Concerns, addresses the possible failure of low pressure ECCS due to unanticipated, large quantities of entrained gas in the suction piping from suppression pools in BWR Mark I containments. This issue is not applicable to CPNPP.

2.1.7.7. GSI-196

GSI-196, Boral Degradation, addresses the potential for spent fuel racks using BORAL for neutron absorption experiencing problems with swelling and degradation of the BORAL plates over long periods of time. This is addressed in Appendix B, Section B.2.3.26.

2.1.7.8. GSI-199

GSI-199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants, addresses how current estimates of the seismic hazard level at some nuclear sites in the central and eastern United States might be higher than the values used in their original designs and previous evaluations. The issue does not involve TLAA evaluations or aging effects.

2.1.7.9. GSI-204

GSI-204, Flooding of Nuclear Power Plant Sites Following Upstream Dam Failure, relates to potential flooding effects from upstream dam failure on nuclear power plant sites, SFPs, and sites undergoing decommissioning with spent fuel stored in SFPs. The issue does not involve TLAA evaluations. However, barriers to external and internal flooding are in the scope of LR and subject to AMR, as described in Section 2.4.

2.2. PLANT LEVEL SCOPING RESULTS

Table 2.2-1
Plant Level Scoping Results: Mechanical Systems

LRA System Name	CPNPP System Name	In Scope for LR	Sections
Reactor Vessel, Internals, and Reactor Coolant System			
Reactor Vessel	Reactor Coolant System (RCPB includes ASME Class 1 portions of Chemical and Volume Control, Residual Heat Removal, and Safety Injection Systems)	Y	2.3.1.1
Reactor Vessel Internals		Y	2.3.1.2
Reactor Coolant System and Attached Piping		Y	2.3.1.3
Steam Generators		Y	2.3.1.4
Engineered Safety Features			
Combustible Gas Control System	Containment Electric Hydrogen Recombiners	N	N/A - Abandoned in place
	Containment Hydrogen Purge System	Y	2.3.2.1
Containment Isolation Systems	Containment Isolation System (Leak Test, Airlock hydraulics, and other penetrations not associated with in-scope systems)	Y	2.3.2.2
Containment Spray System	Containment Spray System	Y	2.3.2.3
Residual Heat Removal System	Residual Heat Removal System	Y	2.3.2.4
Safety Injection System	Safety Injection System	Y	2.3.2.5
Auxiliary Systems			
Chemical and Volume Control Systems	Chemical and Volume Control System	Y	2.3.3.1
	Boron Thermal Regeneration System	Y	2.3.3.1
	Boron Recycle System	Y	2.3.3.1
	Boron Concentration Measurement System	Y	2.3.3.1
Component Cooling Water System	Component Cooling Water System	Y	2.3.3.2
Compressed Air and Gas Systems	Compressed Air - Service	Y	2.3.3.3
	Instrument Air	Y	2.3.3.3
	Compressed Air - Breathing	N	Consumables (2.1.6.5)
	Hydrogen Gas	Y	2.3.3.3
	Nitrogen Gas	Y	2.3.3.3
	Oxygen Gas	N	N/A[1]
	Plant Gas - Miscellaneous	N	N/A[1]
	Carbon Dioxide Gas	N	N/A[1]
	Methane Gas	N	N/A[1]

Table 2.2-1
Plant Level Scoping Results: Mechanical Systems

LRA System Name	CPNPP System Name	In Scope for LR	Sections
Demineralized and Reactor Makeup Water System	Demineralized and Reactor Makeup Water System	Y	2.3.3.4
Emergency Diesel Generator and Auxiliary Systems	Diesel Generator and Auxiliaries	Y	2.3.3.5
	Diesel Generator Fuel Oil	Y	2.3.3.5
Equipment and Floor Drainage Systems	Equipment and Floor Drainage System	Y	2.3.3.6
	Drain Piping - Turbine	Y	2.3.3.6
	Floor Drain	Y	2.3.3.6
FPS	Fire Protection	Y	2.3.3.7
Non-Radiological Waste Management Systems	Sewage Treatment System	N	N/A[2]
	Waste Management	N	N/A[2]
Plant Ventilation Systems	Containment Ventilation Systems	Y	2.3.3.8
	Control Room Air Condition System	Y	2.3.3.8
	Safeguards Building Heating, ventilation, and air conditioning (HVAC) System	Y	2.3.3.8
	Fuel Building Ventilation System	Y	2.3.3.8
	Diesel Generator Building Ventilation System	Y	2.3.3.8
	Uncontrolled Access Area Ventilation System	Y	2.3.3.8
	Non-Permanent Plant Ventilation Systems	N	N/A[1]
	Office and Service Area HVAC	Y	2.3.3.8
	Non-Plant HVAC	N	N/A[1]
	Primary Plant Ventilation	Y	2.3.3.8
	Turbine Building HVAC	N	N/A[2]
	Uninterruptible Power Supply and Distribution Rooms System	Y	2.3.3.8
	Auxiliary Building HVAC System	Y	2.3.3.8
	Service Water Intake Structure Ventilation System	Y	2.3.3.8
Potable and Sanitary Water System	Potable and Sanitary Water System	Y	2.3.3.9
	Chlorination System	Y	2.3.3.9
Process and Effluent Radiological Monitoring and Sampling Systems	Process Plant Sampling System	Y	2.3.3.10
	Post-Accident Sampling System	Y	2.3.3.10
	Secondary Sampling	Y	2.3.3.10
	Radiation Monitoring System	Y	2.3.3.10
	Containment Atmosphere Monitoring	Y	2.3.3.10

Table 2.2-1
Plant Level Scoping Results: Mechanical Systems

LRA System Name	CPNPP System Name	In Scope for LR	Sections
Spent Fuel Pool Cooling and Cleanup System	Spent Fuel Pool Cooling and Cleanup System	Y	2.3.3.11
Station Service Water System	Station Service Water System	Y	2.3.3.12
Ventilation Chilled Water Systems	Safety Chilled Water System	Y	2.3.3.13
	Ventilation Chilled Water – Non-Safety	Y	2.3.3.13
	Chilled Water	Y	2.3.3.13
Waste Processing Systems	Liquid Waste Processing System	Y	2.3.3.14
	Gaseous Waste Processing System	Y	2.3.3.14
	Solid Waste Processing System	Y	2.3.3.14
Water Treatment System	Water Treatment System	N	N/A[2]
	Squaw Creek Reservoir Return Water	N	N/A[2]
	Squaw Creek Reservoir Makeup	N	N/A[2]
	Squaw Creek Reservoir Service Tower	N	N/A[2]
	Squaw Creek Water Supply	N	N/A[2]
Steam and Power Conversion			
Auxiliary Feedwater System	Auxiliary Feedwater System	Y	2.3.4.1
Condensate and Feedwater Systems	Condensate System	Y	2.3.4.2
	Steam Generator Feedwater System	Y	2.3.4.2
Main Steam, Reheat, and Steam Dump System	Main Steam, Reheat, and Steam Dump System	Y	2.3.4.3
	Steam Generator Blowdown & Cleanup System	Y	2.3.4.3
Main Turbine and Auxiliaries System	Auxiliary Steam System	Y	2.3.4.4
	Chemical Feed System	Y	2.3.4.4
	Circulating Water System	Y	2.3.4.4
	Condensate Polishing System	Y	2.3.4.4
	Condenser Vacuum and Waterbox Priming System	Y	2.3.4.4
	Extraction Steam System	N	N/A[2]
	Generator Gas Cooling	N	N/A[2]
	Generator Primary Water	N	N/A[2]
	Generator Seal Oil	N	N/A[2]
	Heater Drains System	Y	2.3.4.4
	Heater Steam System	N	N/A[2]
	Hydrazine Injection System	Y	2.3.4.4

Table 2.2-1
Plant Level Scoping Results: Mechanical Systems

LRA System Name	CPNPP System Name	In Scope for LR	Sections
	Main Generator Seal Oil System	N	N/A[2]
	Main Turbine Lube Oil	N	N/A[2]
	Main Turbine Oil Purification	N	N/A[2]
	Turbine Electrohydraulic Control	N	N/A[2]
	Turbine Gland Steam System	N	N/A[1]
	Turbine Plant Cooling Water System	Y	2.3.4.4
	Turbine Water Supply	N	N/A[2]
	Turbines (High-pressure and Low Pressure)	N	N/A[2]

1 NNS System does not have a nuclear safety related or regulated event function, contains Air or Gas, and is not attached to nuclear safety related SSCs.

2 NNS System does not have a nuclear safety related or regulated event function and may contain fluid but is not attached to or in the same space/structure as nuclear safety related SSCs.

Table 2.2-2
Plant Level Scoping Results: Electrical and I&C Systems

System Name	In Scope for LR	Sections
345 kV & 138 kV Incl Spare Transformer	Y-ISBA	2.5.1
Cathodic Protection	Y-ISBA	2.5.1
Communication	Y-ISBA	2.5.2
Elec Power 24/48 Volt DC	Y-ISBA	2.5.1
Elec Power 480 Volt Switchgear	Y-ISBA	2.5.1
Elec Power 6.9 kV Switchgear	Y-ISBA	2.5.1
Electrical Control Distribution	Y-ISBA	2.5.1
Electrical Control Inverters	Y-ISBA	2.5.1
Electrical Control Panels	Y-ISBA	2.5.1
Electrical Lighting	Y-ISBA	2.5.1
Electrical Power 480 Volt Motor Control Center (MCC)	Y-ISBA	2.5.1
Electrical Power DC Distribution	Y-ISBA	2.5.1
Emergency Alerting Equipment	Y-ISBA	2.5.2
Generator and Exciter System	Y-ISBA	2.5.1
Heat Tracing	Y-ISBA	2.5.1
Instrumentation and Control Equipment: - Hydrogen Analyzer - Instrumentation and Controls (I&C) - Secondary Plant - Instrument Grounding - Loose Parts Monitoring - Nuclear Instrumentation	Y-ISBA	2.5.2
Lightning Protection and Grounding	Y-ISBA	2.5.2
Light Panels & 118/240 VAC Distribution	Y-ISBA	2.5.1
Meteorological Instrumentation	N	N/A
Plant Computers	Y-ISBA	2.5.2
Radiation Monitoring System	Y-ISBA	2.5.2
Reactor Rod CRTL & Indication	Y-ISBA	2.5.2
Security Systems	N	N/A
Switchyard Equipment	Y-ISBA	2.5.1

Table 2.2-3
Plant Level Scoping Results: Containments, Structures and Component Supports

Structure Name	In Scope for LR	Sections
Containment Unit 1	Y	2.4.1
Containment Unit 2	Y	2.4.1
Auxiliary Building	Y	2.4.2
Diesel Generator Building Unit 1	Y	2.4.3
Diesel Generator Building Unit 2	Y	2.4.3
Electrical and Control Building	Y	2.4.4
Fuel Building[1]	Y	2.4.5
Safeguard Building Unit 1	Y	2.4.6
Safeguard Building Unit 2	Y	2.4.6
Safe Shutdown Impoundment (SSI) Dam	Y	2.4.7
Service Water Intake Structure (SWIS)	Y	2.4.8
Switchgear Building Unit 1	Y	2.4.9
Switchgear Building Unit 2	Y	2.4.9
Turbine Building Unit 1	Y	2.4.10
Turbine Building Unit 2	Y	2.4.10
Yard Structures: Fire barrier walls/Enclosure pits	Y	2.4.11
Firewater Pumphouse	Y	2.4.11
Firewater Storage Tank (FWST) foundation[2]	Y	2.4.11
FW (fire water) Valve Houses	Y	2.4.11
Fuel Oil Storage Tank (FOST) slabs	Y	2.4.11
Manholes, Handholes, Duct Banks	Y	2.4.11
Outdoor Seismic Category I Tanks and piping tunnels (for each unit)[3] - Refueling Water Storage Tank (RWST) - Reactor Makeup Water Storage Tank (RMWST) - Condensate Storage Tank (CST)	Y	2.4.11
Transformer foundations	Y	2.4.11
Switchyard Structures: 138kV Relay House	Y	2.4.12
345kV Control House	Y	2.4.12
Precast trenches/lids	Y	2.4.12
Structure (6, 2 and single pole) foundations	Y	2.4.12
Component Support Commodity Group	Y	2.4.13
Crane/Hoist Commodity Group	Y	2.4.14
Fire Barrier Commodity Group	Y	2.4.15
Tornado Venting Components (addressed with the structures themselves)	Y	2.4.2 2.4.3 2.4.4 2.4.5 2.4.6
Miscellaneous Buildings/Structures		
Alternate Access Point	N	N/A[4]
Administration Annex	N	N/A[4]

Table 2.2-3
Plant Level Scoping Results: Containments, Structures and Component Supports

Structure Name	In Scope for LR	Sections
Administration Building	N	N/A[4]
Auxiliary Boiler	N	N/A[5]
Boat House	N	Outside PA
Chemical Feed Building	N	N/A[5]
Chemical Storage Building	N	Outside PA
Chicago Bridge and Iron Building	N	Outside PA
Chlorination Building	N	Outside PA
Circulating Water Chlorination Building	N	N/A[6]
Circulating Water Discharge Structure	N	N/A[6]
Circulating Water Intake Structure	N	N/A[6]
Combustible Storage Building	N	N/A[4]
Electronic Board Rework Facility (Including connected document vault)	N	Outside PA
Flex Building	N	Outside PA
Flow Meter Calibration Facility	N	Outside PA
Hoffman House	N	Outside PA
Investment Recovery Area (Including warehouse and tin shed)	N	Outside PA
Electronic Board Rework Facility (Including connected document vault)	N	Outside PA
Maintenance Shop	N	N/A[4]
Maintenance Fabrication Shop	N	Outside PA
Material Inspection Station	N	Outside PA
Mechanic Shop	N	Outside PA
Megawatt Support Center	N	N/A[4]
Meteorological Building	N	Outside PA
MT&E Calibration Facility	N	Outside PA
Nuclear Overview Test Lab	N	Outside PA
Old Steam Generator Storage Facility	N	N/A[4]
Paint Shop	N	Outside PA
Paint Storage & Office Building	N	Outside PA
Potable Water Booster Pump Station Building	N	Outside PA
Primary Access Point	N	N/A[4]
Q-Hut	N	Outside PA
Radiation Protection Building	N	N/A[4]
Rad Waste Building	N	Outside PA
Safe Team Building	N	Outside PA
Safety Building / RP	N	N/A[4]
Sewage Treatment Plant (Including Domestic Water Treatment Plant)	N	Outside PA
Service Water Discharge Canal	N	N/A[6]
Site Facilities Maintenance Building	N	Outside PA

Table 2.2-3
Plant Level Scoping Results: Containments, Structures and Component Supports

Structure Name	In Scope for LR	Sections
Solid Waste Storage Facility	N	Outside PA
Squaw Creek Dam	N	N/A[6]
Service Water Intake (SWI) Chlorination Building	N	N/A[6]
Stator Assembly Building	N	Outside PA
Support Services Building	N	Outside PA
Turbine Generator Rotor Storage Building	N	Outside PA
Turbine Support Building	N	N/A[4]
Warehouse “A” (Including connected Tele. Building)	N	Outside PA
Warehouse “B” (Including connected N.P.S. Building)	N	Outside PA
Warehouse “E”	N	Outside PA
Waste Management Building	N	Outside PA
Water Production and Oil Building	N	N/A[4]
Welding Qualification and Training Center Building	N	Outside PA

1 Includes the (accessible) Service Water Tunnel and SFP as rooms/areas.
2 FWST itself is addressed in Section 2.3.3.7.
3 Missile-protected, concrete Tanks with the stainless steel liners addressed in Sections 2.3.2.3, 2.3.3.4, and 2.3.4.1, respectively. Connected tunnels are accessible and considered as another room/area in the Safeguards Buildings.
4 Located inside the Protected Area (PA) a significant distance from Seismic Category I structures.
5 Located inside the PA in the vicinity of Seismic Category I structures, house only NNS components, and failure does not impact Seismic Category I structures.
6 Water control or related structures that are separated from Seismic Category I structures by a great distance and have no interaction with nuclear safety related components or the nuclear safety related SSI. Service Water Chlorination Building adjacent to the SWIS has been found to have no potential to impact the SWIS or nuclear safety related SSCs in it (Section 2.4.8).

2.3. SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The scoping and screening results for mechanical systems consist of components and component groups subject to AMR, which are then grouped and presented on a system basis. Brief descriptions of mechanical systems within the scope of LR are provided as background information. Mechanical system intended functions are provided for in-scope systems. For each in-scope system, components or component groups requiring AMR are provided. For the sections where the system description applies to the system on each Unit, a statement is included indicating that the systems for Units 1 and 2 are essentially identical. The word “essentially” is utilized to clarify that there may be minor differences between the systems on each Unit (e.g., valve numbering, locations of vents and drains, etc.), but these differences would not affect the information that follows.

The mechanical scoping and screening results are provided in four sections:

- Reactor Vessel, Internals, and Reactor Coolant System (2.3.1)
- Engineered Safety Features (2.3.2)
- Auxiliary Systems (2.3.3)
- Steam and Power Conversion Systems (2.3.4)

2.3.1. <u>Reactor Vessel, Internals, and Reactor Coolant System</u>

The following systems are addressed in this section:

- Reactor Vessel (2.3.1.1)
- Reactor Vessel Internals (2.3.1.2)
- Reactor Coolant System and Attached Piping (2.3.1.3)
- Steam Generators (2.3.1.4)

2.3.1.1. <u>Reactor Vessel</u>

<u>Description</u>

The reactor pressure vessel (RPV) is cylindrical, with a welded hemispherical bottom head and a removable, flanged and gasketed, hemispherical upper head. The vessel contains the core, core supporting structures, control rods and other parts directly associated with the core.

The purpose of the RPV is to maintain the RCPB and provide structural support for the RVI, nuclear fuel, incore instrumentation, and control rod drive (CRD) mechanisms (CRDMs).

The RPV accomplishes the specified purpose by providing a RCPB for the circulation of fluid from the RCS and by providing structural support for the RVI, incore instrumentation, and CRDMs during normal operations and DBEs. The vessel has inlet and outlet nozzles located in a horizontal plane just below the RV flange but above the top of the core. Coolant enters the vessel through the inlet nozzles and flows down the core barrel-vessel wall annulus, turns at the bottom, and flows up through the core to the outlet nozzles.

The RV is composed of the closure head, CRDM assembly, nozzles, safe ends and welds, vessel external attachments, vessel internal attachments, vessel shell, bottom head, and bottom mounted instruments. All pressure-containing surfaces in contact with the reactor water are stainless steel clad.

The vessel closure head is attached to the vessel by fifty-four studs, which are threaded into the vessel flange and extend through the closure head flange. Conventional nuts and washers were originally supplied with the RV. Hydraulic nuts were procured to be used with the RV studs, as appropriate. Original nuts and washers continue to be used.

The Unit 1 RPV has a replacement RV closure head (RRVCH) which has a one-piece housing and is connected to the reactor vessel head adapter by a full penetration weld. The lower portion of the pressure vessel contains the latch assembly. Unit 2 has the original RV closure head and CRDMs with a latch housing and rod travel housing which are connected by a threaded, seal-welded maintenance joint. The stainless steel housing of the CRDM for Unit 2 is screwed and seal-welded onto the top of the nozzle penetration.

RCS high point vents are provided on the reactor vessel head. These vents are designed to vent noncondensible gases which may inhibit core cooling during natural circulation. Venting is directly to open areas of the containment to assure appropriate mixing with the containment air. The vents are sized to limit the required makeup flow rate to within the capability of the CVCS.

The RV flange and head are sealed by two hollow metallic O-rings. Seal leakage is detected by means of two leakoff communications: one between the inner and outer ring and one outside the outer O-ring.

The RV is Safety Class 1. Design and fabrication of the RV is carried out in strict accordance with ASME Section III, Class 1 requirements. The head flanges and nozzles are manufactured as forgings. The cylindrical portion of the vessel is made up of several shells, each consisting of formed plates joined by full penetration longitudinal weld seams. The hemispherical heads are made from dished plates. The RV parts are joined by welding, using the single or multiple wire submerged arc.

At all locations in the RPV where stainless steel and Inconel are joined, the final joining beads are Inconel weld metal in order to prevent cracking.

> Unit 1: The location of full penetration weld seams in the vessel bottom head are restricted to areas that permit accessibility during inservice inspection (ISI). There are no full penetration welds in the upper closure head.
>
> Unit 2: The location of full penetration weld seams in the upper closure head and vessel bottom head are restricted to areas that permit accessibility during ISI.

The shell is constructed of lower shell plates and intermediate shell plates, as well as the upper shell plates and flange. These plates are joined with a circumferential weld and longitudinal welds. The core (active fuel height) is across from the lower and intermediate shells.

In addition to the upper incore instrumentation, there are RV bottom port columns which carry the retractable, cold worked stainless steel flux thimbles that are pushed upward into the reactor core. Conduits extend from the bottom of the RPV down through the concrete shield area and up to a thimble seal line. The thimbles are closed at the leading ends and serve as the pressure barrier between the reactor pressurized water and the containment atmosphere.

Mechanical seals between the retractable thimbles and conduits are provided at the seal line. During normal operation, the retractable thimbles are stationary and move only during refueling or for maintenance, at which time a space of approximately 15-ft above the seal line is cleared for the retraction operation.

Boundary

The RPV evaluation boundary for LR is reflected on the LRBDs listed below. While the RPV is screened as in-scope within the RCS, it is evaluated as a subcomponent on its own.

The RPV evaluation boundary begins at the four (4) RPV inlet nozzle safe ends and terminates at the four (4) RPV outlet nozzle safe ends, with the RCS piping attached to the safe ends addressed in Section 2.3.1.3. The RPV boundary also includes fifty-three (53) penetrations for the CRDMs, two (2) penetrations for The RV Level Measuring System (RVLMS) and four (4) penetrations for the core exit thermocouple nozzle assemblies (CETNA). For Unit 1, the CRDMs are welded to the head. For Unit 2, this boundary consists of threaded canopy seals. Unit 2 also contains eighteen (18) plugged spare penetrations. The RPV boundary also includes the fifty-eight (58) RV lower head bottom mounted instrument nozzles used for the Incore Flux Mapping System and fifty (50) instrument nozzles used for core exit thermocouples.

The RPV evaluation boundary with the RVI, which are addressed in Section 2.3.1.2, is at the core support pads attached to the inside of the RPV.

The boundary includes the nozzles to the RPV head vent piping and the RV flange leakage monitoring piping and valves. The RPV head vent and RV flange leakage monitoring piping are covered in Section 2.3.1.3 for the RCS and attached piping.

Unit 1:

- M1-0250-LR

Unit 2:

- M2-0250-LR

Common:

- None.

System Intended Functions

The RV is a major component within the RCS and provides component level support to the RCS System intended functions which are defined in Section 2.3.1.3 for the RCS and attached piping.

Nuclear safety related functions of the RPV (10 CFR 54.4(a)(1)):

(1) Provide RCPB. The RPV provides a boundary for containing the reactor coolant under normal operating temperature and pressure conditions.

(2) Maintain reactor core geometry. The RPV contains the core, core supporting structures, control rods, and other parts directly associated with the core.

(3) Keep the reactor core subcritical for any mode of normal operation or event. The CRDMs of the RPV insert or withdraw rod cluster control assemblies within the core to control average core temperature and to shut down the reactor.

(4) Vent non-condensable gasses from the RCS. The Unit 2 RVCH and Unit 1 RRVCH each have a connection for venting the head to the Containment atmosphere through closed head vent valves.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The RCS is credited with providing reactor coolant inventory and pressure control and process monitoring including incore thermocouples during fire events.

(2) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62). The RCS is credited with RCPB integrity during an ATWS event.

(3) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The RCS and attached piping include components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(4) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). The RCS is credited with maintaining RCPB integrity,

natural reactor coolant circulation for decay heat removal and process monitoring during a SBO event.

(5) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Pressurized Thermal Shock (10 CFR 50.61). The RV beltline shell, including plates, forgings, and welds are subject to PTS analyses.

FSAR References

Sections 3.8, 3.9N, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4 and 7.7

Components Subject to AMR

Table 2.3.1-1 lists the RPV component types that are subject to AMR and their associated component intended functions.

Table 3.1.2-1 provides the results of the AMR.

Table 2.3.1-1
Reactor Vessel Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Bottom head (dome, torus, and welds)	Pressure boundary
Bottom head penetrations (flux thimble tubing)	Pressure boundary
Bottom head penetrations (guide tubes, seals)	Pressure boundary
Bottom head penetrations (instrumentation tubes/nozzles, welds)	Pressure boundary
Bottom head penetrations (seal table)	Pressure boundary
Closure head (Unit 1 forging/flange; Unit 2 dome, torus, and flange)	Pressure boundary
Closure head adapters (CRDM nozzle welds)	Pressure boundary
Closure head penetrations (CETNA, instrumentation, leakage monitoring, vent)	Pressure boundary
Closure head stud assembly (studs, nuts, and washers)	Mechanical closure
CRDM assembly (pressure boundary components including: one-piece housing (Unit 1), threaded, seal-welded joint (Unit 2), pressure forgings, latch housing, and rod travel housing)	Pressure boundary
CRDM thermal sleeves	Withstand thermal stresses
Nozzles (inlet / outlet)	Pressure boundary
Nozzle safe ends	Pressure boundary
Nozzle to safe end welds	Pressure boundary
Vessel external attachments (support pads, seal ledge, and lifting lugs)	Structural support
Vessel internal attachments (core support pads)	Structural support

Table 2.3.1-1
Reactor Vessel Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Vessel shell: • Flange • Intermediate shell plates, circumferential and longitudinal welds • Lower shell plates, circumferential and longitudinal welds • Upper shell plates, circumferential and longitudinal welds	Pressure boundary

2.3.1.2. Reactor Vessel Internals

Description

The RVIs support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and CRDMs, direct coolant flow past the fuel elements, direct coolant flow to the pressure vessel head, provide gamma and neutron shielding, and guides for the incore instrumentation. The RVI components are divided into three parts consisting of:

- the lower core support structure, including the entire core barrel and neutron shield pad assembly,
- the upper core support structure, and
- the incore instrumentation support structures.

Coolant flows from the vessel inlet nozzles down the annulus between the core barrel and the vessel wall and then into a plenum at the bottom of the vessel. It then reverses and flows up through the core support and through the lower core plate (LCP). The LCP is sized to provide the described inlet flow distribution to the core. After passing through the core, the coolant enters the region of the upper nozzles and flows directly through the vessel outlet nozzles. A small portion of the coolant flows between the baffle plates and the core barrel to provide additional cooling of the barrel.

The major containment and support member of the reactor internals is the lower core support structure. This support structure assembly consists of the core barrel, the core baffle, the LCP and support columns, the neutron shield pads, and the core support which is welded to the core barrel. The lower core support structure is supported at its upper flange from a ledge in the reactor vessel head flange and its lower end is restrained in its transverse movement by a radial support system attached to the vessel wall. Within the core barrel are an axial baffle and a LCP, both of which are attached to the core barrel wall and form the enclosure periphery of the assembled core. The LCP is a member through which the necessary flow distribution holes for each fuel assembly are machined. Fuel assembly locating pins (two for each assembly) are also inserted into this plate. Columns are placed between this plate and the core support of the core barrel. The neutron shield pad assembly consists of four pads that are bolted and pinned to the outside of the core barrel. A “key” is attached to the internals at equally spaced points around the circumference (of the core support). In the event of an abnormal downward vertical displacement of the internals following a hypothetical failure, energy absorbing devices limit the displacement after contacting the vessel bottom head. The energy absorbers, cylindrical in shape, are contoured on their bottom surface to the RV bottom head geometry.

The upper core support assembly consists of the top support plate assembly and the upper core support plate, between which are contained support columns and guide tube assemblies. The guide tube assemblies are fastened to the top support plate and are restrained by pins in the upper core plate. Additional guidance for the CRD shafts is provided by the upper guide tube which is attached to the upper support plate and control rod guide tube (CRGT). The upper core support assembly is positioned in its proper orientation with respect to the lower support structure by flat-sided pins pressed into the core barrel which in turn are engaged in slots in the upper core plate. Fuel assembly locating pins protrude from the bottom of the upper core plate. The upper core support assembly is restrained from any axial movements by a large circumferential spring which rests between the upper barrel flange and the upper core support assembly and is compressed by the reactor vessel head flange.

The incore instrumentation support structures consist of an upper system to convey and support thermocouples penetrating the vessel through the head and a lower system to convey and support flux thimbles penetrating the vessel through the bottom. The upper system utilizes the reactor vessel head penetrations. Instrumentation port columns are slip-connected to inline columns that are in turn fastened to the upper support plate. The thermocouples are carried through these port columns and the upper support plate at positions above their readout locations. In addition to the upper incore instrumentation, there are RV bottom port columns which carry the retractable, cold worked stainless steel flux thimbles that are pushed upward into the reactor core. The thimbles are closed at the leading ends and serve as the pressure barrier between the reactor pressurized water and the containment atmosphere. Bottom-Mounted Instrumentation (BMI) wear reduction sleeves are installed in the RV lower internals instrumentation columns of Unit 1.

Boundary

The RVI boundary includes the upper core support structure, lower core support structure, and incore instrumentation support structure. Also included in the RVI boundary are the fuel assemblies and the rod cluster control assemblies, including the spider assembly and rodlets. The boundary between the rod cluster control assembly and the CRDM is at the rod cluster control assembly spider assembly coupler.

While the control rods, core exit and RV Level Indicating System (RVLIS) thermocouples, and fuel assemblies are included within the scope of LR, they are screened as active or short-lived components and are not subject to AMR. Additionally, the irradiation specimen basket, which is contained in the lower core support structure and attached to the neutron panels, does not serve any LR intended function and is, therefore, not in the scope of LR or subject to AMR.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

1) Maintains core assembly geometry within the reactor to ensure core cooling, core reactivity control, and the integrity of the fuel cladding as a radioactive material barrier.

2) Provides structural support and alignment for the core, reactivity control components, and instrumentation.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

None.

FSAR References

Sections 3.7N/B.3.14, 3.9N/B.2.3, 3.9N/B.2.4, 3.9N/B.2.5, 3.9N/B.2.6, 3.9N.5.1 to 3.9N.5.4, 4.1, 4.5, and 5.2

Components Subject to AMR

Table 2.3.1-2 lists the RVI component types that are subject to AMR and their associated component intended functions.

Table 3.1.2-2 provides the results of the AMR.

Table 2.3.1-2
Reactor Vessel Internals Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Baffle-former bolts (including corner bolts)	Structural support
Baffle-former edge bolts	Structural support
Baffle-former plates	Flow distribution Structural support
Barrel-former bolts	Structural support
BMI port columns (bodies)	Structural support
BMI wear reduction sleeves (Unit 1)[1]	Structural support
Clevis inserts and insert bolts	Structural support
Core barrel flange	Structural support
Core barrel lower flange weld	Structural support
Core barrel upper flange weld	Structural support
Core barrel welds (axial)	Structural support
Core barrel welds (girth)	Structural support

Table 2.3.1-2
Reactor Vessel Internals Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Core support column and sleeve	Structural support
Core support column and sleeve bolting	Structural support
CRGT guide cards	Flow distribution Structural support
CRGT lower flange welds	Structural support
Flux thimble tubes	Structural support
Head and vessel alignment pins	Structural support
Hold-down spring	Structural support
Lower core plate (including manway cover)	Flow distribution Structural support
Lower support forging	Structural support
Neutron shield panel support pins	Structural support
No additional measures components	Flow distribution Structural support
Radial support key	Structural support
Radial support key bolts	Structural support
Upper core plate	Flow distribution Structural support
Upper core plate alignment pins	Structural support
Upper support ring	Structural support

(1) The Unit 1 BMI wear reduction sleeves are grouped with their corresponding BMI column bodies in Table 3.1.2-2, as these sleeves are completely contained within the instrumentation column bodies.

2.3.1.3. Reactor Coolant System and Attached Piping

Description

The RCS consists of four parallel, similar, heat transfer loops, each consisting of a reactor coolant pump (RCP) and SG, connected to the RPV. In addition, the system includes a pressurizer (PZR), pressurizer relief tank (PRT), connecting piping, and the instrumentation necessary for operational control and protection. During operation, the RCS transfers the heat generated in the core to the SGs where steam is produced to drive the turbine generator. Borated demineralized water is circulated in the RCS at a flow rate and temperature consistent with achieving the reactor core thermal-hydraulic performance. The water also acts as a neutron moderator and reflector, and as a solvent for the neutron absorber used in chemical shim control. The RCPB provides a barrier against the release of radioactivity generated within the reactor and is designed to ensure a high degree of integrity throughout the life of the plant. RCS pressure is controlled by the use of the PZR where water and steam are maintained in equilibrium by electrical heaters and water sprays. Spring loaded safety valves and power operated relief valves (PORVs) are mounted on the PZR and discharge to the PRT, where the steam is condensed and cooled by mixing with water. RCS high point vents are provided on the reactor vessel head and on the pressurizer. These vents are designed to vent non-condensable gases which may inhibit core cooling during natural circulation. Venting is directly to open areas of the containment to assure good mixing with the containment air. The vents are sized to limit the required makeup flow rate to within the capability of the CVCS.

The RCPs ensure an adequate core cooling flow rate and hence sufficient heat transfer, to maintain a departure from nucleate boiling ratio (DNBR) greater than the limit value within the parameters of operation. The required net positive suction head (NPSH) is by conservative pump design always less than that available by system design and operation. Sufficient pump rotation inertia is provided by a fly wheel, in conjunction with the impeller and motor assembly, to provide adequate flow during coastdown. This flow following an assumed loss of pump power aids in the development of a thermal gradient for initiation of natural circulation while providing the core with adequate cooling.

The RCPs are vertical, single stage, centrifugal, shaft seal pumps designed to pump large volumes of main coolant at high temperatures and pressures. Each pump consists of three areas from bottom to top. They are the hydraulics, the shaft seals, and the motor.

1. The hydraulic section consists of an impeller, diffuser, casing, thermal barrier, heat exchanger, radial bearing, main flange, motor stand, and pump shaft.

2. The motor section consists of a vertical solid shaft, squirrel cage induction type motor, and oil lubricated double thrust bearing, two oil lubricated radial bearings, and a flywheel.

3. The shaft seals section consists of three seals contained within the main flange and seal housings.

Above the impeller is a thermal barrier heat exchanger which limits heat transfer between hot system water and seal injection water. Component cooling water (CCW) is supplied to the thermal barrier heat exchanger. High-pressure seal injection water is introduced through the thermal barrier wall. A portion of this water flows through the radial bearing and the seals; the remainder flows down the shaft through the thermal barrier where it acts as a buffer to prevent system water from entering the radial bearing and seal section of the unit. The thermal barrier heat exchanger provides a means of cooling system water to an acceptable level in the event that seal injection flow is lost. The water lubricated journal type pump bearing, mounted above the thermal barrier heat exchanger, has a self-aligning spherical seat.

In the event of a loss of seal injection and CCW flow to the thermal barrier heat exchanger, RCS fluid begins to travel along the RCP shaft and displaces the cooler seal injection water. Once the temperature within the number 1 seal reaches the actuation temperature range of the SHIELD Shutdown Seal (SSDS), the SSDS will activate to limit leakage from the RCS through the RCP seals.

The loss of reactor coolant through the RCP seal package is limited when the SSDS polymer ring activates around the number 1 seal sleeve.

The RCP motor bearings are of conventional design. The radial bearings are the segmented pad type, and the thrust bearings are tilting pad bearings. All are oil lubricated. The lower radial bearing and the thrust bearings are submerged in oil, and the upper radial bearing is oil fed from a viscosity pump integral with the thrust runner. CCW is supplied to the two oil coolers on the pump motor.

The RCS piping is designed and fabricated to accommodate the system pressures and temperatures attained under all expected modes of plant operation or anticipated system interactions. The piping in the RCS is Safety Class 1 and is designed and fabricated in accordance with the ASME Section III, Class 1 requirements. Stainless steel pipe conforms to ANSI B36.19 for sizes 1/2-in through 12-in and wall thickness Schedules 40S through 80S. Stainless steel pipe outside of the scope of ANSI B36.19 conforms to ANSI B36.10. The CPNPP Unit 1 and 2 pressurizer surge line design utilizes schedule 160 piping with the exception of a one-ft section of schedule 140 piping in the Unit 1 pressurizer surge line. All butt welds, branch connection nozzle welds, and boss welds are of a full penetration design. Socket weld fittings and socket joints conform to ANSI B16.11.

The pressurizer surge line connects the pressurizer to one RCS hot leg. The line enables continuous coolant volume pressure adjustments between the RCS and the pressurizer. The pressurizer is a vertical, cylindrical vessel with hemispherical top and bottom heads. The surge line nozzle and removable electric heaters are installed in the bottom head. A thermal sleeve is provided to minimize stresses in the surge line nozzle. A screen at the surge line nozzle and baffles in the lower section of the pressurizer prevent an insurge of cold water from flowing directly to the steam/water interface and assist mixing. Spray line nozzle, relief and safety valve connections are located in the top head of the vessel. Spray flow is modulated by automatically controlled air operated valves. The spray valves also can be operated manually by a switch in the Control Room. A small, continuous spray flow is provided through a manual bypass valve around the power operated spray valves to assure that the pressurizer liquid is homogeneous with the coolant and to prevent excessive cooling of the spray piping.

The Pressurizer Relief Discharge System does not constitute part of the RCPB per 10 CFR 50.2 since all of its components are downstream of the RCS safety and relief valves (FSAR Section 5.4.11.3). The steam and water discharged from the various safety and relief valves inside the containment is routed to the PRT (PRT) if the discharged fluid is of reactor grade quality. The tank normally contains water and a predominantly nitrogen atmosphere. In order to obtain effective condensing and cooling of the discharged steam, the tank is installed horizontally, and the steam is discharged through a sparger pipe located near the bottom, under the water level. Cold water is drawn from the Reactor Makeup Water System, or the content of the tank is circulated through the reactor coolant drain tank heat exchanger of the Waste Processing System and back into the spray header. The nitrogen gas blanket is used to control the atmosphere in the tank and to allow room for the expansion of the original water plus the condensed steam discharge.

Boundary

RCS components and attached piping, in other systems, that comprise the RCPB are ASME Code / ANSI Safety Class 1. These RCPB components start with the piping just outside of the RPV nozzle safe ends and continue through all four reactor coolant loops (RCLs) back to the RPV nozzle safe ends. Each loop includes interfaces with other systems. The RCS and attached piping in other systems include the CVCS, RHRS, and Safety Injection System (SIS).

In-scope components in the RCS and attached piping are those that maintain the pressure boundary of the system starting with the piping just outside of the RV. The RCS and attached piping begin with the Class 1 piping from the RV and continues through all four loops' piping and components back to the RV. Each loop contains boundaries that interface with other Class 1 systems. The interfaces within each loop include SI, RHR, Process Sampling, and Waste Processing. Class 1 piping and components in these other systems are addressed under the AMR for the RCS and attached piping, with the exception of the RV and steam generators, which are addressed separately.

Each RCS loop interfaces with the SIS leading up to the accumulator tanks. RCS loop drains interface with the Waste Processing System. The RCS and attached piping interfaces with the Oil Spillage Protection System (OSPS) which includes the OSPS tanks (one per loop) and their attached piping, pans, hoses, and reducers, etc. These are discussed in the FPS Section 2.3.3.7.

The boundaries also include the piping, valves, and components connected to the PRT and RCS standpipe. These NNS components are attached to nuclear safety related components and/or contain liquid. These NNS components have the potential to impact nuclear safety related functions due to aging.

The evaluation boundary for the RCS and attached piping is shown on the following LRBDs:

Unit 1:

- M1-0250-LR
- M1-0251-LR
- M1-0253-LR
- M1-0253-A-LR
- M1-0260-LR
- M1-0261-LR
- M1-0262-LR
- M1-0263-LR

Unit 2:

- M2-0250-LR
- M2-0251-LR
- M2-0253-LR
- M2-0255-LR
- M2-0255-001-LR
- M2-0260-LR
- M2-0261-LR

- M2-0263-LR
- M2-0263-B-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide RCPB. The RCS provides a boundary for containing the reactor coolant under normal operating temperature and pressure conditions. The PORVs and safety valves prevent an overpressure condition during plant transients.

(2) Sense process conditions and generate signals for reactor trip or ESF actuation. The RCS instrumentation provides system pressure, temperature, pressurizer water level, and reactor coolant flow inputs to reactor trip and ESF actuation systems.

(3) Provide and maintain sufficient reactor coolant inventory for core cooling. Coolant is circulated at the flow and temperature required for achieving the reactor core thermal-hydraulic performance. The RCS circulates reactor coolant either by forced circulation with the RCPs or by natural circulation to transfer sufficient heat from the reactor core to the SG secondary fluid during normal operation and anticipated operational occurrences so that reactor core thermal limits are not exceeded.

(4) Remove residual heat from the reactor core through natural or forced circulation following DBAs. The RCS provides connections with the Residual Heat Removal System (RHRS) and provides a portion of the flow path to support decay heat removal.

(5) Maintain the dose consequences within the guidelines of 10 CFR 50.67 or 10 CFR Part 100. The RCS provides sufficient core cooling to ensure that the nuclear fuel and the reactor coolant design limits are not exceeded.

(6) Vent non-condensable gasses from the RCS. The RCS has connections to the CVCS and Boron Recycle System (BRS) which allows for the ventilation of these non-condensable gases.

(7) Provide a path for coolant to the core following a LOCA.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The RCS is credited with providing reactor coolant inventory and pressure control and process monitoring including incore thermocouples during fire events.

(2) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62). The RCS is credited with RCPB integrity during an ATWS event.

(3) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The RCS and attached piping include components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(4) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). The RCS is credited with maintaining RCPB integrity, natural reactor coolant circulation for decay heat removal and process monitoring during a SBO event.

FSAR References

Sections 1.2.2.2.2, 3.1.2.6, 5.1, 5.2, and 5.4

Components Subject to AMR

Table 2.3.1-3 lists the RCS and attached piping component types subject to AMR and their associated component intended functions.

Table 3.1.2-3 provides the results of the AMR.

Table 2.3.1-3
Reactor Coolant System and Attached Piping Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Bolting	Mechanical closure
Condensate pot	Pressure boundary
Flow element	Pressure boundary Throttle
Heat exchanger (RCP bearing lube oil, thermal barrier cooler, motor air cooler)	Leakage boundary (spatial) Pressure boundary

Table 2.3.1-3
Reactor Coolant System and Attached Piping Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Moment restraint	Pressure boundary
Orifice/Scoop	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pressurizer	Pressure boundary
Pressurizer baffles	Direct flow
Pressurizer DMW (SWOL)	Pressure boundary
Pressurizer manway/insert	Pressure boundary
Pressurizer nozzle (surge/spray)	Pressure boundary
Pressurizer safe end	Pressure boundary
Pressurizer screen/basket	Filter
Pressurizer spray head	Spray
Pressurizer thermal sleeve	Withstand thermal stresses
Pump casing (RCP)	Pressure boundary
Pump casing (RCP oil-lift)	Leakage boundary (spatial)
Pump casing (RCP oil integral viscosity)	Leakage boundary (spatial)
Pump seal housing (RCP)	Pressure boundary
Rupture disc	Leakage boundary (spatial)
Tank (pressurizer relief)	Leakage boundary (spatial)
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)
Thermowells	Leakage boundary (spatial) Pressure boundary
Trap	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial) Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary

2.3.1.4. Steam Generators

Description

The SGs are a major component within the RCS. The system description for the RCS is not repeated here, and instead focuses on the SGs. Although the SGs are not a system at CPNPP, they are a major component with a significant number of subcomponents that warrant a separate AMR. A technical description of the SGs is provided below to facilitate the AMR.

The Unit 1 SGs were replaced during refueling outage 1RF12 in Spring 2007. The Unit 2 SGs are original to CPNPP. The Unit 1 SGs are model Delta 76 vertical SGs, and the Unit 2 SGs are model D-5 vertical SGs. Each unit has four SGs, one for each RCL.

The SGs are Westinghouse vertical U-tube units containing Inconel tubes and equipped with integral moisture separation equipment to reduce the moisture content of the steam to 0.10 percent for Unit 1 and to 0.25 percent or less for Unit 2.

Unit 1 Model Delta 76 SG Description

On the primary side, the reactor coolant flows through the inverted U-tubes, entering and leaving through nozzles located in the hemispherical bottom head of the SG. The head is divided into inlet and outlet chambers by a vertical divider plate extending from the head to the tubesheet. Steam is generated on the shell side, flows upward, and exits through the outlet nozzle at the top of the vessel. During normal operation, subcooled feedwater is supplied from the plant Feedwater System and enters the SG through the main (or sometimes auxiliary) feedwater inlet nozzle located in the upper shell of the SG. Inside the SG, the feedwater is joined by the recirculating water separated from the steam-water mixture by the moisture separators, producing a subcooled mixture in the upper plenum that is slightly below saturation temperature. The subcooled mixture flows down the downcomer annulus formed by the inner diameter of the SG shell and the O.D. of the wrapper, then enters the lower tube bundle through an opening between the lower edge of the wrapper and the secondary surface of the tubeplate. Subsequently the water-steam mixture flows upward through the tube bundle and into the steam drum section, where individual centrifugal moisture separators remove most of the entrained water from the steam. The steam continues to the secondary separators for further moisture removal, increasing its quality to a minimum of 99.9 percent. The moisture separators recirculate the separated water through the annulus between the shell and tube bundle wrapper. The returning flow then combines with the feedwater for another passage through the SG. Dry steam exits through the outlet nozzle which is provided with a steam flow restrictor.

Unit 2 Model D-5 SG Description

On the primary side, the reactor coolant flows through the inverted U-tubes, entering and leaving through nozzles located in the hemispherical bottom head of the SG. The head is divided into inlet and outlet chambers by a vertical divider plate extending from the head to the tubesheet. Steam is generated on the shell side, flows upward, and exits through the outlet nozzle at the top of the vessel. During normal operation, feedwater flows through a flow restrictor, directly into the counter flow preheat section and is heated almost to saturation temperature before entering the boiler section. Subsequently the water-steam mixture flows upward through the tube bundle and into the steam drum section, where individual centrifugal moisture separators remove most of the entrained water from the steam. The steam continues to the secondary separators for further moisture removal, increasing its quality to a minimum of 99.75 percent. The moisture separators recirculate the separated water through the annulus between the shell and tube bundle wrapper via the space formed by the distribution plate, between the tubesheet and the preheat section. The returning flow then combines with the already preheated water-steam mixture for another passage through the SG. Dry steam exits through the outlet nozzle which is provided with a steam flow restrictor.

Boundary

The SGs interface with the MS, FW, and AFW Systems. The SGs appear on the LRBDs for each of the interfacing systems and are highlighted on the RCS LRBDs M1-0250-LR and M2-0250-LR. The SG boundary includes the connections at nozzles and safe ends from the interfacing system piping to the channel head, shell, and internals, including secondary side support structures.

Unit 1:

- M1-0250-LR

Unit 2:

- M2-0250-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

Reactor Coolant System

(1) Remove residual heat from the reactor core through natural or forced circulation following DBAs.

(2) Provide a boundary for containing the coolant under operating temperature and pressure conditions and for limiting leakage (and activity release) to the containment atmosphere.

Feedwater System

(3) Provide feedwater to maintain the water inventories in the SGs.

Auxiliary Feedwater System

(4) Maintain water levels in the SGs in the event of a LOCA.

Main Steam System

(5) Support containment pressure boundary.

(6) Deliver the required quantity and quality of steam to the auxiliary feedwater pump turbine.

(7) Provide controlled heat release from the reactor during normal and emergency conditions.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain integrity of NNS components such that no physical interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

Reactor Coolant System

(1) Utilized to achieve reactor coolant inventory control and reactor coolant pressure control during a Fire Safe Shutdown regulated event (10 CFR 50.48).

(2) Maintain its pressure boundary and provide core cooling during a SBO regulated event (10 CFR 50.63).

(3) Provides SG water level input to the AMSAC (10 CFR 50.62).

(4) Contains EQ components that are nuclear safety related and located in harsh environments (10 CFR 50.49).

Feedwater System

(5) Provide system isolation and a flow path for AFW during a SBO regulated event (10 CFR 50.63).

Auxiliary Feedwater System

(6) Provide auxiliary feedwater flow from the CST to the SGs to ensure decay heat removal during a SBO (10 CFR 50.63) and Fire Safe Shutdown (10 CFR 50.48) regulated events.

Main Steam System

(7) Provide steam to the auxiliary feedwater pump turbines during a SBO regulated event (10 CFR 50.63).

(8) Maintain decay heat removal during SBO (10 CFR 50.63) and Fire Safe Shutdown (10 CFR 50.48) regulated events.

<u>FSAR References</u>

Sections 1.2.2.2.2, 5.4.2, and 10.4.9.1

Components Subject to AMR

Table 2.3.1-4 lists the SG subcomponent types subject to AMR and their associated component intended functions.

Table 3.1.2-4 provides the results of the AMR.

Table 2.3.1-4
Steam Generator Subcomponents Subject to Aging Management Review

Component Type	Component Intended Function(s)
SG Primary Side	
Channel head	Pressure boundary
Channel head divider plate	Direct flow
Bolting (Class 1)	Mechanical closure
Primary drain and plug	Pressure boundary
Primary inlet and outlet nozzle and closure ring	Pressure boundary
Primary inlet and outlet nozzle safe end	Pressure boundary
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary
Primary manway, insert plate, and cover	Pressure boundary
Tube plug	Pressure boundary
Tube sheet	Pressure boundary
Tube to tube sheet weld (Unit 1 only)	Pressure boundary
Tubes	Pressure boundary Heat transfer
SG Secondary Side	
Anti-vibration bar	Structural integrity (attached)
Auxiliary feedwater inlet nozzle	Pressure boundary
Auxiliary feedwater inlet nozzle thermal sleeve	Withstand thermal stresses
Auxiliary feedwater inlet nozzle dissimilar metal weld	Pressure boundary
Auxiliary feedwater internal discharge pipe	Direct flow
Blowdown tap	Pressure boundary
Closure bolting	Mechanical closure
Feedwater distribution ring (Unit 1 only)	Direct flow
Feedwater inlet nozzle	Pressure boundary
Feedwater inlet nozzle thermal sleeve	Withstand thermal stresses
Feedwater inlet nozzle dissimilar metal weld	Pressure boundary
Feedwater inlet nozzle flow restrictor (Unit 2 only)	Throttle
Feedwater spray nozzle (Unit 1 only)	Direct flow
Handhole and cover	Pressure boundary
Inspection port and cover	Pressure boundary
Lower shell, cone, and upper shell/head	Pressure boundary
Main steam outlet nozzle	Pressure boundary
Main steam outlet flow restrictor	Throttle
Narrow and wide range water level tap	Pressure boundary
Preheater assembly (Unit 2 only)	Direct flow

Table 2.3.1-4
Steam Generator Subcomponents Subject to Aging Management Review

Component Type	Component Intended Function(s)
Sample tap	Pressure boundary
Secondary side manway and cover	Pressure boundary
Secondary side drain tap	Pressure boundary
Steam separator assembly	Direct flow
Tube support plate	Structural integrity (attached)
Tube wrapper	Direct flow

2.3.2. Engineered Safety Features

The following systems are addressed in this section:

- Combustible Gas Control System (2.3.2.1)
- Containment Isolation System (2.3.2.2)
- Containment Spray System (2.3.2.3)
- Residual Heat Removal System (2.3.2.4)
- Safety Injection System (2.3.2.5)

Note – Habitability and filtration engineered safety features are addressed in Section 2.3.3 with other auxiliary plant ventilation systems. In addition, the portions of RHRS and SIS that are in the RCPB (ASME Class 1) are addressed in Section 2.3.1.3

2.3.2.1. Combustible Gas Control System

Description

The purpose of the Combustible Gas Control System (CGCS) is to limit the concentration of hydrogen in containment following a DBA. Buildup of hydrogen gas inside containment may be generated by reactions such as zirconium metal with water, corrosion of materials of construction and exposure of the organic cable materials to radiation and radiolysis of aqueous solution in the core sump. This buildup could result in hydrogen burns or hydrogen detonations that could jeopardize containment integrity. The CGCS limits this buildup by utilizing the hydrogen purge subsystem that purges containment through filters to reduce radioactive releases.

The CGCS consists of the Hydrogen Purge System along with the Hydrogen Monitoring System. Previously the CGCS also contained the hydrogen recombiner subsystem, however that subsystem has been abandoned in place. The Hydrogen Purge System functions to provide controlled purging of the containment atmosphere to aid in cleanup post LOCA. When the system operates, it can maintain the hydrogen concentration in containment below the lower flammability limit post LOCA. The Hydrogen Monitoring System monitors the hydrogen partial pressure in several well-ventilated areas of the RCB in order to obtain the typical values for hydrogen gas concentration.

The Hydrogen Purge System within the CGCS consists of two 700 cubic-ft per minute (cfm) blowers for supply, inlet and outlet ductwork, piping, isolation valves, a flow control valve, two atmospheric cleanup systems and two exhaust fans. The blowers are capable of transporting 700 cfm of fresh, filtered air to the containment. Air is drawn from either containment as required, passed through a filter plenum (particulate, iodine absorbers, high efficiency particulate air (HEPA) filters) and discharged through the plant discharge duct. A demister and heater are used to maintain the humidity entering the filters below 70 percent. Two trains are provided (one train is required to operate), each capable of controlling the design airflow of 700 cfm when the containment is less than 5.8 psig.

The Hydrogen Monitoring System continuously monitors the hydrogen content of containment atmosphere at four different elevations in containment during normal plant operations and will be operational within 90 minutes following a LOCA. The Hydrogen Purge System is manually operated and is isolated from containment by normally closed valves.

Boundary

Nuclear safety related components in the CGCS are those that maintain the pressure boundary of containment starting downstream from the class 2 boundary at hydrogen purge supply isolation valves, and through pipe penetrations MIII-0018 and MIII-0019 as well as 2-MIII-0018 and 2-MIII-0019.

NNS affecting nuclear safety related components in the Hydrogen Purge System are the class 5 piping connecting to the class 2 boundary upstream of the hydrogen purge supply isolation dampers to the ductwork connections.

The LR boundaries are reflected on the LRBDs listed below.

Unit 1:

- M1-0301-LR

Unit 2:

- M2-0301-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide isolation of lines penetrating containment to maintain the containment pressure boundary.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain integrity of NNS components such that no interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Perform a function that demonstrates compliance with the Commission's regulations for the EQ program (10 CFR 50.49). The CGCS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

FSAR References

Sections 1.2.2.3.5 and 6.2.5
Table 17A-1

Components Subject to AMR

Table 2.3.2-1 lists the Combustible Gas Control System component types subject to AMR and their associated component intended functions.

Table 3.2.2-1 provides the results of the AMR.

Table 2.3.2-1
Combustible Gas Control Systems Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Bolting	Mechanical closure
Damper housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary Structural integrity (attached)
Tubing	Pressure boundary Structural integrity (attached)
Valve body	Pressure boundary Structural integrity (attached)

2.3.2.2. Containment Isolation System

Description

The Containment Isolation System (CIS) allows the normal or emergency passage of fluids through the containment boundary while preserving the ability of the boundary to limit the escape of fission products from postulated accidents. The CIS, in conjunction with other interfacing systems, is designed to monitor the development of gross leakages in containment and to limit radioactive emission from the containment during normal operations and in response to abnormal/accident conditions.

The CIS is a virtual system that comprises components from multiple plant systems. Rather than separate components from those plant systems that are in the scope of LR, for inclusion in the CIS, this section is focused on the Containment penetrations that are not part of another system. Unique CIS components include Containment personnel airlock and emergency airlock operating systems; Containment leak rate testing; and Containment pressurization/pressure sensing instrumentation components.

Containment personnel airlock (airlock operating system only)

Access to the Containment structure is provided by a personnel airlock. The personnel airlock is an electro-hydraulically operated double-door assembly. Each door is hinged and gasketed, with leakage test taps aligned to the annulus between the gasket sealing surfaces. Both doors are interlocked so that if one door is open, the other cannot be activated. Both doors are also furnished with hydraulic actuators as well as manual pressure equalizing valves which can be operated by persons leaving or entering the personnel hatch. Test connections for the airlocks are isolated by blind flanges or caps.

The Hydraulic System which constitutes the personnel airlock operating mechanism contains some non-metallic seals and components necessary for it to perform its design function. These components are part of active components or are shaft seals which are grouped with valve packing and are considered consumables. In normal use during the opening and closing of the airlock door, the hydraulic components are normally pressurized to between 100 psig to 500 psig. Any leakage or failure would be readily visible at the point of Containment ingress and egress.

Containment Airlock Equalization and Hydraulic Systems contain components such as rotary actuator cylinders, locking ring cylinders, valves, and tubing. There are differences in design of the Containment personnel Airlock Hydraulic Systems between Units 1 and 2. The number of attachments and the type and number of components which are nuclear safety related or NNS are different.

Containment emergency personnel airlock (airlock operating system only)

An emergency airlock is provided for access to Containment in the event of a LOCA. The emergency airlock is a manually operated double-door assembly. Both doors of the emergency airlock are furnished with manually operated pressure-equalizing connection and valves which are interlocked with door operations.

Containment leak rate testing

Containment integrated leak rate testing is performed to verify the leakage rate is within acceptable limits, thus ensuring the ability of Containment to limit the escape of fission products. Containment leakage rate test, pressurization/pressure sensing penetrations consist of pipes or sleeves embedded in the Containment wall concrete, welded to the Containment liner and with installed blind flanges at each end. A test connection is provided so that the space between the end flanges can be pressurized in order to measure the leakage rate. The leak rate test and maintenance connections are each equipped with a bolted blind flange with locked closed valves outside the Containment, or a bolted blind flange both inside and outside the Containment. Containment penetrations MIV-0005, -0006, and -0007 have threaded plugs.

Containment pressurization/pressuring-sensing instrumentation

There are instrument lines which penetrate the Containment that are required to remain functional following a LOCA or steam line break. These lines sense the pressure of the Containment atmosphere and transmit this pressure to instruments outside the Containment. Each Containment pressure sensing instrument constitutes a closed, liquid-filled system sealed on the inside of the Containment by a diaphragm and on the outside by the pressure. Signals derived from these instruments initiate the SI, Containment isolation and Containment spray. Isolation is provided by means of sealed bellows connected to a fluid-filled tube. The arrangement consists of a double isolation barrier. If the instrument line breaks outside the Containment, leakage of the Containment atmosphere is prevented by virtue of the sealed bellows. If the instrument line breaks inside the Containment, leakage is prevented by a leak-tight diaphragm installed in the pressure instrument which is designed to withstand the full containment design pressure.

Boundary

The Containment penetrations are listed in FSAR Tables 6.2.4-1, 6.2.4-2, 6.2.4-3, 6.2.4-4, and 6.2.4-6. The majority of the piping penetrations are linked to a system in the scope of LR. In these instances, containment isolation is identified as a system intended function in Sections 2.3.2, 2.3.3 and 2.3.4. Furthermore, the electrical penetrations, airlock, emergency airlock, equipment hatch, and fuel transfer tube, along with piping/tubing penetration assemblies are within the Containment structural evaluation boundary described in Section 2.4.1.

As such, the CIS evaluation boundary is limited to the components associated with Containment (overall) leak rate testing, Containment pressurization/pressure sensing instrumentation, and the operating/equalization components up to the attachment to the personnel and emergency airlocks. The CIS LR boundaries are reflected on the LRBDs listed below.

Unit 1:

- M1-0245-LR
- M1-0301-A-LR

Unit 2:

- M2-0245-LR
- M2-0245-A-LR
- M2-0301-A-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The CIS allows normal and emergency passage of fluids and personnel through the containment boundary.

(2) The CIS minimizes leakage of radioactive materials through fluid lines penetrating containment in the event of a postulated accident.

(3) The CIS ensures that the offsite radiological consequences of a main steam (MS) line rupture or LOCA are within the guidelines of 10 CFR Part 100.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

None.

FSAR References

Figure 3.8-22,
Sections 1.2.2.3.4, 3.1.5, 3.8.1, 3.8.2, 6.2, 6.2.4, 6.2.6, 7.1, 7.3, and 8.3.1
Tables 6.2.4-1, 6.2.4-2, 6.2.4-3, 6.2.4-4, 6.2.4-6, 9.4-2, 14.2-2, and 17A-1

Components Subject to AMR

Table 2.3.2-2 lists the CIS component types subject to AMR and their associated component intended functions.

Table 3.2.2-2 provides the results of the AMR.

Table 2.3.2-2
Containment Isolation System Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Bolting	Mechanical closure
Piping	Pressure boundary Leakage boundary (spatial) Structural integrity (attached)
Tank (airlock hydraulic)	Leakage boundary (spatial)
Tubing	Pressure boundary Leakage boundary (spatial) Structural integrity (attached)
Valve body	Pressure boundary Leakage boundary (spatial) Structural integrity (attached)

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following CIS components are within the scope of LR, but not subject to AMR:

- Pump seals, bearings, motors, rotary actuators, and locking rings - perform their function with moving parts.
- Containment personnel airlock hydraulic pumps are periodically replaced and are therefore short lived and not subject to AMR.

2.3.2.3. Containment Spray System

Description

The Containment Spray System (CSS) is an ESF System provided to mitigate the consequences of a LOCA, a MS line break inside the Containment, or a feedwater line break inside the Containment. CSS components are located in the Safeguards Building, the Containment Building and the yard.

The CSS has dual functions of removing both heat and fission-product iodine from the post-accident Containment atmosphere. The purpose of the CSS is to function with ECCS to ensure that Containment pressure and temperature do not exceed the design parameters for all accidents including a LOCA. The purpose of the CSS is also to ensure that offsite radiological consequences are within the limits of 10 CFR Part 100 by reducing the fission product concentration within the Containment atmosphere. The spray headers and nozzles arrangement for the CSS is designed to provide a maximum spray coverage in the Containment.

Upon system activation during a LOCA, adequate Containment cooling is provided in sequential modes:

1. The CSS initially supplies the containment spray headers with borated water from the RWST. A chemical additive subsystem is included to inject a buffering solution Sodium Hydroxide (NaOH) into the borated spray water to enhance iodine removal from the Containment atmosphere and retention in the spray water.

2. When the water level in the RWST reaches the low-level set point, the water source is swapped to the Containment Recirculation Sump. Water from the sump is still sprayed through the spray headers, after it is cooled by the Containment spray heat exchangers, to provide for the continued cooling of the Containment atmosphere.

The CSS includes two redundant trains, each with two pumps, a heat exchanger, and spray nozzles.

Boundary

The CSS boundaries for LR are reflected on the LRBDs listed below.

In-scope components in the CSS are those that maintain the pressure boundary of the system starting from the RWST to the nozzles of the ring headers in containment. The components that are subject to AMR includes two containment spray pumps (total four pumps for two trains), heat exchanger cooled by the CCWS (one per train), ring header with nozzles, isolation valves, associated piping, instrumentation, and controls. The RWST, containment recirculation sumps, and piping from the containment spray pumps, are also part of the CSS.

The CSS also includes a chemical additive subsystem which includes the following in-scope components: a chemical additive tank (CAT), piping, chemical eductors, and piping associated with the Nitrogen System. The CSS also includes NNS components such as the vents and drains, valve isolation tanks, guard pipes, and the expansion joints.

The components associated with providing cooling to the bearings of the containment spray pumps are treated as part of the CSS. The containment spray pump seal Coolers are also part of the CSS but are shown on the LRBDs for the CCWS.

Unit 1:

- M1-0232-LR
- M1-0232-A-LR

Unit 2:

- M2-0232-LR
- M2-0232-A-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Support containment pressure boundary.

(2) Provide for long-term post-accident cooling to the RCB.

(3) Provide and maintain sufficient inventory for containment atmosphere cooling.

(4) Ensure that containment pressure and temperature do not exceed the design parameters for all accidents including LOCAs.

(5) Ensure that offsite radiological consequences are within the limits of 10 CFR Part 100 by reducing the fission product concentration within containment.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provide a source of borated water (RWST) during a Fire Safe Shutdown regulated event (10 CFR 50.48).

(2) Perform a function that demonstrates compliance with the Commission's regulations for the EQ program (10 CFR 50.49). The CSS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

FSAR References

Sections 1.2.2.3.2, 6.2.2, and 6.5.2

Components Subject to AMR

Table 2.3.2-3 lists the CSS component types subject to AMR and their associated component intended functions.

Table 3.2.2-3 provides the results of the AMR.

Table 2.3.2-3
Containment Spray System Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Bolting	Mechanical closure
Eductor	Pressure boundary
Flow element	Pressure boundary Throttle
Heat exchanger (containment spray, pump bearing cooler, pump seal cooler)	Heat transfer Pressure boundary
Nozzle	Pressure boundary Spray
Orifice	Leakage boundary (spatial) Pressure boundary Structural integrity (attached) Throttle

Table 2.3.2-3
Containment Spray System Components Subject to Aging Management Review

Component Type	Component Intended Function (s)
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (containment spray)	Pressure boundary
Strainer (emergency sump suction)	Pressure boundary Filter
Tank (chemical additive)	Pressure boundary
Tank liner (RWST)	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary Structural integrity (attached) Leakage boundary (spatial)
Valve body	Pressure boundary Structural integrity (attached) Leakage boundary (spatial)
Valve Isolation expansion joint	Leakage boundary (spatial) Structural integrity (attached)
Valve isolation tank	Leakage boundary (spatial) Structural integrity (attached)

2.3.2.4. Residual Heat Removal System

Description

The RHRS transfers heat from the RCS to the CCWS to reduce the temperature of the reactor coolant to the cold shutdown temperature at a controlled rate during the second part of normal plant cooldown and maintains this temperature until the plant is started up again.

Parts of the RHRS also serve as flowpaths for the ECCS during the injection and recirculation phases of a LOCA. The RHRS also is used to transfer refueling water between the refueling cavity and the RWST at the beginning and end of the refueling operations.

The RHRS, in conjunction with the Steam and Power Conversion (S&PC) Systems, is designed to transfer the fission production decay heat and other residual heat from the reactor core within acceptable limits. The crossover from the S&PC Systems to the RHRS occurs at approximately 350 degrees Fahrenheit (°F) and 425 pounds per square-inch gauge (psig).

Suitable redundancy at temperatures below approximately 350°F is accomplished with the two RHR pumps (located in separate compartments with means available for draining and monitoring of leakage), the two heat exchangers, and the associated piping, cabling, and electric power sources. The RHRS is capable of operating on either onsite or offsite electrical power systems. Suitable redundancy at temperatures above approximately 350°F is provided by the four SGs and associated piping systems.

In the event of a fire, the RHRS is required to cool the RCS from hot shutdown to cold shutdown. In the event of a DBA on one unit, the other unit is required to be capable of an orderly shutdown and cooldown.

The RHRS is designed to be isolated from the RCS whenever the RCS pressure exceeds the RHRS design pressure. The RHRS is isolated from the RCS on the suction side by two motor operated valves in series on each suction line. Each motor operated valve is interlocked to prevent its opening if RCS pressure is greater than 425 psig. The RHRS is isolated from the RCS on the discharge side by two check valves in each return line. Also provided on the discharge side is a normally open motor operated valve downstream of each RHRS heat exchanger.

Each inlet line to the RHRS is equipped with a pressure relief valve designed to relieve the combined flow of all the charging pumps at the relief valve set pressure. These relief valves also protect the system from inadvertent over-pressurization during plant cooldown or startup. Each discharge line from the RHRS to the RCS is equipped with a pressure relief valve designed to relieve the maximum possible back-leakage through the valves isolating the RHRS from the RCS.

The RHRS consists of two residual heat exchangers, two RHR pumps, and the associated piping, valves, and instrumentation necessary for operational control. The inlet lines to the RHRS are connected to the hot legs of two RCLs, while the return lines are connected to the cold legs of each of the RCLs. These return lines are also the ECCS low head injection lines.

During RHRS operation, reactor coolant flows from the RCS to the RHR pumps, through the tube side of the residual heat exchangers, and back to the RCS. The heat is transferred to the CCW circulating through the shell side of the residual heat exchangers.

The RCS cooldown rate is manually controlled by regulating the reactor coolant flow through the tube side of the residual heat exchangers. A line containing a flow control valve bypasses each residual heat exchanger and is used to maintain a constant return flow to the RCS. Instrumentation is provided to monitor system pressure, temperature, and total flow.

The RHRS is also used for filling the refueling cavity before refueling. After refueling operations, water is pumped back to the RWST until the water level is brought down to the flange of the RV. The remainder of the water is removed via a drain connection at the bottom of the refueling canal.

When the RHRS is in operation, the water chemistry is the same as that of the reactor coolant. Provision is made for the Process Sampling System to extract samples from the flow of reactor coolant downstream of the residual heat exchangers. A local sampling point is also provided on each RHR train between the pump and heat exchangers.

In its capacity as the low head portion of the ECCS, the RHRS provides long-term recirculation capability for core cooling following the injection phase of the LOCA. This function is accomplished by aligning the RHRS to take fluid from the containment sump, cool it by circulation through the residual heat exchangers, and supply it to the core directly as well as via the centrifugal charging pumps (CCPs) and SI pumps.

Boundary

The boundaries of the RHRS are given below.

Normal standby alignment:

- From the outlet of the RWST check valves to the RHRS pump suction,
- Through the RHRS pumps and heat exchangers (including bypass flow lines),
- To the downstream side of the heat exchanger outlet valves.

Emergency water source alignment (cold leg recirculation):

- Begins at the valve isolation tank, downstream of the containment recirculation sump,
- Continues to the suction of each RHRS pump, and
- To the downstream side of the heat exchanger outlet valves.

Normal unit shutdown alignment and refueling alignment:

- Begins at the downstream side of the motor-operated valves on the letdown lines from the RCS loop hot legs,
- Through a containment penetration and continues to the suction piping of each of the RHRS pumps, and
- To the downstream side of the heat exchanger outlet valves.
- The RHRS reactor coolant isolation valves provide the interface with the RCS. The boundary includes the lines to the pump suction relief valves, and ends at the discharge of the relief valves, which vents to the RCS PRT.

Included in all alignments are the cross-connect line on the outlet of the RHRS heat exchangers and ends on the upstream side of the discharge valve to the piping, which constitutes one of the interfaces with CVCS. Included in this boundary are minimum flow recirculation lines on each RHR loop, which connects the piping downstream of each RHR heat exchanger with its associated RHRS pump suction line.

All associated piping, components, and instrumentation contained within the flow path described above are included in the system evaluation boundary.

The RHRS heat exchangers and pump seal coolers are included in the scoping boundary. The cooling side of these heat exchangers are provided by CCWS. The drain and vent lines from the tube side of the residual heat exchangers are included in the boundary up to the downstream side of the manual isolation valves to the Vents And Drains System (VD).

The RHRS boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0260-LR
- M1-0263-B-LR

Unit 2:

- M2-0260-LR
- M2-0263-A-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Maintain integrity of the RCPB

(2) Support containment pressure boundary

(3) Provide low pressure injection to the RCS as part of the ECCS to provide core cooling and additional shutdown margin including injection from the RWST and recirculation of the RCS from the containment sump

(4) Provide suction from the containment sump to the SI and CCPs during cold leg and hot leg recirculation

(5) Provide for cooling of the RCS during normal plant cooldown and shutdown operations

(6) Provide and maintain sufficient reactor coolant inventory for core cooling

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The RHRS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(2) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The RHRS provides decay heat removal during a Fire Safe Shutdown regulated event.

FSAR References

Sections 3.1, 5.4, and 6.3

Components Subject to AMR

Table 2.3.2-4 lists the RHRS component types subject to AMR and their associated component intended functions.

Table 3.2.2-4 provides the results of the AMR.

Table 2.3.2-4
Residual Heat Removal System Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Mechanical closure
Flow element	Pressure boundary Throttle
Heat exchanger (RHR, RHR pump seal cooler)	Heat transfer Pressure boundary
Piping	Leakage boundary (spatial) Pressure boundary
Pump casing (RHR pump)	Pressure boundary
Thermowell	Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary
Valve isolation expansion joint	Leakage boundary (spatial) Structural integrity (attached)
Valve isolation tank	Leakage boundary (spatial) Structural integrity (attached)

2.3.2.5. Safety Injection System

Description

The SIS is a part of the ECCS, which is designed to cool the reactor core and provide shutdown capability following initiation of the following accident conditions:

1. Pipe breaks in the RCS which cause a discharge larger than that which can be made up by the normal makeup system, up to and including the instantaneous circumferential rupture of the largest pipe in the RCS

2. Rod cluster control assembly ejection accident

3. Pipe breaks in the steam system, up to and including the instantaneous circumferential rupture of the largest pipe in the steam system

4. A SG tube failure

The primary function of the ECCS is to remove the stored and fission product decay heat from the reactor core during accident conditions.

The SIS contains the SI pumps and accumulator tanks along with the associated piping, valves, instrumentation, and other related equipment. These components are part of the ECCS which is designed such that a minimum of three accumulators, one charging pump, one SI pump, and one RHR pump together with their associated valves and piping will assure adequate core cooling in the event of a design basis LOCA. The SIS is designed with two redundant trains of active components.

The accumulators are pressure vessels partially filled with borated water and pressurized with nitrogen gas. During normal operation, each accumulator is isolated from the RCS by two check valves in series. Should the RCS pressure fall below the accumulator pressure, the check valves open and borated water is forced into the RCS. One accumulator is attached to each of the cold legs of the RCS.

The SI pumps, upon receipt of a SI signal, deliver water to the RCS from the RWST during the injection phase and from the containment sump via the RHR pumps during the recirculation phase. The pumps inject water into the RCS cold legs or hot legs.

Boundary

The SIS boundaries for LR are reflected on the LRBDs listed below.

Class 1 nuclear safety related components in the SIS and associated downstream check valves function as the interfacing boundary of the RCS leading to the RV. The boundaries of the SIS are given below.

- From the discharge header of the charging pumps to the RCS loop cold legs

- SI pump discharge piping up to the isolation valves outside the containment

- From the accumulators to the RCS loop cold legs

- SI pump discharge piping from the isolation valves outside the containment to the RCS hot legs and SIS cold legs

- SI pump suction

Other components within the system evaluation boundary include those components associated with the RWST, the SI pumps, the accumulator tanks, downstream of the charging pumps, and downstream/upstream of the RHR heat exchangers. All eventually feed into Class 1 components (or divert to the NNS test paths). The carbon steel piping associated with the N_2 accumulators that feed nitrogen into the accumulator tanks housing borated water are also in scope.

Unit 1:

- M1-0261-LR
- M1-0262-LR
- M1-0263-LR
- M1-0263-A-LR
- M1-0263-B-LR

Unit 2:

- M2-0261-LR
- M2-0262-LR
- M2-0263-LR
- M2-0263-A-LR
- M2-0263-B-LR
- M2-0263-C-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Injects borated water into the RCS cold legs to remove stored and fission product decay heat from the reactor core during accident conditions.

(2) Supports recirculation of core coolant back to the RV following a DBA.

(3) Injects borated recirculated coolant into the hot legs, during long-term recovery after a LOCA, to reduce the concentration of solids in the reactor core due to evaporation.

(4) Supports the containment pressure boundary.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in the safety analysis and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The SIS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(2) Provide a flow path for borated water to the RCS during a Fire Safe Shutdown regulated event, which is relied upon to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). Borated water flow is supplied from the RWST or the boric acid storage tanks to the RCS using a CCP via the high head SI flowpath during an alternate shutdown scenario.

FSAR References

Sections 6.3 and 9.2.1

Components Subject to AMR

Table 2.3.2-5 lists the SIS component types subject to AMR and their associated component intended functions.

Table 3.2.2-5 provides the results of the AMR.

Table 2.3.2-5
Safety Injection System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Accumulator	Pressure boundary
Accumulator (nitrogen)	Pressure boundary
Bolting	Mechanical closure
Filter housing	Pressure boundary
Flow element	Leakage boundary (spatial) Pressure boundary Throttle
Heat exchanger (SI pump lube oil cooler)	Heat transfer Pressure boundary

Table 2.3.2-5
Safety Injection System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Orifice (mini-flow)	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (SI pump)	Pressure boundary
Tank (SI pump lube oil cooler reservoir)	Pressure boundary
Tubing	Structural integrity (attached) Leakage boundary (spatial) Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3. Auxiliary Systems

The following systems are addressed in this section:

- Chemical and Volume Control System (2.3.3.1)
- Component Cooling Water System (2.3.3.2)
- Compressed Air and Gas Systems (2.3.3.3)
- Demineralized and Reactor Makeup Water System (2.3.3.4)
- Emergency Diesel Generator and Auxiliary Systems (2.3.3.5)
- Equipment and Floor Drainage Systems (2.3.3.6)
- Fire Protection System (2.3.3.7)
- Plant Ventilation Systems (2.3.3.8)
- Process and Effluent Radiological Monitoring and Sampling System (2.3.3.9)
- Waste Processing Systems (2.3.3.10)
- Spent Fuel Pool Cooling and Cleanup System (2.3.3.11)
- Station Service Water System (2.3.3.12)
- Ventilation Chilled Water Systems (2.3.3.13)
- Potable and Sanitary Water System (2.3.3.14)

2.3.3.1. Chemical and Volume Control System

Description

The purpose of the CVCS is to maintain water levels in the pressurizer and water inventory in the RCS, maintain the seal-water injection flow to RCPs, control reactor coolant water chemistry conditions, activity level, soluble chemical neutron absorber concentration and makeup, provide means for filling, draining and pressure testing the RCS, and support the ECCS.

Performance of the following functions will establish the design criteria of the CVCS:

1. Purification of reactor coolant fluid;
2. Corrosion control;
3. Regulation of reactor coolant inventory;
4. Reactivity shim; and
5. Seal water injection for RCPs.

During power operation, a continuous feed-and-bleed system is maintained to and from the RCS. The bypassed fluid is depressurized, cooled, purified, and stored by a series of valves, heat exchangers, demineralizers, and tanks. Furthermore, the amount of reactor coolant is automatically adjusted to compensate for changes in volume as a result of coolant temperature changes. The CVCS provides reactivity control by varying the boron concentration in the reactor coolant.

Water for the RCP shaft seals is supplied from the charging pump.

The CCPs associated with the CVCS also serve as the high-head pumps for the ECCS. In the event of a LOCA, the CVCS is isolated except for the charging pumps, which inject borated water into the reactor core.

The CVCS consists of several subsystems: The Charging, Letdown and Seal Water System, The Reactor Coolant Purification and Chemistry Control System, The Reactor Makeup Control System, and The Boron Thermal Regeneration System (BTRS). In Addition, The BRS is included with CVCS.

The charging and letdown functions of the CVCS are employed to maintain a programmed water level in the RCS pressurizer, thus maintaining proper reactor coolant inventory during all phases of plant operation. This is achieved by means of continuous feed and bleed process during which the feed rate is automatically controlled based on pressurizer water level. The bleed rate can be chosen to suit various plant operational requirements by selecting the proper combination of letdown orifices in the letdown flow path.

Reactor coolant is discharged to the CVCS from a RCL cold leg; it then flows through the shell side of the regenerative heat exchanger where its temperature is reduced by heat transfer to the charging flow passing through the tubes. The coolant then experiences a large pressure reduction as it passes through the letdown orifice(s) and flows through the tube side of the letdown heat exchanger where its temperature is further reduced. Downstream of the letdown heat exchanger a second pressure reduction occurs. This second pressure reduction is performed by the low pressure letdown valve, the function of which is to maintain upstream pressure thus preventing flashing downstream of the letdown orifices.

The coolant then flows through one of the mixed bed demineralizers. The flow may then pass through the cation bed demineralizer which is used intermittently when additional purification of the reactor coolant is required. Two mixed bed demineralizers may be used in parallel during shutdown for maximum purification.

Alternatively, the flow may be directed such that the mixed bed demineralizers are bypassed. Flow could then be directed to the cation bed demineralizer and/or to the BTRS demineralizer(s) for purification process.

From a point upstream of the BTRS or from a point upstream of the reactor coolant filters, a small sample flow may be diverted from the letdown stream to the Boron Concentration Measurement System. The Boron Concentration Measurement System is abandoned in place.

During reactor coolant boration and dilution operations, especially during load follow (which is not used), the letdown flow leaving the demineralizers may be directed to the BTRS. The coolant then flows through the reactor coolant filter and into the volume control tank through a spray nozzle in the top of the tank. Hydrogen (from the Bulk Hydrogen System) is continuously supplied to the volume control tank where it mixes with fission gasses which are stripped from the reactor coolant into the tank gas space. The contaminated hydrogen is vented to the Gaseous Waste Processing System (GWPS). The partial pressure of hydrogen in the volume control tank determines the concentration of hydrogen dissolved in the reactor coolant for control of oxygen produced by radiolysis of water in the core.

Three pumps (one positive displacement pump and two CCPs) are provided to take suction from the volume control tank and return the cooled, purified reactor coolant to the RCS. Normal charging flow is handled by one of the three charging pumps. This charging flow splits into two paths. The bulk of the charging flow is pumped back to the RCS through the tube side of the regenerative heat exchanger. The letdown flow in the shell side of the regenerative heat exchanger raises the charging flow to a temperature approaching the reactor coolant temperature. The flow is then injected into a cold leg of the RCS. Two charging paths are provided from a point downstream of the regenerative heat exchanger. A flow path is also provided from the regenerative heat exchanger outlet to the pressurizer spray line. An air operated valve in the spray line is employed to provide auxiliary spray to the vapor space of the pressurizer during plant cooldown. This provides a means of cooling the pressurizer near the end of plant cooldown, when the RCPs, which normally provide the driving head for the pressurizer spray, are not operating.

A portion of the charging flow is directed to the RCPs (nominally 8 gpm per pump) through a seal water injection filter. It is directed down to a point between the pump shaft bearing and the thermal barrier cooling coil. Here the flow splits and a portion (nominally 5 gpm per pump) enters the RCS through the labyrinth seals and thermal barrier. The remainder of the flow is directed up the pump shaft, cooling the lower bearing, and to the No. 1 seal leakoff. The No. 1 seal leakoff flow discharges to a common manifold, exits from the containment, and then passes through the seal water return filter and the seal water heat exchanger to the suction side of the charging pumps, or by alternate path to the volume control tank. A very small portion of the seal flow leaks through to the No. 2 seal. A No. 3 seal provides a final barrier to leakage of reactor coolant to the containment atmosphere. The No. 2 leakoff flow is discharged to the reactor coolant drain tank in the Liquid Waste Processing System.

This seal injection flow is assured because there are 3 charging pumps, which individually are capable of providing the normal charging line flow plus the nominal seal injection flow. A No. 3 seal provides a barrier to leakage of reactor coolant to the containment atmosphere. The No. 3 seal injection is supplied by reactor makeup water to a standpipe. Part of the water flows downward, joins with the leakoff from the No. 2 seal and exits through the No. 2 seal leakoff. The remaining water exits through the No. 3 seal leakoff which is discharged to the containment sump.

The excess letdown path is provided as an alternate letdown path from the RCS in the event that the normal letdown path is inoperable. Reactor coolant can be discharged from a cold leg to flow through the tube side of the excess letdown heat exchanger where it is cooled by CCW. Downstream of the heat exchanger a remote-manual control valve controls the letdown flow. The flow normally joins the No. 1 seal discharge manifold and passes through the seal water return filter and heat exchanger to the suction side of the charging pumps. The excess letdown flow can also be directed to the reactor coolant drain tank or directly into the volume control tank via a spray nozzle. When the normal letdown line is not available, the normal purification path is also not in operation. Therefore, this alternate condition would allow continued power operation for a limited period of time, dependent on RCS chemistry and activity. The excess letdown flow path is used to provide additional letdown capability during the final stages of plant heatup. This path removes some of the excess reactor coolant due to expansion of the system as a result of the RCS temperature increase.

Surges in RCS inventory due to load changes are accommodated for the most part in the pressurizer. The volume control tank provides surge capacity for reactor coolant expansion not accommodated by the pressurizer. The volume control tank water level is controlled via a three-way valve which directs letdown/makeup flow to the volume control tank or diverts it to the BRS via the recycle hold-up tank (RHUT). In addition, the three-way valve controller has an “Auto” position which controls the volume control tank water level automatically by diverting all or a portion of the letdown flow to the RHUT when the volume control tank exceeds its normal operating water level. Low level in the volume control tank initiates makeup from the Reactor Makeup Control System. If the Reactor Makeup Control System does not supply sufficient makeup to keep the volume control tank level from falling to a lower level, a low alarm is actuated. Manual action may correct the situation or, if the level continues to decrease, a low-low level signal from both level channels causes the suction of the charging pumps to be transferred to the RWST.

The positive displacement charging pump is also used to perform hydrostatic tests which verify the integrity and leak-tightness of the RCS. The pump can pressurize the RCS to the maximum designated test pressure. The hydrostatic test is performed prior to initial operation and is part of the periodic RCS inservice inspection program.

Mixed bed demineralizers are provided in the letdown line to provide cleanup of the letdown flow. The demineralizers remove ionic corrosion products and certain fission products. During normal power operation one demineralizer is in continuous service and can be supplemented intermittently by the cation bed demineralizer, if necessary, for additional purification. The cation resin removes principally cesium and lithium isotopes from the purification flow. The second mixed bed demineralizer serves as a standby unit for use if the operating demineralizer becomes exhausted during operation. A bypass line and isolation valve also provide additional flexibility for cleanup of letdown flow. The line and valve allow letdown flow to be aligned such that the mixed bed demineralizers are bypassed and flow is directed to the cation bed demineralizer for cleanup. Letdown can also be aligned to flow to the BTRS demineralizer(s) for cleanup, either directly or in series with either a mixed bed or the cation bed demineralizer.

The soluble neutron absorber (boric acid) concentration is controlled by the Reactor Makeup Control System. The BTRS if properly configured, may also be used. The Reactor Makeup Control System is also used to maintain proper reactor coolant inventory. In addition, for emergency boration and makeup, the capability exists to provide refueling water of 4 weight percent boric acid directly to the suction of the charging pump.

The Reactor Makeup Control System provides a manually pre-selected makeup composition to the charging pump suction header or to the volume control tank. The makeup control functions are those of maintaining desired operating fluid inventory in the volume control tank and adjusting reactor coolant boron concentration for reactivity control. Reactor makeup water and boric acid solution (4 weight percent) are blended together at the reactor coolant boron concentration for use as makeup to maintain volume control tank inventory or they can be used separately to change the reactor coolant boron concentration. The boric acid is stored in two boric acid tanks. Two boric acid transfer pumps are provided with one pump normally required to provide boric acid to the suction header of the charging pumps, and the second pump in reserve. They are both aligned to take suction from separate boric acid tanks. On a demand signal by the reactor makeup controller, the pump starts and delivers boric acid to the suction header of the charging pumps. The pump can also be used to recirculate the boric acid tank fluid.

All portions of the CVCS which normally contain concentrated boric acid solution (4 weight percent boric acid) are required to be located within a heated area in order to maintain solution temperature at ≥65°F. If a portion of the system which normally contains concentrated boric acid solution is not located in a heated area, it must be provided with some other means (e.g., heat tracing) to maintain solution temperature at ≥65°F. Heat tracing is utilized inside the plant on 4 percent boric acid solution lines where potential freezing poses a recrystallization problem.

The reactor makeup water pumps (RMWPs) take suction from the reactor make-up water storage tank and are employed for various makeup and flushing operations throughout the systems. There is one pump for each unit plus a common pump for both units. One of these pumps normally operates continuously and provides flow to the suction header of the charging pumps or the volume control tank through the letdown line and spray nozzle on demand.

During reactor operation, changes are made in the reactor coolant boron concentration for the following conditions:

1. Reactor startup – boron concentration must be decreased from shutdown concentration to achieve criticality.

2. Load follow – boron concentration must be either increased or decreased to compensate for the xenon transient following a change in load.

3. Fuel burnup – boron concentration must be decreased to compensate for fuel burnup and the buildup of fission products in the fuel.

4. Cold shutdown – boron concentration must be increased to the cold shutdown concentration.

5. Burnable Poison depletion – dependent on the core design and time in core life. Boron concentration may need to be increased to compensate for the depletion of burnable poisons in the fuel.

The BTRS may be used to control boron concentration to compensate for xenon transients during load follow operations. Boron thermal regeneration can also be used in conjunction with dilution operations of the Reactor Makeup Control System to reduce the amount of effluent to be processed by the Liquid Waste System or the BRS.

The boron thermal regeneration process was designed to allow load follow operations as required by the design load cycle. Load follow operation is currently not utilized at Comanche Peak.

Because load follow operation is currently not utilized, there is no need for chilled water to be provided to the letdown chiller heat exchanger. Therefore, the BTRS chiller and associated components in the chilled water loop are normally removed from service and drained so as not to provide chilled water to the shell side of the letdown chiller heat Exchanger. Also, because load follow operation is currently not utilized, the heating source for the letdown reheat heat exchanger is normally isolated, and the tube side of the heat exchanger is drained. There is no near-term plan to utilize these components for load follow operation. If the BTRS chiller and associated components are ever returned to service, flow to and from the thermal regeneration demineralizers and piping vibration will be verified prior to the return to service.

The BTRS is currently used to reduce reactor coolant boron concentration at the end of the core cycle. Additionally, the BTRS demineralizers may be loaded with various types of resin in order to provide supplemental or enhanced cleanup of CVCS letdown flow.

When the BTRS is placed in service, BTRS water taken from the RCS may flow through the tube side of the letdown chiller heat exchanger, as well as through the shell side of the letdown reheat heat exchanger. There is the possibility for leakage of water containing radioactivity from the tube side into the normally drained shell side of the letdown chiller heat exchanger, or from the shell side into the normally drained tube side of the letdown reheat heat exchanger.

Leakage into the shell side of the letdown chiller heat exchanger passes through to the chiller surge tank. The high-level alarm of the chiller surge tank provides in-leakage detection when the BTRS is in service. Leakage water entering the tube side of the letdown reheat heat exchanger passes through open drain valves into floor drains which direct the water to floor drain tanks 1 and 2, both of which have high level alarms.

Downstream of the mixed bed demineralizers, the letdown flow can be diverted to the BTRS where part or all of the letdown flow can be treated when boron concentration changes are desired.

Additionally, the BTRS demineralizer(s) can be utilized to provide for supplemental or enhanced cleanup of letdown flow. After processing, the flow is returned to a point upstream of the reactor coolant filter.

Storage and release of boron during load follow operation is determined by the temperature of fluid entering the thermal regeneration demineralizers. A chiller unit and a group of heat exchangers are employed to provide the desired fluid temperatures at the demineralizer inlets for either storage or release operation of the system.

The flow path through the BTRS is different for the boron storage and the boron release operations. During boron storage, the letdown stream enters the moderating heat exchanger and from there it passes through the letdown chiller heat exchanger. These two heat exchangers cool the letdown stream prior to it entering the demineralizers. The letdown reheat heat exchanger is valved out on the tube side and performs no function during boron storage operations. The temperature of the letdown stream at the point of entry to the demineralizers is controlled automatically by the temperature control valve which controls the shell side flow to the letdown chiller heat exchanger. After passing through the demineralizers, the letdown enters the moderating heat exchanger shell side, where it is heated by the incoming letdown stream before going to the volume control tank.

Therefore, for boron storage, a decrease in the boric acid concentration in the reactor coolant is accomplished by sending the letdown flow at relatively low temperatures to the thermal regeneration demineralizers. The resin, which was depleted of boron at high temperature during a prior boron release operation, is now capable of storing boron from the low temperature letdown stream. Reactor coolant with a decreased concentration of boric acid leaves the demineralizers and is directed to the RCS via the charging system.

During the boron release operation, the letdown stream enters the moderating heat exchanger tube side, bypasses the letdown chiller heat exchanger, and passes through the shell side of the letdown reheat heat exchanger. The moderating and letdown reheat heat exchangers heat the letdown stream prior to it entering the resin beds. The temperature of the letdown at the point of entry to the demineralizers is controlled automatically by the temperature control valve which controls the flow rate on the tube side of the letdown reheat heat exchanger. After passing through the demineralizers, the letdown stream enters the shell side of the moderating heat exchanger, passes through the tube side of the letdown chiller heat exchanger, and then goes to the volume control tank. The temperature of the letdown stream entering the volume control tank is controlled automatically by adjusting the shell side flow rate on the letdown chiller heat exchanger. Thus, for boron release, an increase in the boric acid concentration in the reactor coolant is accomplished by sending the letdown flow at relatively high temperatures to the thermal regeneration demineralizers. The water flowing through the demineralizers now releases boron which was stored by the resin at low temperature during a previous boron storage operation. The boron enriched reactor coolant is returned to the RCS via the charging system.

The purpose of the BRS is to reuse reactor coolant effluent by decontaminating it using demineralization and gas stripping and then using evaporation to separate and recover boric acid and makeup water.

The BRS collects and processes effluent which may be reused as makeup to the RCS. For the most part, this effluent is the deaerated, tritiated, borated, and radioactive water from the letdown and process drains. The operation of BRS is not continual and only operates in batches, once it has collected effluent from core cycles.

When water is directed to the BRS, the flow passes first through the recycle evaporator feed demineralizers and filters and then into the RHUTs. The recycle evaporator feed pumps can be used to transfer liquid from one RHUT to the other if desired. When sufficient water is accumulated to warrant evaporator operation, the recycle evaporator feed pumps take suction from the selected RHUT. The fluid then flows through the recycle evaporator. Here, dissolved gases (i.e., hydrogen, fission gases and other gases) are removed in the stripping column before the liquid enters the evaporator shell.

These gases are directed to the evaporator vent condenser and then to the Plant Ventilation System. An alternate flow path to the Gaseous Waste Processing System is available. During evaporator operation, distillate from the evaporator flows to the waste monitor tanks for discharge. Also located in this flow path, are the recycle evaporator condensate demineralizer and the recycle evaporator condensate filter. The accumulated batch is normally transferred directly to the boric acid tanks in the CVCS through the recycle evaporator concentrates filter. Before transferring the boric acid from the evaporator to the boric acid tanks, it is analyzed, and, if it does not meet the required chemical standards, it can be diverted back to the RHUTs for reprocessing or to the Liquid Waste Processing System for disposal.

<u>Boundary</u>

The CVCS boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0253-LR
- M1-0253-A-LR
- M1-0254-LR
- M1-0255-LR
- M1-0255-01-LR
- M1-0255-02-LR
- M1-0256-LR
- M1-0256-A-LR

Unit 2:

- M2-0253-LR
- M2-0253-A-LR
- M2-0254-LR
- M2-0255-LR
- M2-0255-01-LR
- M2-0255-02-LR
- M2-0256-A-LR
- M2-0256-B-LR

Common:

- M1-0257-LR
- M1-0258-LR
- M1-0259-LR
- M1-0259-01-LR
- M1-0259-A-LR

The portion of the CVCS subject to AMR begins at the interface between the RCS and attached Class 1 piping to the Class 2 boundaries. CVCS letdown begins off of RCS loop 3. The Class 1 CVCS piping is included with the RCS and Attached Piping System, found in Section 2.3.1.3, such that the CVCS boundary begins at the

Class 2 piping at the Class 1/Class 2 boundary. The RCS and Attached Piping System interfaces with CVCS charging in a similar way, where CVCS charging lines include Class 2 piping and the Class 1 piping is part of the RCS and Attached Piping System, which is discussed in Section 2.3.1.3. Normal charging goes to RCS loop 4 and alternate charging goes to RCS loop 1. CVCS auxiliary spray following CVCS charging interfaces with RCS pressurizer spray lines for loops 1 and 4. The CVCS and RCS interface at the RCP where the CVCS supplies seal water injection flow. In addition, CVCS provides water for seal #3 injection standpipes, and receives reactor coolant from seal 1, 2 and 3 leakoff lines. Seal 1 leakoff is sent to the CVCS volume control tank. Seal 2 leakoff interfaces with the Liquid Radioactive Waste System where it is routed to the reactor coolant drain tank (RCDT). Seal 3 leakoff is sent to the Equipment And Floor Drainage System.

The RHUT in the CVCS is located in the Auxiliary Building (AB). The tanks are located in a watertight compartment which drains to Sump 8 through normally locked-closed valves. The RHUT vent ejector is addressed in Table 3.3.2-1.

The RCS and attached Class 1 piping boundary ends at

- Fail closed valve to regenerative heat exchanger;
- Check valves downstream of regenerative heat exchanger;
- Fail closed valve from Regenerative heat exchanger to the RCS and attached piping;
- Fail closed valve from RCS loop 1 excess letdown to excess letdown heat exchanger;
- RCP seal 1 housing;
- RCP seal water injections at various check valves;
- RCP seal bypass orifices; and
- RCS flow restrictors (Class 1/Class 2).

The Boron Concentration Measurement System, which is abandoned in place, is classified as non-safety affecting safety because it is conservatively assumed to be filled with liquid during normal operation. The system consists of piping and piping components.

The chemical mixing tank is NNS and is directly connected to nuclear safety related Class 2 and 3 piping.

The letdown chiller heat exchanger shell side is supplied by a closed cooling water system and is a nuclear safety related component. The chiller unit, which provides the cooling is considered a non-safety affecting safety component. The chiller is considered a complex assembly for AMR with the exception of the chiller evaporator and condenser heat exchangers. In the event the letdown chiller fails to cool the liquid, such that the BTRS cannot be used, the Reactor Makeup Control System of the CVCS can be used for alternate boration and dilution of reactor coolant for load follow.

The chiller pumps deliver cooling fluid. If one pump fails, the other provides the necessary flow of fluid for chiller unit operation. The pumps are located in the AB and are NNS.

The chiller surge tank contains the coolant system inventory and provides the water source for the chiller pumps. This tank is also NNS and located in the AB.

The boric acid batching tank is Class 5 NNS and is attached to nuclear safety related Class 3 piping. It is also located in the AB near other nuclear safety related components; therefore, it is within the scope of LR.

The recycle evaporator feed demineralizer is in its own room in the AB and is included within the scope of LR.

The recycle evaporator feed pumps are NNS and contain liquid during normal operation and so are included in the evaluation boundary.

The BRS recycle evaporator package (TBX-BREVRE-01) is in operation during evaporator operation and contains nuclear safety related components as well as NNS:

- Feed preheater (both feed and steam sides) is NNS;
- The submerged tube evaporator (both feed and steam sides) is NNS;
- Evaporator condenser distillate water side is NNS, but the cooling water side (channel head) is Class 3;
- Recycle distillate cooler distillate side is NNS and the cooling water side (shell side) is Class 3;
- Vent condenser gas side is NNS, and the cooling water side (channel head) is Class 3;
- Distillate and concentrate pumps are NNS;
- Feed, distillate, concentrate, and vent piping and valves are all NNS, but CCWS piping and valves are Class 3; and
- Class 5 piping and supports are NNS, and valves are NNS.

The CVCS CCPs are a part of the ECCS boundary. Also, in the ECCS flow path are the SI pumps, RWST, RHR pumps and heat exchangers, accumulator tanks, and the RCS cold legs (FSAR Figure 6.3-2). Included in this scoping boundary are the minimum flow recirculation lines from each of the CCP discharge lines. The minimum flow recirculation lines join together and return to the volume control tank through the seal water heat exchanger. The scoping boundary for the positive displacement charging pump also includes the recirculation line and the discharge relief valve line. Included in the CVCS scoping boundary for the high-pressure injection flow path is the piping downstream of the isolation valves from the A-train RHR low-pressure injection pump discharge. Also included in this scoping boundary is the portion of the charging pump to SI pump suction header which begins downstream of the SIS at the motor-operated suction cross-connect isolation valves.

The normal (non-emergency) flow path for the CVCS scoping boundary begins at the RCS and attached piping interfaces. This is the letdown flow path which includes flow through the regenerative heat exchanger, excess letdown heat exchanger, letdown heat exchanger and mixed bed and cation bed demineralizers. The flow continues through the volume control tank and through the suction supply line to the charging pump suction header and the CCPs and positive displacement charging pump. The scoping boundary continues through the discharge line for the charging pumps supplying the seal injection and makeup flow, and divides into two lines: the first line supplying seal injection flow to the RCPs, and the second line supplying flow to the makeup line connections on the RCL cold legs or pressurizer auxiliary spray line.

The scoping boundary for the boric acid addition portion of the system begins at the boric acid tanks, continues through the boric acid transfer pumps to the boric acid blender and terminates at the volume control tank. The scoping boundary includes the minimum flow line for the boric acid transfer pumps back to the boric acid tanks and the line from the boric acid batching tank to the suction of the boric acid transfer pumps. The scoping boundary continues to the upstream side of the isolation valve that supplies boric acid to the RWST.

The scoping boundary for the BRS includes tanks (RHUTs), pumps (recycle evaporator feed), filters (recycle evaporator condensate, recycle evaporator feed, and recycle evaporator concentrates), recycle evaporator sample coolers, demineralizers (recycle evaporator condensate and boron recycle evaporator feed), and the recycle evaporator package.

The scoping boundary for the BRS begins at the recycle evaporator feed demineralizers and recycle evaporator feed filters, to the RHUTs and continues to the suction header of the recycle evaporator feed pumps, continues through the pumps to a common discharge line to the recycle evaporator condensate demineralizer. Flow from the recycle evaporator feed pumps could be routed through the boric acid processing recycle evaporator packages and returned to the common pump discharge line upstream of the recycle evaporator condensate demineralizer. The SIS pressure relief, VCT relief, CCPs suction relief and positive displacement charging pump suction relief are routed to the RHUTs in the BRS.

The RHUTs are NNS and are not included within the scope of LR because the tanks are located in watertight compartments which do not house nuclear safety related components. The upper level (platform grating) of the tank rooms contain nuclear safety related CCW lines and cabling routed within rigid steel conduit; however, there is reasonable assurance that a leak from the tank would be detected and corrective actions taken prior to loss of intended function of the nuclear safety related components. Reasonable assurance is based on preventive maintenance (PM) activities which have personnel periodically entering the rooms.

The scoping boundary for the BTRS begins at the inlet piping to the moderating heat exchanger, continues through the tube side of the moderating heat exchanger, through the tube side of the letdown chiller heat exchanger, and through the shell side of the letdown reheat heat exchanger. Downstream of these heat exchangers, the scoping boundary for the BTRS continues through the boron thermal regeneration demineralizers, to the shell side of the moderating heat exchanger. The scoping boundary continues from the shell side of the moderating heat exchanger and ends at the moderating heat exchanger to reactor coolant filter isolation valve upstream of the reactor coolant filter. This portion of the BTRS also includes the chiller surge tank, two chiller pumps, and boron thermal regeneration chiller, which provides the cooling on the shell side of the letdown chiller heat exchanger. The letdown reheat heat exchanger tube side is normally removed from service, isolated and drained. When in service, both the shell and tube side each have borated reactor coolant water environments from and to the CVCS letdown path.

All associated piping, components, and instrumentation contained in the above described flow paths, necessary for performance of their design function are included in the system evaluation boundary.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide RCPB. The CVCS has connections to the RCS on the cold legs and RCP seals through a series of check valves;

(2) Achieve and maintain the reactor core subcritical for any mode of normal operation or event. The CVCS injects borated water into the RCS for emergency core cooling, and provides for chemical conditioning of the RCS for reactivity control under normal operating conditions;

(3) Introduce emergency negative reactivity to make the reactor subcritical. The CVCS injects borated water into the RCS for emergency core cooling, and provides for chemical conditioning of the RCS for reactivity control under normal operating conditions;

(4) Provide and maintain sufficient reactor coolant inventory for the RCS for core cooling. The CVCS injects borated water into the RCS from the RWST for emergency core cooling;

(5) Introduce negative reactivity. The CVCS injects borated water into the reactor coolant and provides for chemical conditioning of the RCS for reactivity control under normal operating conditions;

(6) Provide primary containment boundary. The CVCS have piping connections penetrating the primary containment and valves that provide the containment isolation function; and

(7) Maintain the dose consequences within the guidelines of 10 CFR 50.67 or 10 CFR Part 100. The CVCS maintain adequate reactor coolant inventory in

the reactor vessel to limit core damage. The CVCS ensure that there is no significant reduction in shutdown margin when cooling water is introduced into the reactor, which ensures that radioactive releases are satisfied for the offsite dose criteria.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The CVCS provides borated water to the RCP seals for an Appendix R fire.

(2) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The CVCS provides indication and controls to mitigate the consequences of DBEs utilizing equipment in the Environmental Qualification of Electric Components (B.2.2.2) AMP.

(3) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). The CVCS are designed to mitigate the consequences of a SBO by providing seal water flow to the RCP seals.

FSAR References

Sections 1.2.2.8.1, 9.3.4, 9.3.4.1.1.1, 9.3.4.1.2, 9.3.4.1.2.1, 9.3.4.1.2.2, 9.3.4.1.2.3, 9.3.4.1.2.4, 9.3.4.1.2.5, 9.3.4.2, 9.3.4.2.1.1, and 9.3.4.2.2
Tables 3.4-1, 9.3-6, 9.3-7, 9.3-8, 9.3-9, 10.4-16, and 17A-1

Components Subject to AMR

Table 2.3.3-1 lists the CVCS component types subject to AMR and their associated component intended functions.

Table 3.3.2-1 provides the results of the AMR.

Table 2.3.3-1
Chemical and Volume Control System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Blender housing	Pressure boundary
Bolting	Mechanical closure
Ejector (RHUT)	Leakage boundary (spatial)
Filter element	Filter
Filter housing	Leakage boundary (spatial) Pressure boundary
Flexible hose	Pressure boundary
Flow element	Leakage boundary (spatial) Pressure boundary Throttle
Heat exchanger (CCP oil cooler)	Heat transfer Pressure boundary
Heat exchanger (chiller unit condenser)	Leakage boundary (spatial)
Heat exchanger (chiller unit evaporator)	Leakage boundary (spatial)
Heat exchanger (evaporator)	Leakage boundary (spatial)
Heat exchanger (excess letdown)	Heat transfer Pressure boundary
Heat exchanger (feed preheater)	Leakage boundary (spatial)
Heat exchanger (letdown chiller)	Heat transfer Pressure boundary
Heat exchanger (letdown reheat)	Heat transfer Pressure boundary
Heat exchanger (letdown)	Heat transfer Pressure boundary
Heat exchanger (moderating)	Heat transfer Pressure boundary
Heat exchanger (positive displacement charging pump oil cooler)	Heat transfer Pressure boundary
Heat exchanger (recycle distillate cooler)	Leakage boundary (spatial) Pressure boundary
Heat exchanger (recycle evaporator grab sample cooler)	Leakage boundary (spatial)
Heat exchanger (recycle evaporator vent condenser)	Leakage boundary (spatial) Pressure boundary
Heat exchanger (recycle vent condenser)	Pressure boundary Leakage boundary (spatial)
Heat exchanger (regenerative heat exchanger)	Heat transfer Pressure boundary
Heat exchanger (seal water heat exchanger)	Heat transfer Pressure boundary
Moment restraint	Pressure boundary

Table 2.3.3-1
Chemical and Volume Control System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Orifice	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Piping element	Leakage boundary (spatial)
Pump casing (boric acid transfer pump)	Pressure boundary
Pump casing (CCP)	Pressure boundary
Pump casing (CCP auxiliary lube oil pump)	Pressure boundary
Pump casing (CCP main lube oil pump)	Pressure boundary
Pump casing (chiller pump)	Leakage boundary (spatial)
Pump casing (concentrate canned pump)	Leakage boundary (spatial)
Pump casing (distillate canned pump)	Leakage boundary (spatial)
Pump casing (positive displacement charging pump)	Pressure boundary
Pump casing (recycle evaporator feed pump)	Leakage boundary (spatial)
Spray nozzle	Spray
Tank (absorption tower)	Leakage boundary (spatial)
Tank (boric acid batching)	Leakage boundary (spatial)
Tank (boric acid)	Pressure boundary
Tank (cation bed demineralizer)	Leakage boundary (spatial)
Tank (chemical mixing)	Leakage boundary (spatial)
Tank (chiller surge)	Leakage boundary (spatial)
Tank (discharge dampener)	Pressure boundary
Tank (mixed bed demineralizer)	Pressure boundary
Tank (recycle evaporator condensate demineralizer)	Leakage boundary (spatial)
Tank (recycle evaporator feed demineralizer)	Leakage boundary (spatial)
Tank (recycle evaporator reagent)	Leakage boundary (spatial)
Tank (stripping column)	Leakage boundary (spatial)
Tank (stuffing box coolant)	Pressure boundary
Tank (suction stabilizer)	Leakage boundary (spatial) Pressure boundary
Tank (thermal regeneration demineralizer)	Pressure boundary
Tank (volume control tank)	Pressure boundary
Thermowell	Leakage boundary (spatial) Pressure boundary
Trap	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial) Pressure boundary

Table 2.3.3-1
Chemical and Volume Control System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.2. Component Cooling Water System

Description

The purpose of the CCW System is to transfer heat from nuclear safety related structures, systems, and components to an ultimate heat sink (UHS) within a closed loop. The closed loop also provides an intermediate barrier between radioactive or potentially radioactive sources, thus precluding direct leakage of radioactive fluids into the UHS SSI.

The CCW System supplies adequate cooling water to remove heat from the components which are part of the RCS, ECCS, CSS, CVCS, SFP Cooling and Cleanup System, Waste Processing System, Sampling System, Safety Chilled Water System, NNS ventilation chillers (condensers) and the Instrument Air System during all required operating modes and transfers the heat to the Station Service Water (SSW) System.

The CCW System consists of two redundant safeguards loops and one non-safeguards loop (per unit). The safeguards loops service the engineering safeguards components and the non-safeguards loop services the NNS portions of the system. The system is sized for the full capacity cooling requirements of the unit during all postulated plant operating modes. Each safeguards loop consists of one (1) 100 percent capacity CCW pump and heat exchanger. The non-safeguards loop is supplied by either safeguards loop. During normal plant operation, one pump and heat exchanger are in operation and the second pump and heat exchanger are on standby. The Unit 1 and 2 safeguards loops are isolated from each other during normal operation by at least one locked closed isolation valve.

Each safeguards loop supplies and returns cooling to/from the following:

1. Two containment spray pump seal coolers
2. One RHR pump seal cooler
3. One RHR heat exchanger
4. One containment spray heat exchanger
5. One Chilled Water System condenser
6. Two control room A/C condensers (common)

7. One uninterruptible power supply A/C condenser (common)

8. One Post-Accident-Sample System (PASS) sample cooler (Train-A only)

The Unit 1 and 2 safeguards loops are isolated from their non-safeguards loops in abnormal conditions where loss of inventory occurs by redundant automatic isolation valves.

The non-safeguards loop consists of:

1. Two hydrogen recombiner heat exchangers (common)

2. Two waste gas compressor seal water coolers (common)

3. Process sample coolers (NNS)

4. One positive displacement charging pump hydraulic coupling oil cooler and lube oil cooler

5. One letdown heat exchanger (CVCS letdown cooling)

6. One seal water heat exchanger (CVCS, RCPs seals)

7. Two SFP heat exchangers (common)

8. One boron recycle evaporator package (not used) consisting of one distillate cooler, one evaporator condenser, and one vent condenser (common)

9. One waste evaporator package (not used) consisting of one distillate cooler, one evaporator condenser, and one vent condenser (common)

10. One floor drain evaporator package (not used) consisting of one distillate cooler, one evaporator condenser and one vent condenser (common)

11. Four RCP coolers, each consisting of one lower bearing lube oil cooler, one upper bearing lube oil cooler, two motor air coolers, and one thermal barrier cooler (located inside containment)

12. One excess letdown heat exchanger (CVCS equipment located inside containment) and one reactor coolant drain tank heat exchanger

13. Four ventilation chillers (NNS) (common)

14. One letdown chiller package condenser (NNS) (not used)

15. Two instrument air compressors

16. One in-line trim cooler (Unit 1) and two in-line trim coolers (Unit 2)

17. One filter demineralizer chemical addition skid consisting of demineralizer, filter, hydrazine tank and metering pump

The two safeguards loops are redundant, in that the components supplied with cooling water by either of the safeguards loops can perform the minimum required safeguards functions.

Two cooling water supply lines from the non-safeguards loop penetrate the corresponding unit's containment structure. One line supplies cooling water to the RCPs and the other line supplies cooling water to the excess letdown heat exchanger and reactor coolant drain tank heat exchanger. Three cooling water return lines penetrate the containment structure: one line from the excess letdown and reactor coolant drain tank heat exchangers; one line from the RCPs bearing lube oil coolers and motor air coolers and the third from the RCP thermal barrier coolers. The containment isolation valves on this third penetration are designed to close automatically upon a detection of in-leakage of reactor coolant to the CCW System. The sixth CCW containment penetration is for the discharge piping from the CCW containment drain tank pumps to the CCW drain tank in the SGB.

There are no containment penetrations directly associated with the CCW System safeguards loops.

The non-safeguards loops are cross-connected to permit either unit to supply cooling water to common ventilation chillers, evaporator packages, hydrogen recombiners, and waste gas compressors. These components are separated from the CCW of the other unit by at least one closed valve. The non-safeguards loops are also provided with cross-connections between the two SFP heat exchangers which are isolated by CCW butterfly valves so that either spent fuel heat exchanger can be cooled by either Unit's CCW. Cross-connections in the SFP Cooling and Cleanup System ensure that at least one spent fuel (SF) pump can be aligned to either heat exchanger, if required. Alternatively, the CCW butterfly valves may be reoriented for flow-through operation.

There are two CCW surge tanks; one for each unit. The surge tanks are horizontal cylindrical tanks. The surge tanks are located in the AB at an elevation which assures adequate available NPSH to the CCW pumps and is the highest point in the system. The surge tanks are vented to the AB atmosphere. Each surge tank is partitioned to provide a separate chamber and separate piping for each loop (Train A and B).

The system hydraulics during single CCW pump operation causes water to overflow the surge tank partition to the surge tank chamber on the suction-side of the operating pump. A 3-ft long by 6-in high rectangular hole is cut in the surge tank partitions to allow this flow without affecting the surge tank level alarms and control functions. The partitions have this opening added above the "empty" level to equalize level on both sides of the tank. Therefore, the separation of volumes is limited to below this opening.

To preclude discharging corrosion-inhibited component cooling and chilled water to the environment, one drain tank for each unit is provided in the SGB to collect CCW from piping and equipment being drained and from the discharge of most of the CCW thermal relief valves. Drainage flows to the drain tank by gravity. Two 100 percent-capacity CCW System drain pumps are provided. Discharge lines from some CCW thermal relief valves and overflow lines from the CCW System surge tank are routed to the floor drains.

One CCW System drain pump from each unit is used to pump the drains to the truck discharge connection, or to the Wastewater Management System, depending on the quality and quantity of the water collected.

One containment CCW System drain tank for each unit is provided to collect CCW from components in the containment. Two 100- percent-capacity containment CCW System drain pumps are provided. One pump for each unit is used to pump the drains back to the main drain tank in the SGB. One containment penetration is provided for the drain line.

The CCW System water chemistry is controlled via a filter/demineralizer/chemical addition skid (one per Unit) and by the addition of chemicals via the CAT. Samples are periodically taken from sample taps to verify that water chemistry is as required. If dilution is required, water is bled off to the drain tank through one of the existing drain connections. Noninhibited water is added through the CCW System surge tank.

Boundary

The CCW System boundaries for LR are reflected on the LRBDs listed below.

Nuclear safety related components in the CCW System are those that maintain the pressure boundary of the system starting from the CCW surge tanks and continuing through the CCW pumps and the CCW heat exchangers (including all associated piping, valves, and other components).

The CCW System interfaces with various nuclear safety related and NNS systems. Therefore, the CCW System boundaries for LR extend to and through the interface with these different systems (interfacing heat exchangers/coolers and other components) and extends back to the CCW surge tanks. The CCW System components include all nuclear safety related components up until the inlet and outlet piping, piping components, instrumentation and valves associated with the interfacing mechanical components (such as heat exchangers/coolers) for each of these interfacing systems as listed on the CCW System LRBDs. These individual cooling units or heat exchangers and other major components supplied by the CCW System are evaluated in their specific systems.

The CCW System boundary interface with other interfacing systems that are not associated with heat exchangers/coolers directly supplied by the CCW System such as the SSW and the ECCS include all nuclear safety related components up to the extent indicated on the CCW System LRBDs.

Also included in the CCW System are portions of the NNS piping and equipment on the LRBDs.

Equipment included as part of the NNS components with a leakage boundary (spatial) function include the CCW drain tanks, the CATs, the enclosure of the instrument air compressor packages, the components on the filter demineralizer chemical addition skid, the containment CCW drain tanks and the CCW drain pumps. Equipment included as part of the NNS components with a leakage boundary (spatial) and structural integrity (attached) function include the piping and valves that extend beyond the nuclear safety related/NNS interfaces up until the NNS components listed above.

The NNS components with a leakage boundary (spatial) and structural integrity (attached) function also includes the piping that extend beyond the nuclear safety related/NNS interface up to the ventilation chillers, the seal water coolers (associated with the waste gas compressor packages) and the catalytic recombiner package heat exchangers.

Additionally, one of the CCW trim cooler installed on Unit 2 and associated piping and valves, are also included as part of the NNS components with a leakage boundary (spatial) function. Other CCW Trim Coolers installed in Unit 1 and 2, along with associated piping and valves (as shown on the CCW System LRBDs), are located within the Turbine Building and are therefore not included within the scope of LR.

Unit 1:

- M1-0229-LR
- M1-0229A-LR
- M1-0229B-LR
- M1-0230-LR
- M1-0230A-LR
- M1-0230B-LR
- M1-0230C-LR
- M1-0231-LR
- M1-0231A-LR

Unit 2:

- M2-0229-LR
- M2-0229A-LR
- M2-0229B-LR
- M2-0230-LR
- M2-0230A-LR
- M2-0231-LR
- M2-0231A-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The CCW System removes heat from nuclear safety related SSCs and transfers it in a closed loop to the SSW, where it is transferred to an UHS SSI, under normal operating and accident conditions.

(2) The CCW System is required to remove residual heat from the RCS.

(3) The CCW System supplies cooling water to the CVCS let down heat exchangers to cool the letdown flow to the CVCS.

(4) The CCW System also functions to support and maintain the containment pressure boundary. A leakage of the reactor coolant to the CCW System is detected by monitoring the level of the CCW surge tank. Additionally, the CCW System also consists of radiation monitors and valves that detect and isolate any leakage of reactor coolant into the CCW System.

(5) The closed loop of the CCW System provides an intermediate barrier between radioactive or potentially radioactive sources, thus precluding direct leakage of radioactive fluids into the UHS (SSI).

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Contains components relied upon to perform a function that demonstrates compliance with regulations for EQ (10 CFR 50.49). The CCW System includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(2) Provides cooling for required components during Fire Safe Shutdown regulated events (10 CFR 50.48) and SBO (10 CFR 50.63) regulated events.

FSAR References

Section 9.2.2

Components Subject to AMR

Table 2.3.3-2 lists the Component Cooling Water System component types subject to AMR and their associated component intended functions.

Table 3.3.2-2 provides the results of the AMR.

Table 2.3.3-2
Component Cooling Water System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Filter housing	Leakage boundary (spatial)
Flexible hose	Leakage boundary (spatial) Pressure boundary
Flow element	Pressure boundary Throttle
Heat exchanger (CCW)	Heat transfer Pressure boundary
Heat exchanger (CCW trim cooler to rotary air compressor supply water)	Leakage boundary (spatial)
Orifice	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Piping element	Leakage boundary (spatial)
Pump casing (CCW pump)	Pressure boundary
Pump casing (CCW drain pump)	Leakage boundary (spatial)
Pump casing (demineralizing metering pump)	Leakage boundary (spatial)
Strainer	Leakage boundary (spatial)
Tank (CCW surge tanks)	Pressure boundary
Tank (CCW chemical addition tanks, containment CCW drain tanks, demineralizer vessel, hydrazine addition tank)	Leakage boundary (spatial)
Thermowell	Leakage boundary (spatial) Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.3. Compressed Air and Gas Systems

Description

Compressed Air System

The Compressed Air System (CAS) consists of two separate systems, the Instrument Air System (CI) and the Service Air System (CA). The CI is designed to provide a reliable supply of clean, dry, oil-free air of suitable quality and pressure for pneumatic instruments and controls and pneumatically operated valves for normal plant operation. The CA is designed to provide the necessary compressed air for pneumatic tools and general plant usage. The CI, via a filtering skid, also provides suitable air to inflate the refueling lift gate seals. The CAS is in scope for LR; however, there are portions of the CAS that do not perform intended functions and are not in scope.

The CAS serves no safety function because it is not required to achieve safe shutdown or to mitigate the consequences of a DBA. Therefore, the CAS is a NNS system, however, the lines penetrating containment are designed in accordance with NRC GDC 2, 4, 5, and 56, NRC RGs 1.26 and 1.29, and applicable BTPs.

Instrument Air System

During normal system operation, instrument air to each unit is supplied by a train of equipment consisting of a lead instrument air compressor package, air receiver, and air dryer package. Two complete common standby train packages are available and automatically come online if the unit compressors cannot maintain header pressure. The common compressors can be manually selected as the lead or backup compressor for either unit.

Before being delivered to the distribution network, the instrument air is filtered, dried, and filtered again.

The instrument air line, that penetrates the containment is provided with two isolation valves. In addition, a flow-limiting orifice is provided for the penetration.

A pressure control valve and local supply station are provided for the refueling gates in the FB.

Air-operated valves throughout the plant are arranged for safe failure in the absence of air.

Accumulators are provided for the auxiliary feedwater control valves, recirculation valves, steam admission valves, and atmospheric relief valves. Accumulators are also provided for each Steam Generator PORV/atmospheric relief valve, and the CCW return pressure controller for the safety chillers. Accumulators are also provided for the control room air inlet control dampers. The accumulators themselves are considered as part of the system which they supply and are evaluated in those systems. However, instrument air lines to these accumulators are within the scope of this system, including Safety Class 3 portions.

Service Air System

During normal operation, service air to each unit is supplied by a service air compressor and a service air receiver. The service air is then delivered to the distribution system. The service air line that penetrates the containment is provided with two isolation valves. In addition, a flow limiting orifice is provided for the penetration.

A pressure control valve and local supply station is provided for the refueling gate in each RCB.

Plant Gas System

The Plant Gas System consists of the Nitrogen Gas Supply System (NGS), the Oxygen Gas Supply System (OGS), the Hydrogen Gas Supply System (HGS), the Miscellaneous Gas Supply System (XGS), and the Argon Gas Supply System (CGS). The Plant Gas System is within the scope of LR. However, portions of the system are not required to perform intended functions and are not in scope. The only portions of the system that are required to perform intended functions are the NGS and HGS.

Nitrogen Gas Supply System

The NGS is designed to provide storage capacity to ensure regular replenishment of consumed nitrogen. The system is divided into two separate, permanent subsystems: the bulk storage supply and the bottle supply. Each of these subsystems has two supply manifolds, one for normal operation, the other to act as a standby source.

Nitrogen is supplied to various components from a 2400 psig pressure Bulk Storage System or bottle supply.

The low pressure portion of the Bulk Storage System supplies nitrogen gas as a cover gas (for intermittent use) to multiple components, including the auxiliary feedwater CST, CVCS volume control tank, RCS PRT, reactor makeup water storage tank.

The high-pressure portion of the Bulk Storage System supplies nitrogen (for intermittent use) to the SIS accumulators and pressurizer PORVs. This portion of the system is not in scope and is outside LR evaluation boundaries.

Nitrogen bottle supply provides a permanent source of nitrogen to the containment air and reactor coolant PASS remote operating modules for sample line purging to allow for continuous operation of PASS when needed. This portion of the system is not in scope and is outside LR evaluation boundaries.

The piping for the NGS is NNS, except for those portions which connect to a nuclear safety related component or penetrate the containment. Where this piping does connect to a nuclear safety related component requiring an isolation valve, this valve and the piping between the valve and the connection are designed to the same safety class as the component. Lines which do not require isolation valves are NNS up to the connection of the nuclear safety related component. Note: NGS lines which penetrate containment or connect to a nuclear safety related component are considered as part of the system which they supply, as shown on applicable LRBDs, and are evaluated under those systems.

Hydrogen Gas Supply System

The HGS is designed to provide bulk gas storage capacity to ensure regular replenishment of consumed gases. The system has two manifolds, one for normal operation, the other for standby reserve.

Hydrogen is supplied via bulk gas supply or bottle gas supply. Bulk gas supply supplies the volume control tanks. The HGS supplies a header which is common to the two units. This header divides into the NSSS supply line and the turbine generator supply line. The NSSS supply line supplies each unit's volume control tank. Bulk gas supply also supplies the gas decay tanks, turbine generator, and primary water tank. However, these portions of the system are not in scope and are outside LR evaluation boundaries.

Hydrogen bottled gas supply (HBS) supplies the turbine generator and primary water tank, as well as the reactor coolant drain tank. This portion of the system is not in scope and is outside LR evaluation boundaries.

The piping for the HGS is NNS except for those portions which connect to a nuclear safety related component or penetrate the containment. Where this piping does connect to a nuclear safety related component requiring an isolation valve, this valve and the piping between the valve and the connection are designed to the same safety-class as the component. Note: hydrogen supply lines which penetrate containment or connect to a nuclear safety related component are considered as part of the system which they supply, as shown on applicable LRBDs, and are evaluated under those systems.

For additional description of the Plant Gas System and its components, see FSAR Section 10.4.15.

<u>Boundary</u>

The LR boundaries are reflected on the LRBDs listed below.

CAS scoping boundaries include CI connections to air accumulators as shown on LRBDs M1-0216-001-LR, M1-0218-001-LR, M1-0218-001A-LR, M2-0218-001-LR, and M2-0218-002-LR.

Additional CAS scoping boundaries include CI and CA containment penetrations, as shown on LRBDs M1-0216-A-LR, M1-0218-LR, M2-0216-A-LR, M2-0216-B-LR, and M2-0218-LR.

Final CAS scoping boundaries are CI System connections to the SFP swing gate seals, as shown on M1-0219-LR.

Plant Gas System scoping boundaries include HG supplies to CVCS volume control tanks, as shown on LRBDs M1-0243-002-LR and M2-0243-002-LR.

Additional Plant Gas System scoping boundaries include NGS supplies to the CVCS volume control tanks and boric acid tanks, RCS PRTs, demineralized water reactor makeup water storage tanks, and CSTs, as shown on LRBDs M1-0243-A-LR and M2-0243-A-LR.

Unit 1:

- M1-0216-001-LR
- M1-0216-A-LR
- M1-0218-LR
- M1-0218-001-LR
- M1-0218-001A-LR
- M1-0243-A-LR
- M1-0243-002-LR

Unit 2:

- M2-0216-A-LR
- M2-0216-B-LR
- M2-0218-LR
- M2-0218-001-LR
- M2-0218-002-LR
- M2-0243-A-LR
- M2-0243-002-LR

Common:

- M1-0219-LR

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Support containment pressure boundary. The CAS includes piping that penetrates the containment. The containment penetrations, including containment isolation valves, are relied upon to ensure containment integrity.

(2) Prevent loss of shielding and cooling water for stored fuel and spent fuel. The CAS supplies SFP refueling gate seals to prevent leakage of pool water.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). CAS containment isolation valves and swing gate seal pressure indicators are included in the scope of the Environmental Qualification of Electric Components (B.2.2.2) AMP.

FSAR References

Sections 9.3.1 and 10.4.15

Components Subject to AMR

Table 2.3.3-3 lists the Compressed Air and Gas Systems component types subject to AMR and their associated component intended functions.

Table 3.3.2-3 provides the results of the AMR.

Table 2.3.3-3
Compressed Air and Gas Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Filter housing	Structural integrity (attached)
Flexible hose	Pressure boundary
Piping	Pressure boundary Structural integrity (attached)
Tubing	Pressure boundary Structural integrity (attached)
Valve body	Pressure boundary Structural integrity (attached)

2.3.3.4. Demineralized and Reactor Makeup Water System

Description

The Demineralized and Reactor Makeup Water System (DRMWS) is used to supply demineralized water to various nuclear safety related and NNS related systems. The DRMWS is comprised of two subsystems: the demineralized water subsystem and the RMW subsystem.

A demineralized water subsystem is provided to furnish deaerated and non-deaerated demineralized water to both units. The system consists of one demineralized water storage tank, two demineralized water transfer pumps, two vacuum deaerator feed pumps, one vacuum deaerator, two vacuum deaerator vacuum pumps, one duplex condensate return unit, two deaerated water transfer pumps and all associated piping, valves, instrumentation, and controls.

The demineralized water storage tank receives non-deaerated makeup water from the water treatment system through a modulating level control station. The demineralized water storage tank is a 400,000-gallon plastic lined carbon steel atmospheric tank located in the yard. Two demineralized water transfer pumps take suction from the demineralized water storage tank.

A RMW subsystem is designed to furnish reactor grade deaerated demineralized makeup water to each unit.

Each unit has one reactor makeup water storage tank (RMWST), one reactor makeup water pump (RMWP) (one redundant RMWP is shared by both units) and all associated piping, valves, instrumentation, and controls.

The RMWST of each unit receives makeup from the deaerated water transfer pumps through a level control station. The reactor makeup water storage tanks are steel reinforced concrete atmospheric tanks lined with stainless steel and equipped with a diaphragm. Nitrogen gas is supplied from bulk storage as required to the RMWST to prevent oxygen rich air from reaching the water. Maximum nitrogen flow rate into the RMWST is controlled by an inlet restricting orifice. Nitrogen is maintained between the tank wall and the diaphragm to ensure the diaphragm does not adhere to the tank wall and is able to freely move during tank drawdown during a postulated DBE. The RMWST has the capability for nitrogen sparging through the normal recirculation flow path. Nitrogen pressure is maintained by a diaphragm (flapper) valve at the terminus of the vent pipe.

Three RMWPs take suction from the reactor makeup water storage tanks. During normal operation, one RMWP is aligned with a reactor makeup storage tank to supply deaerated demineralized water to a single unit (one pump per unit). The third pump is used as a redundant standby pump for each unit which is normally isolated from each unit's flow paths by manual isolation valves.

Flow restriction orifices are provided to limit flow rates to the CVCS and CCW System/CHS.

<u>Boundary</u>

The DRMWS boundaries for LR are reflected on the LRBDs listed below.

The DRMWS includes those nuclear safety related components starting at the RMWST that supply treated water to other nuclear safety related systems as described above. The RMWST diaphragm is included in scope, since, if degraded, could block the ability to makeup to nuclear safety related systems. Piping that provides a pressure boundary for the RCB at containment penetrations is also in scope. Other piping and components that are associated with class 5 components and are in Seismic Category I structures that are normally filled with water are also in scope. These have a leakage (spatial) intended function corresponding to the 10 CFR 54.4(a)(2) intended function. Other class 5 piping that is connected to class 3 check valves, isolation valves, and piping serving the RMWST has a structural integrity (attached) intended function. The components that have 10 CFR 54.4(a)(3) intended functions are included in the boundary descriptions described above.

Unit 1:

- M1-0241-001-LR
- M1-0241-A-LR
- M1-0242-LR
- M1-0242-A-LR
- M1-0242-B-LR

Unit 2:

- M2-0241-LR
- M2-0242-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The RMW subsystem nuclear safety related function is to provide a Seismic Category I source of makeup water for the following systems:

a) CCW System
b) Safety Chilled Water System
c) SFP Cooling and Cleanup System
d) CVCS

(2) In addition, the DRMWS has containment penetrations which support the containment pressure boundary.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provide water supply to fire suppression in containment, which is relied upon to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48).

(2) Accommodates and is compatible with environmental conditions that demonstrate compliance with the Commission's regulations for EQ

(10 CFR 50.49). The DRMWS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

FSAR References

Section 9.2.3

Components Subject to AMR

Table 2.3.3-4 lists the DRMWS component types subject to AMR and their associated component intended functions.

Table 3.3.2-4 provides the results of the AMR.

Table 2.3.3-4
Demineralized and Reactor Makeup Water System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flexible connection	Leakage boundary (spatial)
Orifice	Leakage boundary (spatial) Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pulsation dampener	Leakage boundary (spatial)
Pump casing (RMWP)	Pressure boundary
Respirator washer	Leakage boundary (spatial)
Tank (fuel transfer system hydraulic power unit reservoir)	Leakage boundary (spatial)
Tank (hot water)	Leakage boundary (spatial)
Tank (RMWST) diaphragm	Diaphragm integrity
Tank liner (RMWST)	Pressure boundary
Tubing	Leakage boundary (spatial) Structural integrity (attached)
Valve body	Leakage boundary (spatial) Pressure boundary

2.3.3.5. Emergency Diesel Generator and Auxiliary Systems

Description

The Emergency Diesel Generator (EDG) and Auxiliary Systems consists of the DG sets and the following auxiliary systems:

- Diesel Generator Fuel-Oil Storage and Transfer System (DGFOSTS)
- Diesel Generator Cooling Water System (DGJWS)
- Diesel Generator Starting System (DGSAS)
- Diesel Generator Lube Oil System (DGLOS)
- Diesel Generator Combustion Air Intake and Exhaust System (DGAIES)

Diesel Generator Sets

Two full capacity DG sets are supplied for each unit. Each DG set automatically starts in emergency mode upon undervoltage on its respective emergency bus or SI actuation signal. Emergency buses are normally fed from offsite power. Upon loss of offsite power (LOOP), automatic bus transfer to the alternate power source occurs. However, if the alternate source is not available, the DG starts. Each DG and its distribution system is designed and installed to provide a reliable source of redundant onsite generated (standby) AC power.

The engine is diesel oil, four-cycle 450 rpm, turbocharged, water-to-water cooled with SSW.

Diesel Generator Fuel-Oil Storage and Transfer System

The DGFOSTS is designed to supply a reliable source of fuel oil for the four emergency DG sets for a period of not less than seven days for continuous operation at rated load.

Four DG sets are supplied by four separate fuel-oil system trains, with each train consisting of a buried storage tank, two transfer pumps, day tank, piping, and I&C necessary for reliable operation. Connections are provided for filling and venting of the storage tanks, and provisions are made for the draining and sampling of fuel oil and removal of condensate. Each day tank is provided with instrumentation to monitor and alarm low and high fuel levels.

Two fuel-oil transfer pumps are located in each DG room. Each pump takes suction from its associated storage tank and discharges to the associated day tank.

Each diesel fuel oil storage tank is equipped with a vent line with a flame arrestor, level transmitter, and a fill line with shut-off valve. The fuel oil storage tanks are located in the yard buried next to the Diesel Generator Building (DGB). The fuel oil storage tanks are designed to Seismic Category I requirements and corrosion protection for these tanks is provided. The tanks are externally coated, and cathodic protection is applied.

A strainer is located downstream of each redundant fuel oil transfer pump. In addition, duplex strainers are located downstream of the fuel oil day tank on the engine skid. These strainers are provided to catch any suspended sediment. A duplex filter is also located on the engine skid upstream of the fuel supply header to collect any additional suspended sediment.

The day tanks supply an immediate source of fuel-oil to the DG sets. Fill, vent, drain connections and a return line to the storage tank for overflow are provided for each tank.

The engine fuel is No. 2 diesel fuel oil as specified by the diesel manufacturer with quality limits as stated in ASTM D975.

Diesel Generator Cooling Water System

The DGJWS is designed to allow the DGs to be rapidly loaded and operate continuously at their maximum ratings. Components within the DGJWS are sized to remove the maximum heat produced using service water as a cooling medium. The DGJWS for each DG consists of two subsystems: a closed cooling water loop (jacket water) for cylinder jackets, cylinder heads, turbochargers, air intercoolers, and lube oil cooler; and an external cooling water supply (service water) which cools the jacket water heat exchanger. The external cooling water supply includes supply and return piping that is part of the auxiliary module.

When the DGs are not in operation, each engine has a thermostatically controlled electric standby heater and motor-driven keep warm pump that are provided to reduce the effects of fast start thermal transients on long-term maintenance requirements.

The DG sets are capable of operating at rated speed for seven (7) days with no load across the terminals and are capable of assuming design sequenced and continuous loading or any part thereof, during this period. The DG sets have no minimum loading requirements.

The DGJWS is designed as a closed system with a vented standpipe at the highpoint. The standpipe, with a low level alarm, ensures sufficient NPSH for the engine driven jacket water pumps.

Jacket water temperature is maintained constant by the use of an automatic three-way valve which is thermostatically operated. Vents at high points in the system ensure that no air is trapped in the system.

Leakage in the DGJWS can result in a loss of coolant inventory. This will cause a high jacket water temperature alarm followed by a possible trip of running the EDG in NORMAL mode. A low level jacket water alarm is also provided.

Long-term corrosion and organic fouling in the DGJWS is minimized by the use of demineralized water mixed with $NaNO_2$.

Diesel Generator Starting System

The DGSAS is an air-powered system designed to start the DG set. Diesel engines are started by injection of compressed air into the cylinders. Each DG has two

100 percent capacity air systems. Each system includes air compressors, air receivers, air dryers, and two solenoid starting valves. Either starting air system satisfies EDG operability.

Each receiver is sized to contain enough air for five starts. Two air supply lines are provided, each having redundant solenoid starting valves. One valve passes enough air to start the diesel engine, thus ensuring a sufficient supply of starting air if one valve fails to operate. Each receiver also has a valve to permit periodic blowdown of accumulated moisture and foreign material.

Instrumentation is provided to monitor the operation of the system. On low receiver pressure, redundant pressure elements actuate an alarm in the DG room and a trouble alarm in the Control Room.

Diesel Generator Lube Oil System

Each DGLOS is designed to provide adequate engine lubrication under all operating conditions, including immediate full-load operation after starting. Each DG operates as a dry sump system and has one main lube oil pump that is engine driven. A positive displacement pump draws oil from the sump through a course strainer. The lube oil travels through the pump, a cooler, a filter, and then through a strainer to the engine. Filtering ensures oil is of acceptable quality. The DGLOS is cooled by the DGJWS. The DGLOS is a closed system. Refilling of the DGLOS is accomplished through a normally capped two-inch connection.

The required oil quality as specified by the engine manufacturer is maintained by automatically filtering and straining the oil as it is circulated in the engine.

The engine crankcase is protected from over pressurization by the following design features. The system is equipped with alarms and trips initiated by high oil temperature and/or low pressure, which shuts down the DG if operating limits as specified by the engine manufacturer are exceeded. The DGLOS trips are blocked during emergency operation. The crankcase is equipped with centrifugal blowers for crankcase ventilation during DG operation. The crankcase is also equipped with blowout panels to protect the unit from damage.

The lubrication oil sump, the lubrication oil filter and the lubrication oil strainer are all vented.

When the engine is not operating, a motor-driven prelube pump automatically starts and draws oil from the sump, passes it through a strainer and a filter, and then into the engine lubricating system. This recirculation of lube oil continues until the engine receives another start signal. The oil is heated by an electrical immersion heater in the sump. This ensures continuous prelubrication of the engine and standby heating of the oil.

The heated oil, in this keep warm mode, is circulated throughout the engine block but does not feed the turbocharger’s lubrication header. Check valves in the lube oil system ensure that oil is kept near these assemblies so that lubrication can be provided by the engine-driven lube oil pump within one-half of one engine revolution on startup.

Diesel Generator Combustion Air Intake and Exhaust System

The DGAIES is designed to provide adequate combustion air for each EDG under all operating conditions and adequate capability to direct the engine exhaust to the outside air under all operating conditions. The DGAIES consists of the air intake system, turbocharger, turbocharger air intercooler, and the exhaust gas system. Each engine has its own independent DGAIES.

The intake system consists of a filter, silencer, flexible connection, adapter for connection to turbocharger intake, air intake duct connection, and interconnection piping. The volume of intake air is sufficient to ensure continued operations under emergency conditions.

The turbocharger consists of an air compressor and a gas turbine coupled on the same shaft.

The turbocharger air intercooler transfers heat produced from the compression of combustion air by the turbocharger to the DGJWS.

The diesel generator combustion exhaust system consists of an outlet adapter for the turbocharger gas turbine outlet, a flexible connection, silencer, exhaust duct connection, interconnecting piping, and a relief valve.

The diesel generator combustion air intake is provided with intake air filters to protect the engine from dirt or other contaminants. The missile protected intake is located 36-ft above ground level to minimize the intake of ground dust or debris. The missile protected inlet protects the diesel generator combustion air intake system from external missiles and prevents the entrance of rain or snow. The combustion air intake and the exhaust are located apart so that dilution or contamination of the intake air by exhaust products does not affect operation of the DGs. The engine exhaust is directed upward and away from the intake, which is directed downward. The intake is located at a sufficient distance from the onsite bulk gas storage to preclude any contamination of the intake air due to an accidental onsite gas release.

The exhaust pipe downstream of the exhaust silencer contains a drain which prevents water from collecting. A full-flow relief valve located upstream from the exhaust silencer permits the engine to continue operating if the portion of the diesel generator combustion exhaust gas system exposed on the roof is crushed by a tornado generated missile. If the normal flow path for the exhaust is blocked, this valve will discharge the exhaust gases directly to the atmosphere. There is no piping downstream of the valve.

Boundary

The EDG and Auxiliary Systems boundaries for LR are reflected on the LRBDs listed below.

The EDG and Auxiliary Systems scoping boundary encompasses the diesel engines and includes the DGFOSTS, DGJWS, DGSAS, DGLOS, and DGAIES.

DGFOSTS scoping boundaries are shown on LRBDs M1-0215-F-LR, M1-0215-G-LR, M2-0215-F-LR, and M2-0215-G-LR. Beginning at the fuel oil storage tank, fuel is drawn by fuel oil transfer pumps and delivered to the fuel oil day tank. Fuel is drawn from the day tank, fed through duplex strainers and filters, and delivered to the engine via the fuel oil pump, fuel injectors, and fuel injector pumps. Unused fuel is returned to the fuel oil day tank via bypass line and drip waste return pump.

DGJWS scoping boundaries are shown on LRBDs M1-0215-H-LR, M1-0215-J-LR, M2-0215-H-LR, and M2-0215-J-LR. The DGJWS includes both open cycle and closed cycle portions. In the open cycle portion, SSW travels from inlet piping to the jacket water cooler. After cooling the closed cycle portion, SSW is returned via outlet piping. The closed cycle portion, starting at the jacket water cooler, is drawn from the jacket water cooler and enters the lube oil cooler where it is used to cool lubricating oil. After exiting the lube oil cooler, jacket water is drawn into intercoolers and turbochargers where it is used to cool the diesel engines and intake air to the diesels. After leaving the engine, jacket water is returned to the DGJWS standpipe. Jacket water from the standpipe is pumped via engine and auxiliary jacket water pumps where it is returned to the jacket water cooler, completing the closed loop. A keep warm pump draws jacket water from the standpipe and circulates it during standby, in order to avoid thermal transients during startup.

DGSAS scoping boundaries are shown on LRBDs M1-0215-D-LR, M1-0215-E-LR, M2-0215-D-LR, and M2-0215-E-LR. The DGSAS starting air compressors and air dryers are NNS and are not within the scope of LR. Scoping boundaries begin at the outlet piping from the air dryers. Air is drawn from this piping into starting air receivers. From the air receivers air is drawn into the engine after passing through strainers and starting air admission valves.

DGLOS scoping boundaries are shown on M1-0215-B-LR, M1-0215-C-LR, M2-0215-B-LR, and M2-0215-C-LR. Beginning at the lube oil sump tank, lubricating oil may be drawn from the lube oil heater via pre-lube pump, through pre-lube filters and strainers, and into the engine. Lubricating oil may also be drawn from the lube oil sump tank by engine and auxiliary lube oil pumps into the lube oil cooler. After being cooled by jacket water within the cooler, lubricating oil passes through duplex filters and strainers and enters the engine, lubricating various engine components. Lubricating oil is also directed into left and right bank turbochargers for lubrication. After lubricating engine components and the turbochargers, lubricating oil is returned to the lube oil sump tank.

DGAIES scoping boundaries are shown on M1-0215-LR, M1-0215-A-LR, M2-0215-LR, M2-0215-A-LR. Intake air is drawn from an outdoor missile protected intake, where it is split and fed through two sets of intake air filters and air inlet silencers. Air is drawn into the engine and through right and left bank intercoolers and turbochargers. Exhaust air exiting the turbochargers is exhausted outdoors through the DGB roof away from the intake, after passing through an exhaust silencer. A crankcase vacuum blower and associated piping are utilized to remove contaminants from the intake air manifold and direct them out through the DGB roof.

Included in the LR scoping boundary of the EDG and Auxiliary Systems are those portions of NNS piping and equipment that extend beyond the nuclear safety related/NNS interface up to the location of the first seismic anchor, or to a point no longer in proximity to equipment performing a nuclear safety related function, whichever extends further. Included in this boundary are components relied upon to preserve the structural support intended function. Included in this boundary are pressure-retaining components relied upon to preserve the leakage boundary intended function of this portion of the system.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide power to nuclear safety related components. The EDG and Auxiliary Systems starts and is available to supply power for nuclear safety related loads upon undervoltage on its respective emergency bus or receipt of SI actuation signal.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The EDG and Auxiliary Systems are fire safe shutdown systems utilized to provide support services.

(2) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). Components within the EDG and Auxiliary Systems are required to cope with SBO to satisfy the requirements of RG 1.155 and 10 CFR 50.63.

FSAR References

Sections 8.3.1.1.11, 9.5.4, 9.5.5, 9.5.6, 9.5.7 and 9.5.8

Components Subject to AMR

Table 2.3.3-5 lists the EDG and Auxiliary Systems component types subject to AMR and their associated component intended functions.

Table 3.3.2-5 provides the corresponding results of the AMR.

Table 2.3.3-5
Emergency Diesel Generator and Auxiliary Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Air receiver	Pressure boundary
Bolting	Mechanical closure
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flame arrestor	Leakage boundary (spatial)
Heat exchanger	Heat transfer Pressure boundary
Heater casing	Pressure boundary
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Piping element (sight glass)	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Strainer	Filter Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary
Turbocharger casing	Heat transfer Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.6. Equipment and Floor Drainage Systems

Description

The Equipment and Floor Drainage System is provided to collect liquids from the various systems in the plant, separate them according to purity and radioactivity, and to route them to the proper location for disposal or recycle. It also monitors leakage in vital areas.

Separate drain headers are provided for each drain type according to activity and quality level to prevent mixing of different liquid wastes. Equipment drains are also provided in some areas in addition to floor drains so that non-radioactive and radioactive waste can be drained separately. The Equipment and Floor Drainage System is also provided with radiation monitors to detect radioactive contamination caused by equipment failures or accident conditions before discharging the drains to the environment. The drainage system used to carry clean water is completely separate from the drainage system used to carry potentially radioactively contaminated water to prevent the accidental release of radioactive material to the environment.

Collection and transfer of liquids from the lower levels of buildings are facilitated by sump pumps, sumps, and drain collection tanks. Spare, full-capacity sump pumps are provided at each transfer point in the drainage system. Backwater valves are provided, as necessary, to prevent water from backing up through a drain line and possibly impairing the function of nuclear safety related equipment. Ball Float devices, which allow water to drain from an area but prevent steam propagation or unfiltered air in leakage to other interconnecting areas, are provided as necessary for the protection of essential systems and components due to postulated piping failures per FSAR Section 3.6B and for control room habitability during a DBA. The nuclear safety related portions of the VD that penetrate the containment shall be provided with leak detection, isolation, and containment capabilities having redundancy, reliability, and performance capabilities which reflect the importance to safety of isolating these piping systems.

Boundary

RCB Drains

Leakage from all RCB floors is directed to one of two containment sumps. The reactor cavity is also provided with a sump at the lowest point in the RCB. The pumps from all three sumps are aligned through a common flow totalizer with floor drain tank No. 1 and have a normally closed line into the waste holdup tank. The RCB drains do not function during an accident and are isolated by two fail-closed, air-operated containment isolation valves, one inside and one outside containment.

SGB Drains

Drains from all Safeguards areas above EL. 785-ft 6-in. are routed directly to the floor drain tank, CCW drain tank, or to one of the sumps. Each sump has two nuclear safety related pumps to prevent flooding from continuous system leakage and to detect a passive failure. The area at or below EL. 785-ft 6-in is provided with a sump, independent from the sump serving the other area with the drain headers discharging into the closed SGB sumps.

The Diesel Generator Room sump pumps are normally aligned for discharge into the Wastewater Management System, for treatment prior to discharge. In-scope components are addressed up to the flange connection as shown on M1-0237-LR.

CCW tank room sump No. 3 collects drainage from the CCW drain tank, containment spray and RHR pumps, and is aligned to discharge into the Wastewater Management System. CCW tank room sump No. 3 is only fed by drains which collect fluid from normally non-radioactive sources. In-scope components are addressed up to the flange connection as shown on M1-0237-LR.

SGB drain sumps 1 and 2 (for each unit) are normally aligned for discharge into the waste holdup tank. The Auxiliary to SGB Seismic Gap is equipped with automatic level controls for a small effluent pump. The drains from the floor drain tank and floor drain tank room utilize a locked closed valve to prevent recirculation of the tank contents back into sump No. 1 in the event of failure of the tank or piping within the tank cubicle.

AB Drains

The AB drainage is routed via several different flow paths. The drainage of the southern half of the AB above EL. 792-ft is accomplished by a gravity drainage system into the floor drain tank for Unit 1. At or below EL. 792-ft, leakage from the southern half of the AB is collected in various sumps. Drainage from the Battery Room, Secondary Sampling Room, Chemical Storage Room, Air Compressor Room, Mechanical Equipment Room, and the Unit 2 Cable Spreading Room is routed to Sump No. 11. The sump pumps are normally aligned to discharge to the Wastewater Management System. Sump Nos. 3 and 10 receive drainage from the CCW heat exchangers and nuclear safety related chillers, respectively. Sump No. 3 additionally receives drainage from the discharge of service water tunnel sump pumps Nos. 1 and 2. Sump No. 10 pumps are normally aligned to discharge to the Unit 1 CCW drain tank, with a normally closed connection to the Unit 2 CCW drain tank. Sump No. 3 pumps are normally aligned to discharge to the Waste Management System low volume waste (LVW) pond. The pumps have normally closed discharges to the Units 1 & 2 CCW drain tanks. Sump Nos. 4, 5 and 9 receive drainage from the remainder of the southern half of the AB below EL. 792-ft. The sump pumps are aligned to discharge to floor drain tank No. 1. The northern half of the AB above EL. 810-ft 6-in is drained by means of a gravity drainage system that ties into the drainage system and the drainage for the southern half of the AB routed to floor drain tank No. 1. The portions of the northern half of the AB at EL. 790-ft 6-in are drained into sumps. Sump Nos. 6 and 8 take drainage from the waste evaporator condensate tank and recycle evaporator feed pump areas, respectively. In addition, sump No. 8 takes drains from a portion of Unit 2 TB EL. 810-ft 6-in. The sump pumps are aligned to discharge into the waste holdup tanks. Sump No. 2 collects the remainder of the drainage from the lowest part of the northern half of the AB. The sump pumps are aligned to discharge to floor drain tank No. 1.

The discharges from sumps 1, 7 and 12 are directed to floor drain tank 1 with an alternate closed line to floor drain tank 3.

TB Drains

All drainage piping and equipment in the TB are NNS and are not required to function after an accident or for safe reactor shutdown. Therefore, the components within the Equipment and Floor Drainage System located in the TB are not included in scope.

FB Drains

All drainage from the FB, with the exception of the Service Water Tunnel, is directed into one of two sumps. Most drainage from the FB is directed to FB sump No. 1, which is located at EL. 800-ft 2-in. FB sumps 1 and 2 are aligned to discharge to floor drain tank No. 1, which is located in the SGB at EL. 773-ft.

Drainage from the FB service water tunnel is directed into two sumps. Service water tunnel sumps 1 and 2, which are located at EL. 785-ft 6 in, are aligned to discharge to the ABFD sump 3.

The evaluation boundaries for the Equipment and Floor Drainage System are shown on the following LRBDs:

Unit 1:

- M1-0236-LR
- M1-0236-A-LR
- M1-0236-B-LR
- M1-0236-01-LR
- M1-0236-01A-LR
- M1-0236-02-LR
- M1-0236-02A-LR
- M1-0236-03-LR
- M1-0236-04-LR
- M1-0237-LR
- M1-0237-01-LR
- M1-0238-LR
- M1-0238-A-LR

Unit 2:

- M2-0236-LR
- M2-0236-A-LR
- M2-0236-B-LR
- M2-0236-03-LR
- M2-0238-LR
- M2-0238-A-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The Equipment and Floor Drainage System includes piping that penetrates the primary containment. The containment penetrations include containment isolation valves to assure that radioactive material is not inadvertently transferred out of containment. Therefore, the Equipment and Floor Drainage System provides containment pressure boundary.

(2) Prevent flooding of safety related equipment. Safeguard building floor drain sump pumps prevent flooding of the safeguards building via pumping water from the sumps to the WPS floor drain tanks.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function. The Equipment and Floor Drainage System includes water filled components in the Unit 1 and Unit 2 SGBs, AB, RCB, and FB that have the potential for spatial interaction with nuclear safety related components.

(2) The Equipment and Floor Drainage System provides functional support to preclude flooding due to continuous system leakage in rooms that contain nuclear safety related equipment.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) The Equipment and Floor Drainage System provides drainage in areas protected by fixed water fire suppression systems (10 CFR 50.48). The VD and FDS provides adequate drainage to protect nuclear safety related equipment during internal flooding caused by an FPS discharge.

(2) The Equipment and Floor Drainage System is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The equipment and floor drainage system includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

FSAR References

Sections 9.3.3.2.1, 9.3.3.2.2, 9.3.3.2.3, 9.3.3.2.4 and 9.3.3.2.5

Components Subject to AMR

Table 2.3.3-6 lists the Equipment and Floor Drainage System component types subject to AMR and their associated component intended functions.

Table 3.3.2-6 provides the results of the AMR.

Table 2.3.3-6
Equipment and Floor Drainage System Component Intended Functions

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flexible hose	Leakage boundary (spatial)
Flow element	Leakage boundary (spatial)
Orifice	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Pressure boundary
Pump casing (SGB sump pumps)	Pressure boundary

Table 2.3.3-6
Equipment and Floor Drainage System Component Intended Functions

Component Type	Component Intended Function(s)
Pump casing (safeguards to auxiliary building seismic gap effluent pumps) (CCW heat exchanger room sump pumps) (CCW drain tank room sump pumps) (diesel generator room sump pumps) (reactor cavity sump pumps) (containment sump pumps) (FB sump pumps) (service water tunnel sump pumps)	Leakage boundary (spatial)
Strainer (SGB to waste processing floor drain tank strainers) (pump bearing flush strainers)	Leakage boundary (spatial)
Tank (containment cooling unit condensate measuring tanks)	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial) Pressure boundary

2.3.3.7. Fire Protection System

Description

The FPS is a standby, mechanical system designed to detect, alarm, and extinguish fires. The FPS is divided into two basic subsystems: The Fire Detection System and the Fire Suppression System. The Fire Detection System is a plant-wide instrumentation system provided to detect fires in various areas of the plant and to alert the Control Room operators of a fire and its location. The fire suppression system includes such firefighting equipment as sprinkler systems (wet pipe, deluge, and pre-action), water spray, standpipe and hose stations, halon systems, and portable extinguishers.

Water is supplied for the standpipes and suppression systems from two dedicated above ground storage tanks, that are maintained at a specific level by a treated water supply, via an underground piping distribution system and water supply lines for each building. The main loop is divided into sections by post indicator valves to allow isolation of the loop in case of a line break. There are three 50 percent capacity fire pumps to supply water to the system. One is an electric motor driven pump, and the other two pumps are diesel engine driven. Water is supplied to the underground fire loop by the lead pump, the electric motor-driven pump, when the jockey pump cannot maintain the system pressure above a predetermined set point. An emergency fill line is provided from the SWIS to refill the tanks with water from the SSI via use of an electric motor driven pump. The electric motor driven pump is provided to allow either tank to be refilled within 8 hours after using its contents to extinguish a fire.

The SGB, FB, and AB have internal loops to supply suppression and standpipes systems. These loops have multiple connections to the underground loop. Valves are available for isolation of sections of the loops as well as isolation of the internal loop from the underground loop. Each suppression and standpipe system has a shutoff valve to facilitate work on the system.

The TBs have an internal loop to supply standpipes. This internal loop has multiple connections to the underground loop in Unit 1 and Unit 2. Crosstie lines are provided between Unit 1 and Unit 2 TBs to facilitate isolation of sections of either loop.

The suppression systems for the DG day tanks are supplied from the main loop independent of each other. Each system has a deluge valve, a cutoff valve, and a detection system. The systems are actuated automatically based on detection of a fire or manually adjacent to the respective area.

The fire pump house structure is protected by an automatic wet-pipe sprinkler system. Water flow and valve tamper alarms are provided at the pump house location and in the Control Room. The deluge water spray systems for the ventilation units (atmosphere cleanup units), except the containment preaccess units, are supplied by the interior building supply loop. The preaccess units are supplied by the demineralized water system.

The halon system for each cable spreading room consists of a detection system, storage cylinders, manifold and header assembly, control valves, piping, nozzles, and local control panel. Each system is designed with two charges of halon. Halon is released automatically after receipt of a fire signal from detectors located in the cable spreading room. The Unit computer rooms are each provided with a manually actuated halon system, and ionization smoke detection provides control room personnel notification of a fire.

Fire hose stations in the FB are required to provide emergency makeup to the SFPs to maintain levels and ensure cooling of stored spent fuel.

Boundary

The FPS scoping boundary includes the two atmospheric fire water storage tanks (FWSTs) which are located outdoors on the east side of the FB as shown on MX-0225-07-LR. PW provides make-up water to these tanks. The FPS boundary starts from valves XFP-0360 and XFP-0363. The suction lines extend from each tank to the fire pump suction header in the fire pump house which houses the three fire pumps, jockey pump and their associated drivers, each installed in separate rooms. An emergency make-up FP line to the FWSTs is provided from the SWIS as the Emergency fill source, drawing water from the SSI.

The components of the diesel engine for the fire pumps are shown on MX-0225-09-LR. The diesel engines for fire pumps and the engine mounted components are part of the active engine assembly. These active components are not subject to AMR. The exhaust piping, exhaust silencer, flame arrestor and heat exchanger are subject to AMR.

There is a single vertical centrifugal fire pump and associated piping located in the SWIS that provides emergency makeup water to either FWST shown on M1-0225-LR. Also located in the SWIS is a diesel driven fire pump (DDFP) that is enclosed in a separate room and has been abandoned in place. The DDFP and associated piping do not interface with other components found within the SWIS and therefore are not within the scope of LR. Similarly, a jockey pump is also abandoned in place and is isolated with a blind flange and therefore not in scope.

Water from the FWSTs is supplied to various site suppression systems utilizing an underground piping distribution system as shown on M1-0225-06-LR. Suppression systems to structures that fall under site facilities, which are not in-scope structures, are not included in scope.

Connections to the 12-in underground loop supply water to the supply headers in the Unit 1 and 2 SGBs and the AB. The FPS for each building is supplied by multiple fire water supply lines.

The TBs have an internal loop to supply standpipes. This internal loop has multiple connections to the underground loop in Unit 1 and Unit 2. The TB consists of one fire area which extends from EL. 775-ft 4-in to the roof of the TB. This fire area includes both the Unit 1 side and the Unit 2 side of the TB. The Fire Suppression System for the TB is shown on M1/2-0225-01-LR.

The main supply headers for suppression systems in nuclear safety related areas of the plant run through the north-south corridors of the Unit 1 and Unit 2 SGBs and the AB on the 790-ft 6-in, 810-ft 6-in, 831-ft 6-in and 852-ft 6-in elevations as shown on M1-0225-02/02A-LR, M1/M2-0225-03/03A-LR, and M1-0225-04-LR.

The Fire Suppression System for containment, Units 1 and 2, are shown on M1/2-0225-05-LR.

The DRMWSs which provides the primary supply of water for the preaccess filtration units spray systems interfaces with the FPS at Valve 1/2FP-0590. Similarly, the Plant Gas for Nitrogen supply interfaces with the FPS at valve location 1/2FP-0607.

The Halon System is used as a fire suppression system in the Unit 1 and 2 cable spreading room. The individual halon systems consist of main and reserve banks of cylinder(s), with an equal quantity of agent in both banks, which are manifolded to the distribution piping. The main and reserve Unit 1 and Unit 2 Cable Spreading Room systems each consist of three banks of four cylinders which discharge simultaneously upon actuation. The Halon System is shown on M2-0225-011-LR.

The RCS oil Spillage Protection System, depicted on M1-0252-01-LR and M2-0252-01-LR, collects RCP bearing lubricating oil leakage. This system responds to 10 CFR Part 50 Appendix R item O and therefore is included with the FPS.

The FPS boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0225-LR
- M1-0225-01-LR
- M1-0225-02-LR
- M1-0225-02A-LR

- M1-0225-03-LR
- M1-0225-03A-LR
- M1-0225-04-LR
- M1-0225-04A-LR
- M1-0225-05-LR
- M1-0225-06-LR
- M1-0252-01-LR

Unit 2:

- M2-0225-01-LR
- M2-0225-03-LR
- M2-0225-03A-LR
- M2-0225-05-LR
- M2-0225-11-LR
- M2-0252-01-LR

Common:

- MX-0225-07-LR
- MX-0225-08-LR
- MX-0225-09-LR

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide primary containment pressure boundary.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Ensure adequate cooling in the SFP to maintain stored fuel within acceptable temperature limits.

(2) Provide backup cooling. The FPS may be aligned to the jacket water heat exchangers for EDGs, as well as the lube oil coolers for SI pumps and CCPs, in the event of a loss of all SSW.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48).

(2) Perform a function that demonstrates compliance with the Commission’s regulations for EQ (10 CFR 50.49). The FPS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

FSAR References

Sections 1.2.2.8.6, 9.5.1 and 9.5.1.4

Components Subject to AMR

Table 2.3.3-7 lists the FPS component types subject to AMR and their associated component intended functions.

Table 3.3.2-7 provides the results of the AMR.

Table 2.3.3-7
Fire Protection System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Drip pan	Pressure boundary
Expansion joint	Pressure boundary
Fire hydrant	Pressure boundary
Flame arrestor	Pressure boundary
Flexible hose	Pressure boundary
Flow element	Pressure boundary
Gas bottle (halon)	Pressure boundary
Hose station	Structural support
Orifice	Pressure boundary Throttle
Piping	Pressure boundary
Piping element	Pressure boundary
Pump casing (vertical centrifugal fire pump) (electric motor driven pump) (diesel driven pumps) (jockey pump) (chemical recirculation pump)	Pressure boundary
Silencer (exhaust)	Pressure boundary
Spray nozzle (charcoal filters, deluge, halon)	Spray
Sprinkler head	Pressure boundary Spray
Strainer	Filter Pressure boundary
Tank (atmospheric fire water storage tanks) (diesel driven fire pump fuel oil tanks) (RCS oil spillage tanks) (retard chamber)	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.8. Plant Ventilation Systems

Description

The Plant Ventilation Systems, including select subsystems, maintain ambient temperature and conditions in various areas of the plant and are described, separately, below.

Containment Ventilation Systems

Separate ventilation systems are furnished for the Containments of Units 1 and 2. The Containment Ventilation Systems consist of the Containment Recirculation and Cooling, CRDM Ventilation, Neutron Detector Well Cooling, Reactor Coolant Pipe Penetration Cooling, Preaccess Filtration, Containment Pressure Relief, and Containment Purging Systems.

Containment Recirculation and Cooling System

The environment within containment is controlled by the Containment Recirculation and Cooling System during startup, power operation and hot standby. During normal operation, air in the Containment is recirculated and maintained at or below 120°F. Four cooling units are provided, each sized for 33 1/3 percent (65,000 scfm) of the normal duty cooling load. Standby units are manually actuated on receipt of a failure alarm in the Control Room. Fans are provided with a connection to the Class 1E buses to preclude loss of cooling caused by LOOP. The cooling medium is water provided from the plant ventilation chilled water supply during normal operation and LOOP, because the plant ventilation chillers are also supplied from the Class 1E buses during LOOP conditions. Instruments are provided to continuously monitor air temperature, humidity, and pressure within the Containment during all phases of reactor operation. The Containment recirculation units together with the CRDM Ventilation System remove the entire Containment heat load during normal operation and LOOP conditions including the CRDM heat load. The neutron detector well heat load is removed by a separate set of coils. The cooled air is distributed throughout the Containment by the supply ductwork with no return ductwork provided. Instead, the warm air rises through various openings in the floors and returns to the suction side of the fan coil units.

CRDM Ventilation System

The CRDM Ventilation System maintains temperatures within the CRDM shrouds. The CRDM cooling coils supplement the general containment cooling provided by the Containment Recirculation and Cooling System. Containment air is drawn through the CRDM shrouds and through the CRDM cooling coils and discharged to the containment atmosphere. Two 100-percent capacity fans are provided. The standby unit, isolated by dampers in the duct, is manually actuated on receipt of a failure alarm in the Control Room. In the event normal power supplies are interrupted and the reactor is maintained at hot standby, the CRDM fans are operated from the emergency power supply. The cooling medium to the CRDM cooling coils is provided by the plant ventilation Chilled Water System. The CRDM Ventilation System does not operate in the event of a DBA.

Neutron Detector Well Cooling System

Neutron detector well cooling units prevent neutron detectors from exceeding their temperature limitations. These units also provide cooling for reactor shield wall concrete and nozzle supports. The neutron detector well and nozzle support cooling system is a closed loop system. The air is cooled and directed up around the reactor from the underside of the vessel. Part of the air cools the neutron detectors, and part of the air is directed to the nozzle supports. The air is returned to the fan via piping embedded in the concrete. Two 100-percent capacity cooling units are provided with each consisting of a fan, two cooling coils, and inlet and outlet dampers. Both units are connected to redundant EDG buses to preclude loss of cooling in case of a LOOP. A temperature monitoring device continuously monitors air temperature in the return air ducts of the detector well system.

Containment Preaccess Filtration

The need for safe, periodic, or emergency access to the Containment necessitates the use of Containment preaccess filtration. This filtration system provides air circulation and filtering throughout all Containment areas. Containment preaccess filtration equipment reduces the concentration of fission product particulate activity in the containment atmosphere prior to personnel entering the Containment. Air inside the Containment is recirculated by two 50-percent capacity filtration units. Each filtration unit includes a fan, a roughing filter, two HEPA filters, and one iodine adsorber. Both units are required to operate for the design iodine removal capacity. The equipment is designed to remove fission product iodine gas as well as radioactive particles to permit prompt access to the Containment. Ductwork connected to the suction side of the preaccess filtration unit extends to all levels of the Containment to ensure that the containment atmosphere is uniformly decontaminated. Air is discharged at the suction side of the Containment recirculation system, which supplies the air through ductwork and guarantees proper mixing. Charcoal adsorbers are provided with a fire protection water deluge system.

Containment Purge Supply and Exhaust System

Containment purge supply and exhaust equipment satisfies the prerequisites for safe, prolonged access to the Containment following shutdowns. The system is utilized during shutdown only; it is not used during startup, power, or hot standby operations.

Fresh, outside air is passed through a filter and heating and cooling coils and discharged near the recirculation supply fans in the Containment. Thermostatically controlled electric heating coils are provided in the purge supply duct to maintain minimum temperatures for personnel comfort during shutdown. One 30,000 scfm filter heating and cooling coil plenum and a fan are required. The containment purge supply isolation valves are designed to close automatically on detection of high radiation levels by the containment air radiation monitor or on a Phase A isolation signal.

Exhaust air is drawn through a prefilter, two HEPA filters, and an iodine adsorber and exhaust fan, and released to the atmosphere via the plant ventilation vent. Two filter plenums with associated fans are required to maintain design purge rate. The air is monitored before discharge to the environment, to limit the concentration of contaminants. The containment purge exhaust isolation valves are designed to close automatically on detection of high radiation levels by the Containment air radiation monitor or on a phase A isolation signal.

Containment Pressure Relief System

The Containment Pressure Relief System is designed to relieve excess Containment pressures caused by temperature transients or air leakage from pneumatic actuators during normal operation. The Containment Pressure Relief System is connected to the Containment purge exhaust duct outside Containment, downstream of both system Containment isolation valves and upstream from the primary plant exhaust filters. This connection ensures that any air from the Containment is filtered prior to release to the atmosphere, via the plant ventilation vent. The Containment Pressure Relief System is designed to reduce the Containment pressure from a maximum of 1.5 psig to atmospheric pressure.

The pressure relief line is connected to the Containment purge exhaust system; the Containment Pressure Relief System requires only one penetration. The exhaust air is decontaminated by the primary plant modular filtering trains prior to being discharged to the plant ventilation discharge duct. Both pressure relief Containment isolation valves automatically close if high radiation is detected by the containment particulate-iodine-gaseous monitor, on a phase A isolation signal, or on containment ventilation isolation. The isolation valves are 18 in. in diameter and will close within three seconds after receiving the signal. The valve and actuator design bases include consideration or buildup of Containment pressure for the LOCA break spectrum and relief line flows as a function of time up to and during valve closure. A debris screen is provided inboard of the inside containment isolation valve. The screen is designed to Seismic Category II criteria and is placed in the flow path of the Containment Pressure Relief System for protection of the isolation valves from debris.

Reactor Coolant Pipe Penetration Cooling System

The Reactor Coolant Pipe Penetration Cooling System supplies high velocity cooled air to each of the reactor coolant hot and cold leg pipe penetration supports. This cool air flow removes heat conducted to the supports by the pipe to keep the pipe tunnel concrete temperature below 200°F. The system consists of four fans (2000 scfm each), fan outlet isolation dampers, and ductwork. The fans are the centrifugal, direct drive type, and parallel blade, counterweight operated gravity dampers at each outlet to prevent free wheeling of the standby fan. The Containment Recirculation System supplies tempered air to the immediate area surrounding the fan inlets. Air is drawn in by the operating fan and supplied through ductwork directly to each pipe penetration. The warm air is forced out by the supply air and rises up, thus being cooled, and recirculated by the Containment Recirculation System. The ductwork is arranged with balancing dampers to ensure that equal amounts of air are supplied to the four supports it connects. The Reactor Coolant Pipe Penetration Cooling System is not required to operate following a LOOP or a DBA.

Control Room Area Ventilation System

The Control Room habitability systems are designed to ensure that the Control Room is habitable for a period not less than 30 days following any LOCA. The Control Room air-conditioning system has a recirculation mode designed to maintain Control Room ambient conditions suitable for personnel occupancy during accident conditions. A set of emergency filtration units removes airborne activity from outside air during emergency pressurization and filtration modes of operation.

The Control Room design provides for a single Control Room serving both units. The Control Room HVAC System is designed to serve this area as well as the computer rooms and offices located at the same elevation and at elevation 840 ft 6 in. The Control Room HVAC system is designed to remove all heat generated by the equipment, computers, lighting, personnel, and so forth and to provide a safe operating condition for personnel. Two modular air-conditioning units provide the cool air required, with two units of the same size on standby to address the single failure criterion. Each modular air-conditioning unit contains a roughing filter, cooling coil, heating element, humidity control equipment, fan, and associated instrumentation controls

The cooling coils are the direct-expansion, refrigerant type and suitable for refrigerant R-12. The coils of each modular air-conditioning unit are connected to separate and independent compressors and water-cooled condensers. Two redundant emergency filtration units are provided for use following DBAs. Each unit comprises a roughing filter, two high-efficiency particulate absorption (HEPA) filters, and iodine adsorbers and booster fans.

The Control Room is pressurized with respect to the environment to prevent infiltration of unfiltered and unmonitored air and to account for leakages. The overpressure is considered sufficient to prevent infiltration because the Control Room building structure is completely airtight, with few penetrations, and designed to withstand tornado generated missiles. This overpressure is maintained by modulating exhaust dampers during normal operation and emergency ventilation.

Overpressure during the emergency recirculation mode is accomplished by introducing up to 800 ft^3/min of filtered air into the Control Room. This air is supplied through a 100-percent-redundant air-cleanup unit consisting of a fan, a mist eliminator, a heater, a roughing filter, two HEPA filters, and an iodine adsorber.

The Control Room pressurized envelope includes the Control Room and all areas adjacent to the Control Room on EL. 831-ft 6-in of the Electrical and Control Building (ECB) containing plant information and equipment that may be needed during an emergency including kitchen, sanitary facilities, and computer rooms. Control Room design is based upon the safe occupation of the Control Room envelope (CRE) during normal operation and for a period of not less than 30 days after a LOCA.

Miscellaneous Ventilation Systems

DGB Ventilation System

Each DG compartment is furnished with a ventilation system sufficient to remove heat from the area. The system consists of a set of intake and exhaust louvers and exhaust fans and is Seismic Category I and ANS Safety Class 3. No redundancy is provided because the diesels are already redundant. The Diesel Generator Room Ventilation Sub-System (DGRVS) consists of two independent trains, one train for each Diesel Generator Area (DGA) (Train A and Train B). Each train consists of four 25 percent capacity vane axial exhaust fans, dampers, louvers, ductwork, and instrumentation necessary for the operation and control of the system.

The Day Tank Rooms Ventilation Sub-System (DTRVS) consists of two independent trains, one train for each DGA. Each train consists of one 100 percent capacity centrifugal exhaust fan, dampers, louvers, ductwork, and instrumentation necessary for the operation and control of the system.

Two (2) electric unit heaters are provided for each DGA (Train A and Train B). I&C are provided for each electric unit heater. The unit heaters are non-safety and are not required to operate during emergency conditions but are required to meet the Seismic Category II requirements, so that in the event of an earthquake the functionality of any Seismic Category I system or component is not adversely affected.

The Diesel Generator Compartment Ventilation System air exhausts are located in the roof of the respective compartments, and intake louvers are on the south and north walls of Unit 1 and Unit 2, respectively. The ventilation systems are Seismic Category I and designed to withstand tornado loads and tornado-related missiles.

Main Steam and Feedwater Piping Area Ventilation System

The MS and Feedwater Piping Area Ventilation System is designed to provide adequate ventilation, to provide sufficient heat in order to ensure freeze protection of equipment during the winter months, and to remove the heat dissipated by the MS and feedwater piping and any additional loads such as lighting or motor operators located in this area. This system is designed to maintain the ambient temperatures of the MS and feedwater areas at between 40°F and 104°F during all normal modes of plant operation. This system is not required to function following a DBA or following a loss-of-offsite power.

Safety related equipment, located adjacent to the MS and feedwater piping area are protected against the effects of MS and feedwater pipe breaks by the use of isolation dampers located where the supply and exhaust ducts penetrate the MS and feedwater piping area. These isolation dampers are Safety Class 3 and Seismic Category I.

The MS and Feedwater Piping Area Ventilation Supply System consists of two 50-percent-capacity vane axial fans connected in parallel and located downstream of a supply housing. The supply housing consists of a roll-type roughing filter, cooling coil, and electric heating coil. The supply air is provided from the Electrical Area Ventilation System as described below.

Electrical Area (Safeguards) Ventilation System

The Electrical Area (Safeguards) Ventilation System is designed to provide adequate ventilation in order to provide sufficient heat to ensure freeze protection of equipment during the winter months and to remove the heat dissipated by the electrical switchgear and associated electrical equipment (including lighting) contained within this area.

The system is designed to maintain the ambient temperature between 40°F and 104°F during all normal modes of plant operation. This system is not required to function following a DBA. The Operator verifies the normal ventilation fans automatically trip following a SI signal and manually trips the fans if required. In addition, emergency fan coil units are provided to maintain the safeguards switchgear train A and train B areas below the maximum ambient temperature of 122°F in the event of loss-of-offsite power or a LOCA, although the temperature may rise up to 129°F for a short period of time during a LOCA. The ductwork associated with the emergency fan coil units is interconnected with electrical area ventilation system ductwork. This ductwork, as well as the emergency fan coil unit, is classified Safety Class 3 in accordance with ANSI N18.2 and Seismic Category I. The coils on the fan coil units are supplied by the safety Chilled Water System.

ECB Uncontrolled Access Area Heating, Ventilation, and Air-Conditioning System

The uncontrolled access area HVAC system is designed to provide adequate ventilation, to provide sufficient heat in order to ensure freeze protection of equipment during the winter months and to remove the heat dissipated by equipment located in cable spreading rooms, battery rooms, and miscellaneous areas. The system maintains the ambient temperature between 40°F min. and 104°F max. during all normal modes of plant operation. It provides sufficient ventilation to the battery rooms to ensure a minimum number of air changes per hour in order to keep the hydrogen concentration of the rooms below the lower flammability limit, i.e., a hydrogen air mixture of 2.0 percent by volume. The battery room exhaust units and associated ductwork are designated ANS Safety Class 3 and Seismic Category I and operate in the event of a DBA. Individual room heaters are supplied to maintain the battery rooms at 70°F min.

The supply system consists of two 50-percent-capacity vane axial fans connected in parallel and located downstream of a supply unit. The supply unit consists of a sheet metal housing which contains a roll filter, an electric heater, and a cooling coil which is supplied water from the non-nuclear-safety related plant ventilation Chilled Water System. Outside air is drawn through louvered openings and an isolation damper, and passes through the supply unit, vane axial fans, and gravity dampers. The supply air is distributed throughout the Control Building and uncontrolled access areas, which contains cable spreading areas, battery and charger rooms, air compressor areas, and portions of a heating and ventilation equipment room.

The exhaust and recirculation system either returns air to the suction side of the supply unit or exhausts the air directly to atmosphere. This is accomplished through a system of exhaust ductwork located throughout the Control Building and uncontrolled access areas. The exhaust and recirculation system consists of two 50-percent-capacity vane axial fans and gravity dampers, both of which are required to direct the return airflow back to the supply unit or to the atmosphere.

A separate ventilation exhaust system is provided for each of the battery and charger rooms. Each battery room ventilation exhaust system consists of two 100-percent-capacity centrifugal fans, and each battery charger room ventilation exhaust system consists of two 100-percent-capacity axial fans; all the fans have pneumatically actuated isolation dampers located on the suction side of the fans and associated ductwork. Supply air is drawn into the battery and charger rooms from adjacent corridors by one of the two exhaust fans. The exhaust fans are arranged in parallel. The battery and charger room exhaust is discharged directly to the environs through a missile-protected roof exhaust vent.

If the supply air handling unit fails to deliver air due to loss of power or any other reason, make up air for the battery rooms is provided by dampers that open the HVAC equipment room to the atmosphere. The suction created by the battery room exhaust fans draws outside air via the HVAC equipment room and supply ductwork into the battery rooms.

Office and Service Area HVAC System

The Office and Service Area HVAC System is designed to provide a comfortable environment for operating personnel by maintaining the temperature for laboratories or other areas that contain calibration or test equipment. The Office and Service Area HVAC System also prevents odors in the toilets, and locker rooms from diffusing to other occupied areas. Potentially radioactive rooms are exhausted through the plant atmospheric cleanup trains prior to releasing the effluents to the atmosphere. This system is designed to function during all normal modes of plant operation, but it is not required to operate in the event of a DBA or following a loss-of-offsite power. Running of the system affects the performance of the PPVS which exhausts air from a portion of areas served by this system. Redundant and diverse, single active failure proof trips of the Office and Service Area Fans are provided to ensure adequate ESF filtration.

The Office and Service Area HVAC Supply System consists of two 50-percent capacity air-handling units each supplying air through a duct distribution system to all the rooms of the office and service area. The air handling units are located in a heating and ventilation equipment room within the control building and consist of a gravity damper, electric heating coil, chilled water cooling coil, and centrifugal fan. Makeup air enters the system through a missile protected inlet. This makeup air is mixed with the return flow from the office and service area rooms and passes through roughing filter. The tempered air is then supplied to the rooms which constitute the office and service area.

Uninterruptible Power Supply (UPS) and Distribution Rooms Air Conditioning System

The UPS and Distribution Rooms Air Conditioning (A/C) System equipment is located at EL. 778-ft of the ECB. The Fan Coil Units are located at EL. 792-ft of the ECB. The system's primary function is to provide cooling for Class 1E electrical equipment in the UPS and Distribution Rooms, Trains A & B, Units 1 and 2, (EL. 792-ft) and the mechanical equipment room (EL. 778-ft). The Fan Coil Units are designed to operate during all modes of plant operation. The air-conditioners are normally on stand-by. However, if a fan coil unit is unavailable, either one of the UPS air-conditioners (Train A or Train B), should be operating.

The Fan Coil Unit portion of the Air Conditioning System is comprised of one 100 percent capacity self-contained Fan Coil Unit. Each unit cools its respective UPS Room. The Heat Sink for the cooling coil is the Safety Chilled Water (SCW) System.

The other portion of the A/C system is comprised of two 100-percent capacity self-contained air-conditioning units located in adjacent rooms that are physically separated by a dividing fire wall. The redundant A/C units are powered from independent Class 1E buses. The UPS and Distribution Room A/C System is ANS Safety Class 3 and Seismic Category I. Each A/C unit consists of replaceable-type filters, refrigerant type (R-12) cooling coil, fan, compressor, condenser, and all necessary I&C. The heat sink on the condenser side of the units is supplied by the CCW System.

SWIS Ventilation System

The heating and ventilation system is designed to maintain the ambient temperatures within the SWIS. The service water pump area exhaust system consists of eight 50-percent-capacity, propeller-type fans, which are mounted on a missile-protected exhaust plenum located in the overhead of the draft damper. The fans are started automatically by locally mounted temperature switches or manually by the intake structure operator. A high temperature alarm in the Control Room is provided.

Outside air is drawn through grated openings with outside air intake screens in the floor of the intake structure located near the base of the pump motors. This air picks up heat dissipated by the service water pump motors. Then the stratified air is discharged by exhaust fans to the outdoors through a missile-protected opening in the side of the intake structure.

Plant Ventilation Systems

FB / SFP Area Ventilation System

The Fuel Building ventilation system is designed to maintain suitable ambient conditions for personnel and equipment during normal plant operations and scheduled shutdowns. During emergency conditions (LOCA with a LOOP) the ambient temperature in the SFP heat exchanger and pump rooms shall be maintained below 122°F, though the temperature may rise to 129°F for a short duration. In addition, a slight negative pressure is maintained during normal operation and during a fuel handling accident to prevent the outflow of unfiltered, contaminated air to the environment. Operating the primary plant ventilation exhaust filter trains minimizes the release of radioactive particulate effluents and radioiodine to the environment.

The primary plant air supply system delivers filtered and tempered outside air to each floor of the FB through a duct distribution system. Each air supply unit consists of a roughing filter, heating, and cooling coils, and a 100-percent-capacity fan.

Emergency fan coil units are provided for the SFP pump rooms. The fan coil units maintain suitable operating temperatures in the pump rooms during all modes of operation. The cooling medium for these fan coil units is the nuclear safety Chilled Water System.

Primary Plant Ventilation System/ AB and Radwaste Area Ventilation System

AB (controlled access area) and radwaste area ventilation system is designed to maintain suitable and safe ambient conditions for operating equipment and personnel during normal plant operation. The primary plant air supply system delivers filtered and tempered outside air to each floor of the AB through a duct distribution system. A minimum of three air supply units of the Primary Plant Ventilation System are normally used for ventilation of the controlled access areas of the Auxiliary, Fuel and Safeguards Buildings.

Each air supply unit consists of a roughing filter, electric heating and cooling coil, and a fan. Chilled water is supplied to the supply air handling units by the plant ventilation Chilled Water System. The AB ventilation system is designed to maintain a slightly negative pressure with respect to the environs during normal operation and during and after a LOCA. The exhaust system ductwork branches to all areas within the AB. Exhaust air is discharged to the atmosphere through the plant ventilation discharge duct after filtration through the modular exhaust filtration units. The AB ventilation duct is monitored by an in-line radiation monitor at the outlet of the ventilation duct header. Each modular non-ESF exhaust filtration unit consists of a roughing and two HEPA filters, an iodine adsorber, and a fan.

Fan coil units are provided for the charging and CCW pump rooms in the AB. The fan coil units maintain pump room temperature at a suitable level during all modes of pump operation. All emergency fan coil units are Seismic Category I and ANS Safety Class 3 and use chilled water supplied by the nuclear safety Chilled Water System as a cooling medium. The positive displacement charging pump fan coil unit is non-safety related and is supplied cooling water from the plant ventilation Chilled Water System.

The FB, AB, Safeguards buildings, and Containment purge supply and exhaust units are all part of a modular ventilation system. This system consists of twelve identical non-ESF exhaust ventilation units, four ESF exhaust units, and eight air supply units. Each of the non-ESF exhaust ventilation units consist of (in order) a roughing filter, HEPA filter, iodine adsorber, HEPA filter, and fan. Each of the eight air supply units consists of a roll filter, heating and cooling coils, and a fan. The total capacity provided is more than required for normal operation; thus, adequate redundancy is provided to prevent a single supply or exhaust fan failure from affecting system operation.

During a LOOP, the non-ESF exhaust fans trip automatically causing the interlocked supply fans to also trip. The operator manually trips any remaining operating supply fans and energizes one (or two) non-ESF exhaust fans to ensure monitoring of effluents.

During a LOCA, in either Unit 1 or Unit 2, all supply and exhaust fans trip automatically on the SI signal while the ESF exhaust fans start automatically. This trip is redundant and meets the single active failure criteria. This will ensure the Primary Plant Ventilation System maintains a slight negative pressure in the negative pressure envelope during all modes of operation.

Chilled water for the cooling coils is provided by the plant ventilation Chilled Water System. Heating coils are electric. The exhaust system is Seismic Category I up to the fan discharge. The air supply system is non-nuclear safety Seismic Category II except for the fan discharge gravity dampers that shall be safety Class 3 and Seismic Category I.

SGB Ventilation System / ESF Ventilation System

The SGB ventilation system is designed to maintain suitable and safe ambient conditions for operating equipment and personnel during normal plant operation and maintains portions of the building under a slightly negative pressure with respect to the environment during all modes of operation. In addition, the operation of the ESF exhaust filtration unit maintains a slightly negative pressure in portions of the building with respect to the environment following a LOCA and loss of offsite power, thus reducing the radioactive effluent released to the environment.

The primary plant air supply system delivers filtered and tempered outside air to each floor of the safety feature area through a duct distribution system. Each supply unit consists of a roughing filter, heating and cooling coils, and fan. Chilled water is supplied to the cooling coils from the plant ventilation Chilled Water System.

Each of the four ESF exhaust filtration units consists of a demister, heater, HEPA filter, iodine adsorber, HEPA filter and fan, and complies with the environmental and components design criteria.

The supply and exhaust system ductwork branches to all areas within the safety feature area. Wherever possible, airflow is directed from areas of lower potential radioactivity to areas of higher potential radioactivity. Unit heaters are provided in specific areas for operator comfort and to maintain ambient temperature above the lower limits for some process piping. Emergency fan coil units, each of which comprises a water cooling coil and fan section, are provided for all compartments which contain motor driven ESF pumps and the electrical areas. The cooling medium for these fan coil units is chilled water, which is supplied by the nuclear safety Chilled Water System.

High-Pressure Chemical Feed Room Ventilation System (HPCFVS)

The HPCFVS is designed to provide adequate ventilation to Room 100 to maintain the equipment below its design qualified temperature during LOOP and LOCA. The HPCFVS consists of Class 1E power supply, safety related and seismically supported supply and exhaust fans. The supply fan is provided with two in-line gravity dampers upstream of the fan and ductwork to distribute outside air to the room. The exhaust fan is provided with two in-line gravity dampers downstream of the fan to exhaust air directly from the room to the outside. The HPCFVS is required to operate when train “B” class 1E power source is utilized, and the temperature inside the room increases as a result of heat dissipated from the MCC located in this room. The HPCFVS is to be started and stopped automatically by a temperature indicating switch (TIS) which senses and indicates the room temperature.

During all modes of plant operation, the HPCFVS will be in a standby mode. Room 100 will be maintained at a slightly negative pressure. However, when the HPCFVS is energized, the supply air to Room 100 is greater than the exhaust air to ensure the room is maintained at a positive pressure. The excess air will be exhausted through the primary plant exhaust system ductwork. The exhaust fan will trip if the supply fan fails to run.

Boundary

Containment Ventilation Systems

Nuclear safety related components in the Containment Ventilation Systems that are included in this SAMR are those that support the 10 CFR 54.4(a)(1) intended functions discussed below. nuclear safety related components in the Containment Ventilation Systems are those that maintain the pressure boundary of Containment starting downstream from, and including, the Containment isolation valves associated with the containment purge supply lines, and upstream of, and including, containment isolation valves associated with Containment purge exhaust lines and Containment pressure relief lines.

The NNS filter housings of the Containment preaccess filtration unit for each CPNPP unit up to the deluge supply and drain valves, and associated loop seal piping, for the unit are also within the evaluation boundaries. NNS components of the Containment Ventilation Systems with the potential to affect nuclear safety related components in the Containment through spatial interaction are also included in the evaluation boundaries. The containment recirculation cooling, neutron detector well cooling, and CRDM air handling unit cooling coils and drip pans as well as the drain connections on the Containment preaccess filtration units are within the evaluation boundaries. In addition, Class 5 piping downstream of normally closed valves and piping, orifice, and screen upstream of the Containment pressure relief penetration are within the boundaries. The NNS valve vent piping and pressure relief intake components extend to the end of the seismic extension of the connection to the nuclear safety related components and are, therefore, assigned a structural integrity (attached) function. The NNS cooling coils and associated drip pans (including the lower portion of the housing) could leak onto any nuclear safety related component in the vicinity (and are, therefore, assigned a leakage boundary (spatial) function.

Additionally, NNS components within the reactor coolant pipe penetration cooling system direct airflow outside the primary shield wall to prevent dehydration of nuclear safety related concrete components (CC).

Containment Ventilation System boundaries for LR are reflected on the LRBDs listed below:

Unit 1:

- M1-0300-LR
- M1-0300-A-LR
- M1-0301-LR

Unit 2:

- M2-0300-LR
- M2-0300-A-LR
- M2-0301-LR

Common:

- None.

Control Room Area Ventilation System

Nuclear safety related components in the control room area ventilation system are those that support the 10 CFR 54.4(a)(1) intended functions discussed below. These are the components downstream of, and including, the southside and northside outside air intake dampers to the ventilation exhaust connection at the roof. This includes all control room area ventilation components except the humidifier packages on the control room A/C units. The control room emergency filtration/pressurization units include deluge and drain valves.

NNS components in the control room area ventilation system evaluation boundaries with the potential to affect nuclear safety related components include the discharge piping from nuclear safety related relief valves for the control room A/C unit condensers, and the supply piping to the humidifiers for the control room A/C units. The NNS relief valve discharge piping extends to the end of the seismic extension of the connection to the nuclear safety related relief valves and is, therefore, assigned a structural integrity (attached) function. The NNS supply piping to the humidifiers could potentially leak onto nuclear safety related components in the vicinity (outside the control room air conditioning units) and is, therefore, assigned a leakage boundary (spatial) function.

The Control Room Area Ventilation System boundaries for LR are reflected on the LRBDs listed below:

Unit 1 / Common:

- M1-0304-LR
- M1-0304-A-LR
- M1-0304-B-LR
- M1-0304-C-LR

Unit 2:

- None.

Miscellaneous Ventilation Systems

Nuclear safety related components in the Miscellaneous Ventilation Systems are those that support the 10 CFR 54.4(a)(1) intended functions discussed below. These components include the:

- Exhaust fans, dampers, ductwork, tubing, and valves for the battery rooms;
- Exhaust fans, dampers, ductwork, tubing, and valves for the DGAs;
- Ductwork and isolation dampers in the MS and feedwater piping area;
- Dampers, ductwork, and fan coil units in the electrical area of the SGB;
- Exhaust dampers and fans for the SWIS;
- Volume control dampers and upstream ductwork from the roof that supply the uncontrolled access area of the AB;
- UPS A/C units, associated condenser, booster fans, dampers, ductwork, and associated piping, tubing, and valves;
- Accumulator for the CCW return pressure control valve actuator from the UPS A/C unit condenser; and
- UPS room fan coil units.

NNS components with the potential for age-related degradation to affect safety related components in the vicinity of the Miscellaneous Ventilation Systems are the cooling coils, and associated drip pans and supply and drain connections, for the MS and feedwater piping area, office and service area A/C units, and uncontrolled access area A/C unit, as well as the R-12 piping associated with the condensers for the uninterruptible power supply A/C units downstream of the nuclear safety related relief valves, conservatively up to the roof exhaust. The NNS cooling coils, drip pans and supply/return piping contain water and are, therefore, assigned a leakage boundary (spatial) function. UPS A/C unit condenser relief valve discharge piping extends to the end of the seismic extension and is, therefore, assigned a structural integrity (attached) function.

Miscellaneous Ventilation Systems LR evaluation boundaries are shown on the following LRBDs:

Unit 1 / Common:

- M1-0302-LR
- M1-0302-B-LR
- M1-0304-01-LR

- M1-0305-LR
- M1-0305-A-LR
- M1-0312-LR
- M1-0313-LR

Unit 2:

- M2-0302-LR
- M2-0302-B-LR

Primary Plant Ventilation Systems

Nuclear safety related components in the primary plant ventilation systems are those that support the 10 CFR 54.4(a)(1) intended functions discussed below. The nuclear safety related components include:

- Fan coil units (emergency/room area coolers) for the motor driven auxiliary feedwater pump rooms, CCW pump rooms, CCP rooms, containment spray pump rooms, RHR pump rooms, SI pump rooms, and SFP heat exchanger and pump rooms;

- Dampers, ductwork, and fans for the high-pressure chemical feed rooms in the AB;

- Dampers, ductwork, exhaust fans and exhaust filter units from the AB, FB, and SGB to the exhaust plenum;

- Gravity dampers associated with the primary plant and AB ventilation equipment room supply.

The primary plant ventilation ESF and non-ESF filtration units also are equipped with FP deluge supply and drain valves for potential fires in the charcoal filters.

NNS components in the plant ventilation systems with the potential for age-related degradation to affect safety related components in the vicinity through spatial interaction are the cooling coils, and associated drip pans, supply/return and drain connections, for the primary plant ventilation supply, AB equipment room supply, and the positive displacement charging pump room fan coil units, and the drip pans (including lower portion of the housing for emergency room coolers). These NNS components are, therefore, assigned a leakage boundary (spatial) function.

Primary plant ventilation systems (including AB, FB, and SGB) boundaries for LR are reflected on the LRBDs listed below:

Unit 1 / Common:

- M1-0302-A-LR
- M1-0302-C-LR
- M1-0303-B-LR
- M1-0303-C-LR
- M1-0303-01-LR

- M1-0309-LR
- M1-0309-A-LR
- M1-0309-B-LR

Unit 2:

- M2-0302-A-LR
- M2-0302-C-LR

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The Containment Ventilation Systems provide primary containment pressure boundary and isolation. The Containment isolation valves in the Containment Ventilation System isolate on an isolation signal.

(2) The control room area ventilation system maintains emergency temperature limits within areas containing nuclear safety related components. The control room area ventilation system maintains the control room environment for personnel comfort and ensures that a temperature of 104°F is not exceeded for equipment concerns.

(3) The control room area ventilation system maintains a habitable environment in the event of a radiological emergency by maintaining the control room at a positive differential pressure with respect to adjacent areas in order to limit unfiltered inleakage to the CRE, providing filtered make up air, and filtering recirculation air.

(4) The Miscellaneous Ventilation Systems maintain an acceptable environment for the operation of nuclear safety related equipment to ensure operability of that equipment.

(5) The primary plant ventilation systems maintain an acceptable environment for the operation of nuclear safety related equipment to ensure operability of that equipment.

(6) The primary plant ventilation systems minimize the spread of airborne radioactivity or contamination from portions of the FB, AB, and SGB and filters the effluent prior to release to the environment under accident conditions.

(7) The primary plant ventilation systems maintain portions of the FB, AB, and SGB at a negative differential pressure with respect to adjacent areas in order to limit spread of airborne radioactivity under accident conditions.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) The Containment Ventilation System contains non-safety related water-filled lines in the Containment structure that have the potential for spatial interactions (spray or leakage) with nuclear safety related SSCs.

(2) Portions of the Containment Ventilation System include NNS piping that is in scope to provide structural support for nuclear safety related piping.

(3) NNS portions of the Containment Ventilation System (i.e., the reactor coolant pipe penetration cooling system) are designed to dissipate heat conducted to the supports by the reactor coolant lines utilizing forced convection to prevent dehydration of concrete.

(4) The control room area ventilation system contains NNS water-filled lines that have the potential for spatial interactions (spray or leakage) with nuclear safety related SSCs.

(5) The control room ventilation system contains NNS equipment that are attached to nuclear safety related SSCs and provide structural support to those SSCs.

(6) The Miscellaneous Ventilation Systems contain NNS water-filled lines that have the potential for spatial interactions (spray or leakage) with nuclear safety related SSCs.

(7) The Miscellaneous Ventilation Systems contain NNS equipment that are attached to safety related SSCs and provide structural support to those SSCs.

(8) The primary plant ventilation systems contain NNS water-filled lines that have the potential for spatial interactions (spray or leakage) with safety related SSCs.

(9) The primary plant ventilation systems contain NNS equipment that are attached to safety related SSCs and provide structural support to those SSCs.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) The Containment Ventilation System is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48). The preaccess filtration units’ containment charcoal filter units have a deluge system installed to extinguish fires in the charcoal filter trays installed in these filter units. The Containment Ventilation System must maintain FP system pressure boundary.

(2) The Containment Ventilation System is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the

Commission’s regulations for EQ (10 CFR 50.49). Components in the system provide Containment isolation following a LOCA.

(3) The control room area ventilation system is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48). The control room area ventilation system filtration units’ charcoal filter units have a deluge system installed to extinguish fires in the charcoal filter trays installed in these filter units. The control room area ventilation system must maintain FP system pressure boundary.

(4) The control room area ventilation system is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the commission’s regulations for SBO (10 CFR 50.63). The control room area ventilation system is relied upon to provide temperature control for the control room area during a SBO event.

(5) The Miscellaneous Ventilation Systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48). The plant ventilation systems are required to operate to maintain acceptable environments for required Fire Safe Shutdown equipment.

(6) The Miscellaneous Ventilation Systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for EQ (10 CFR 50.49). The Miscellaneous Ventilation Systems include components that are nuclear safety related and in a harsh environment and therefore, are environmentally qualified.

(7) The Miscellaneous Ventilation Systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48). The plant ventilation systems provide sufficient ventilation to keep the hydrogen content in the battery rooms below the lower flammability under accident conditions.

(8) The primary plant ventilation systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for FP (10 CFR 50.48). The plant ventilation systems are required to operate to maintain acceptable environments for required Fire Safe Shutdown equipment.

(9) The primary plant ventilation systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for EQ (10 CFR 50.49). The primary plant ventilation systems include components that are nuclear safety related and in a harsh environment and therefore, are environmentally qualified.

FSAR References

Containment Ventilation Systems

Appendix 9.4A

Control Room Area Ventilation System

Sections 6.4.2 and 9.4.1

Miscellaneous Ventilation Systems

Appendices 9.4B, 9.4C.1, 9.4C.2, 9.4C.3, 9.4C.4, 9.4C.6, 9.4C.8 and 9.4C.9

Primary Plant Ventilation Systems

Sections 6.5.1, 9.4.2, 9.4.3, and 9.4.5
Appendices 9.4C.10 and 9.4D

Components Subject to AMR

Table 2.3.3-8a through Table 2.3.3-8d lists the component types in the Containment Ventilation Systems component types subject to AMR and their associated component intended functions.

Table 3.3.2-8a through Table 3.3.2-8d provides the results of the AMR for the Containment Ventilation Systems.

Table 2.3.3-8a
Containment Ventilation Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Cooling coil (Containment recirculation)	Leakage boundary (spatial)
Cooling coil (CRDM air handling unit)	Leakage boundary (spatial)
Cooling coil (neutron detector well)	Leakage boundary (spatial)
Damper housing	Pressure boundary
Damper housing (reactor coolant pipe penetration)	Direct flow
Drip pan	Leakage boundary (spatial)
Ductwork (reactor coolant pipe penetration)	Direct flow
Fan housing (reactor coolant pipe penetration)	Direct flow
Filter housing (Containment preaccess)	Pressure boundary
Orifice*	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Screen	Structural integrity (attached)
Valve body**	Leakage boundary (spatial) Pressure boundary

* Includes both containment pressure relief (24x18 restrictive orifice) and drain flow orifice for Containment preaccess filtration unit loop seal.
** Includes Containment isolation valves and dampers and Containment preaccess filtration deluge supply and drain valves.

Table 2.3.3-8b
Control Room Area Ventilation System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Condenser (control room A/C)	Heat transfer Pressure boundary
Cooling coil (control room A/C)	Heat transfer Pressure boundary
Damper housing	Pressure boundary
Drip pan (control room A/C)	Leakage boundary (spatial)
Ductwork	Pressure boundary
Fan housing	Pressure boundary
Filter housing (control room A/C)	Pressure boundary
Filter housing (emergency filtration/pressurization)	Pressure boundary
Flexible connection	Pressure boundary
Flexible connection (control room A/C)	Pressure boundary
Oil separator (control room A/C)	Pressure boundary
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Strainer (control room A/C)	Pressure boundary
Trap (control room A/C)	Pressure boundary
Tubing (control room A/C)	Pressure boundary Structural integrity (attached)
Valve body	Leakage boundary (spatial) Pressure boundary

Table 2.3.3-8c
Miscellaneous Ventilation Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Accumulator (CCW return pressure control valve actuator)	Pressure boundary
Bolting	Mechanical closure
Condenser (UPS room A/C)	Heat transfer Pressure boundary
Cooling coil (electrical area supply)	Leakage boundary (spatial)
Cooling coil (main steam feedwater area supply)	Leakage boundary (spatial)
Cooling coil (office and service area A/C)	Leakage boundary (spatial)
Cooling coil (unescorted access area exhaust (battery room))	Leakage boundary (spatial)
Cooling coil (UPS room A/C)	Heat transfer Pressure boundary
Damper housing	Pressure boundary
Drip pan	Leakage boundary (spatial)
Ductwork	Pressure boundary
Fan coil unit (electrical area)	Heat transfer Pressure boundary
Fan coil unit (UPS room)	Heat transfer Pressure boundary
Fan housing	Pressure boundary
Filter housing (UPS room A/C)	Pressure boundary
Flexible connection	Pressure boundary
Piping	Pressure boundary Structural integrity (attached)
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-8d
Primary Plant Ventilation Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Cooling coil (Auxiliary Building equipment room supply)	Leakage boundary (spatial)
Cooling coil (primary plant supply)	Leakage boundary (spatial)
Cooling coil (positive displacement charging pump)	Leakage boundary (spatial)
Damper housing	Pressure boundary
Drip pan	Leakage boundary (spatial)
Ductwork	Pressure boundary
Fan coil unit (AFW and ESF pump rooms)	Heat transfer Pressure boundary
Fan coil unit (CCW pump room)	Heat transfer Pressure boundary
Fan coil unit (CVCS pump rooms)	Heat transfer Pressure boundary
Fan coil unit (SFP heat exchanger and pump rooms)	Heat transfer Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	Pressure boundary
Piping	Leakage boundary (spatial) Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.9. Potable and Sanitary Water System

Description

Chlorination

The purpose of the Chlorination Systems (CLSs) is to inject sodium hypochlorite and sodium bromide as required into the SSW. The CLSs are ancillary systems required for normal operation.

Potable and Sanitary Water

The purpose of the Potable and Sanitary Water System (PWS) is to distribute potable water to the plant and associated support structures and buildings for both Unit 1 and Unit 2. The water is supplied by the Somervell County Water District public water system. Domestic wastes generated on-site are transferred to and treated in, the domestic waste treatment facility. Domestic waste treatment effluent is treated with high intensity ultraviolet light for disinfection and odor reduction and is discharged to the Squaw Creek Reservoir in accordance with regulatory agency permitted effluent limits.

Boundary

Chlorination

Scoping boundaries are shown on LRBDs M1-0233-LR and M2-0233-LR. The CLS includes Class 5 process tubing that enters the SWIS. However, the CLS process tubing that enters the SWIS is encased in either PVC or metallic piping which prevents leakage or spray onto nuclear safety related components. The PVC piping is considered to have a 10 CFR 54.4(a)(2) leakage boundary function as it prevents the process tubing from leaking or spraying onto nuclear safety related components. The metallic piping encasing the process tubing is a penetration sleeve which acts as a fire barrier, a 10 CFR 54.4(a)(3) function, is subject to AMR, and is addressed in Section 2.4.15.

Potable and Sanitary Water

Scoping boundaries are shown on LRBD M1-0227-001-LR. Scoping boundaries include the portions of the system within the ECB. Within this building, potable water supply piping supplies the computer room air handling units, technical support center air handling units, and control room a/c unit humidifiers. Not included within scoping boundaries is the domestic water storage tank and connected piping, which has been abandoned in place.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) None.

FSAR References

Section 9.2.4

Components Subject to AMR

Table 2.3.3-9a through 2.3.3-9b lists the PW component types subject to AMR and their associated component intended functions.

Table 3.3.2-9a through 3.3.2-9b provides the results of the AMR.

Table 2.3.3-9a
Chlorination System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Piping	Leakage boundary (spatial)

Table 2.3.3-9b
Potable and Sanitary Water System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Piping	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

2.3.3.10. Process and Effluent Radiological Monitoring and Sampling System

Description

The Process and Effluent Radiation Monitoring And Sampling Systems consist of both monitoring and sampling subsystems. The monitoring subsystems determined to be within the scope of LR are collectively referred to as the Process Radiation Monitoring System (PRMS). The sampling subsystems within the scope of LR are called the Process Sampling System (Primary) (PSS), the Post-Accident Sampling System (PAS), and the Secondary Plant Sampling System (SSS). The system descriptions that follow describe in-scope portions of the PRMS and sampling systems.

The PRMS provides a means for measuring and controlling radioactive process streams and effluents throughout the plant. The PRMS aids in ensuring the protection of the general public and plant personnel from exposure to radiation or radioactive materials in excess of those allowed by applicable regulations or governmental agencies. The design objectives of this system for normal operation are as follows:

1. To provide continuous indication and on-demand record of radiation levels, and automatic record of alarms in process and effluent streams over the range from clean-plant background to levels commensurate with TS limits.

2. To provide data useful in reporting total released activity.

3. To give early warning of increasing levels of radioactivity in process and effluent streams by using an alert-alarm set point.

4. To give an alarm and initiate a control function, where appropriate, upon high radiation levels in plant process and effluent streams using a high-alarm set point.

5. To give an indication that there is a monitor malfunction, equipment failure, or loss of counts by using a channel signal valid data check. If the test is negative, a “fault” alarm is initiated.

The PRMS includes the liquid process and effluent radiation monitors, which include CCW, service water, SG blowdown sample, TB sump effluent, liquid waste effluent, waste gas, condenser off-gas, failed-fuel, and AB to low volume waste (LVW) monitors.

These monitors serve in conjunction with varied portable and mobile monitoring equipment as well as with a comprehensive sampling program. The sampling program is the primary method for quantitatively and qualitatively evaluating process system and effluent activity levels.

In the event of a radiation release, the PRMS can provide immediate information about the concentration and dispersion of radioactivity throughout the plant, enabling operating personnel to evaluate the severity and to mitigate the consequences. For some anticipated operational occurrences resulting primarily from operator error and under certain conditions where radiation levels exceed set points, the Radiation Monitoring System (RMS) automatically actuates necessary valves and thereby limits the consequences of the release.

Continuous radiation detection and/or periodic sampling capabilities is provided for all liquid and gaseous effluent paths from which detectable quantities of radioactivity can be released from the plant during normal operation, including anticipated operational occurrences and accidents. Effluent sampling of all potentially radioactive liquid and gaseous effluent paths is conducted on a regular basis to verify the adequacy of effluent processing to meet the discharge limits. In general, the effluent sampling program requires that stored wastes be sampled and analyzed prior to release to the environment, and that potentially radioactive, continuously released effluents be periodically sampled and analyzed.

Monitors are also provided that detect excessive radiation levels as part of process monitoring and sampling.

If radiation levels in the liquid discharge lines exceed predetermined monitor set points, the monitor trips, and initiates closure of the discharge isolation valve to terminate release. If radiation levels in the Primary Plant Ventilation System exceed predetermined monitor setpoints, the monitor trips and initiates closure of the gaseous waste processing system release valve.

Process streams of the various subsystems of the Liquid Waste Processing System have monitors that are augmented by a sampling system, and this combination provides radiation monitoring to determine changing levels of system radioactivity and equipment performance.

The Process and Effluent Radiation Monitoring And Sampling Systems are made up of multiple systems that contain components subject to AMR. These systems are listed below:

- Process Sampling System
    - Process Sampling Primary Plant System (PSS)
    - Post-Accident Sampling System (PAS)
- Secondary Plant Sampling System (SSS)
- Radiation Monitoring System (RMS)
    - Containment Atmospheric Monitoring System (AMS)

The description for each system is given below.

Process Sampling System (Primary)

The PSS facilitates obtaining representative liquid and gas samples at controlled temperatures and pressures for laboratory analysis and the monitoring of chemical and radiochemical conditions. The system primary function is NNS. Only portions of the system interfacing with nuclear safety related systems and containment penetrations are nuclear safety related. Other portions of the system including the sampling and analysis panels and the sample coolers perform no safety function but are required for normal operation.

The PSS processes samples from the RCS, SIS, RHRS, CVCS, and the SG blowdown system. The PSS also includes a sample station for various demineralizers in the AB.

Post-Accident Sampling System

PAS functional requirements have been eliminated based on License Amendment 91. The system has been placed in lay-up in accordance with plant procedures; however, components in this system are in-scope due to not being physically isolated and passing through nuclear safety related buildings with nuclear safety related equipment in the vicinity. The PAS is shown on M1-0228-01-LR (reactor coolant) and M1/2-0301-A-LR (containment air). The PAS consists of two NNS subsystems for the representative sampling of reactor coolant, containment sump and containment atmosphere following an accident. The equipment within the PAS acts as a barrier to route radioactivity to a centralized location where samples are taken and transferred under controlled conditions for analysis. The system also provides for the controlled routing of purge flows to process systems, and the conditioning of samples prior to collection.

The containment isolation valves, containment penetrations and piping, and the PAS isolation valve control panel are designated Seismic Category I. All other equipment and piping are NNS.

Secondary Plant Sampling System

The SSS is provided to monitor water chemistry in condensate, SG feedwater, SG blowdown, main and auxiliary condensers, condensate polishing, heater drains, CST, vacuum deaerator, MS, atmospheric drain tank #1, and the demineralized water storage tank. The main panel is a factory assembled; skid mounted package located at EL. 778-ft in the ECB. Additional remote sample stations are located in the plant and send analyzer signals back to the main panel.

The main sample conditioning and analysis panel consists of wet and dry sections. The wet section contains the sample coolers, high-pressure regulators, the isothermal bath, and automatic in-line analyzers. The sodium, chloride, dissolved oxygen, and pH monitors are also in the wet section of the panel as they are required to process system flow. The dry section contains annunciators, recorders, hydrazine and pH controllers, and pH monitors with associated electronic circuitry.

The system is required for safe normal operation of the plant and is classified NNS. The system is not required for safe shutdown of the plant or to function after a seismic event. Piping that is located in Seismic Category I structures is designated NNS, piping Class 5.

Only a small portion of this system is in-scope for LR as shown on the M1/M2-228 series LRBDs.

Radiation Monitoring System

The primary function of the RMS is to provide for the radiological health and safety of workers in the plant and the members of the general public offsite, by detecting and measuring the radiation levels in general access areas, process equipment streams, and effluent release points. When an area monitor measures a preselected level of radiation, it will provide visual and audible warnings locally, in the control room and certain other remote readout locations via the plant computers. If high radiation levels are detected in normal effluent batch releases, the RMS causes the release to be terminated. In the case of accident conditions, the RMS will initiate certain mitigative actions and continue to monitor the radiation levels and releases to provide data for emergency response.

The RMS is a nuclear safety related system. It contains both nuclear safety related and NNS portions and interfaces with both nuclear safety related and NNS systems.

Containment Atmospheric Monitoring System

The AMS is a subset of the radiation monitoring system and has nuclear safety related designated components. The AM mechanical system is comprised of capillary tubing and bellows.

<u>Boundary</u>

The assigned systems boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0222-LR
- M1-0222-A-LR
- M1-0222-B-LR
- M1-0228-LR
- M1-0228-A-LR
- M1-0228-B-LR
- M1-0228-C-LR
- M1-0228-001-LR
- M1-0228-002-LR
- M1-0301-A-LR
- M1-0304-LR
- M1-0304-B-LR

Unit 2:

- M2-0222-LR
- M2-0222-001-LR
- M2-0228-LR
- M2-0228-A-LR
- M2-0228-B-LR
- M2-0228-C-LR
- M2-0228-001-LR
- M2-0301-A-LR

Common:

- None

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

Process Sampling System (consisting of the PSS and PAS systems)

(1) The PSS supports the containment pressure boundary.

Secondary Plant Sampling System

(2) None.

Radiation Monitoring System (including the Containment Atmospheric Monitoring System)

(3) Support monitored nuclear safety related systems pressure boundary.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

Process Sampling System

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

Secondary Plant Sampling System

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

Radiation Monitoring System (including the Containment Atmospheric Monitoring System)

(1) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

Process Sampling System

(1) Relied upon in the safety analysis and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49).

Secondary Plant Sampling System

(2) None.

Radiation Monitoring System (including the Containment Atmospheric Monitoring System)

(3) None.

FSAR References

Sections 1.2.2.8.2, 9.3.2, II.B.3 and 11.5.1
Table 17A-1

Components Subject to AMR

Table 2.3.3-10 lists the Process and Effluent Radiation Monitoring and Sampling Systems component types subject to AMR and their associated component intended functions.

Table 3.3.2-10 provides the results of the AMR.

Table 2.3.3-10
Process and Effluent Radiological Monitoring and Sampling System
Component Types Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Heat exchanger (sample cooler)	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Tubing	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.11. Spent Fuel Pool Cooling and Cleanup System

Description

The Spent Fuel Pool Cooling and Cleanup System (SFS) is designed to remove decay heat generated by spent fuel assemblies stored in the SFPs and to maintain the clarity and purity of water in the SFPs, transfer canal, wet cask pit, RWST, and the refueling cavities. The SFS is also designed to ensure the spent fuel assemblies remain covered with water during all storage conditions.

The SFS consists of two redundant cooling loops, two purification loops, one SFP skimmer loop, two refueling cavity skimmer loops, two refueling water loops, and one transfer canal and cask pit drain path. The cooling loops are designed to remove long-term decay heat generated from spent fuel assemblies stored in the SFPs. The purification loops are designed to control and maintain clarity and purity of water in the SFPs, transfer canal, cask pit, refueling cavities, and RWSTs. Temporary equipment is used during refueling operations in lieu of the permanently installed refueling cavity skimmer loops.

The major cooling components are located in the FB. Each cooling loop includes a pump, heat exchanger, and associated piping, valving, and instrumentation. Heat is transferred via the SFP heat exchanger to the CCW System. During heat removal operations, a portion of the SFP water may be diverted through a demineralizer and filter in either of the purification loops to maintain SFP water clarity and purity. SFP cooling water is discharged back into the SFPs via fours spargers (two per pool). Each return line has a hole in it to prevent siphoning water to a level less than one-ft below normal SFP water level.

The major purification components are located in the AB. Two purification loops are Provided for removal of fission products and other contaminates by means of filtration and ion exchange. Each purification loop is capable of purifying flow from either the SFP cooling pumps or the refueling water purification pumps. The purification loops provide for cleanup of water in the RWST, refueling cavities, transfer canal, and the cask loading pits.

To further assist in maintaining water clarity in the SFPs, the water surface is cleaned by a skimmer loop. Water is removed from the surface by the skimmers, pumped through a strainer and filter, and then returned to the pool at remote locations from the skimmers. Each SFP skimmer filter return line to the SFPs has a hole in it to prevent siphoning.

To allow maintenance of the fuel transfer equipment, the transfer canal is drained by the cask pit and transfer canal drain pump. The transfer canal water is pumped through the purification loop and discharged into the RHUT, which is part of the BRS. After maintenance, an auxiliary discharge is provided in the BRS to return water to the refueling transfer canal using the recycle evaporator feed pumps.

The cask pits are drained in a similar manner. The cask pit and transfer canal drain pump impels the water through the purification loop and into the RHUT and returns water to the pits by way of the recycle evaporator feed pumps.

A secondary function of the SFS is to form a small portion of a boron recycle crosstie flow-path between the BRS and the SIS for each unit. This Y-shaped flow path allows the efficient transfer of RHUT water to either RWST.

Refueling gates divide the fuel transfer and storage areas and help to ensure the minimum required depth for SFP cooling is maintained for fuel stored or in transit.

Boundary

Boundaries for the SFS cooling loops start at the suction screens in the SFPs. Water from the SFPs travels through the Cheng rotation vanes, the SFP cooling water pumps, the SFP heat exchangers, and then returned to the SFPs via spargers located six-ft above the fuel assemblies.

Make-up water from the Unit 1 and Unit 2 reactor make-up water storage tanks is added to the SFS via the SFP cooling water pumps.

Make-up water from the Demineralized Water System is added to the SFS via the SFP cooling water pumps.

The SFS boundary with the CCW System ends at, and includes, the inlet and outlet nozzles for CCW to the SFP heat exchangers.

Water from the RWSTs can be clarified in the SFS purification loops with suction to the refueling water purification pumps via the RWSTs to refueling water purification pump suction crosstie piping. Clarified water is returned to the RWSTs from the SFS.

Spent resins from the purification loop demineralizers are discharged to the Liquid Waste Processing System from the SFS.

The process sampling subsystem provides for sampling and monitoring of the SFP demineralizer outlet chemistry. Sample connections are provided in lines from the SFP demineralizers to PSS.

Contents from the RHUT are pumped to the SF purification loop in lines from BRS to refueling water purification pump suction crosstie piping and returned back to the RHUT. The recycle evaporator feed pump in the BRS System is used to transfer water back to the fuel transfer canal or wet cask pit.

Water remaining in the refueling cavity at the end of refueling operations is drained to the reactor coolant drain tank pumps through waste processing system valves and returned to the purification loop via Waste Processing System valves.

Components and piping in the cooling loops, the two spent fuel demineralizers in the purification loops, and piping for refueling cavity drains are designed in accordance with ASME Section III, Class 3. Portions of SFS piping and valves which penetrate containment walls are designed per ASME Section III, Class 2. The remaining components and piping of the SFS are classified as NNS and designed in accordance with ANSI B31.1 Power Piping. The boundary between safety class piping and NNS class piping appears on LRBDs as safety class 3 to piping class 5 transition except on vent, drain and test lines which are NNS downstream of the root valve. The boundary between safety class 2 piping at containment penetrations to class 5 NSS piping is depicted on the LRBDs.

Other components within the system evaluation boundaries include those components associated with the SFP cooling loops, purification loops, and surface skimmer loop.

The SFS boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0235-LR
- M1-0235-01-LR
- M1-0235-02-LR

Unit 2:

- M2-0235-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Remains functional during and following DBEs to prevent significant reduction in fuel storage coolant inventory.

(2) Provides primary containment pressure boundary. The fuel transfer tube, purification loop piping, refueling cavity skimmer pump discharge, and refueling cavity drain lines penetrate primary containment.

(3) Removes heat generated by stored spent fuel elements from the station's SFPs to maintain stored fuel within acceptable temperature limits.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in the safety analysis and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). There are SFS components designed to accommodate and be compatible with post-accident environmental conditions in order to maintain their intended function.

FSAR References

Sections 9.1.3, 9.1.4.1 and 9.1.4.2
Tables 6.2.4-1, 9.1-2, and 9.4-2

Components Subject to AMR

Table 2.3.3-11 lists the SFP Cooling and Cleanup System component types subject to AMR and their associated component intended functions.

Table 3.3.2-11 provides the results of the AMR.

Table 2.3.3-11
Spent Fuel Pool Cooling and Cleanup System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Filter housing	Leakage boundary (spatial)
Flow element	Leakage boundary (spatial) Pressure boundary Throttle
Heat exchanger (SFP)	Heat transfer Pressure boundary
Orifice (SFP heat exchanger outlet lines) (Unit 2 SFP cooling pump suction line) (refueling cavity purification pressure reduction)	Pressure boundary Throttle
Orifice (cask pit and transfer canal drain pump discharge line)	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (SFP cooling water)	Pressure boundary
Pump casing (cask pit and transfer canal drain) (refueling cavity skimmer) (refueling water purification) (SFP skimmer),	Leakage boundary (spatial)
Resin trap	Filter Pressure boundary
Rotation vane (pipe only, rotation vanes are welded internally to the pipe, are not pressure retaining and are non-code)	Pressure boundary

Table 2.3.3-11
Spent Fuel Pool Cooling and Cleanup System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Screen	Filter
Strainer / skimmer	Leakage boundary (spatial)
Tank (SF demineralizers)	Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.12. Station Service Water System

Description

The purpose of the SSW is to supply cooling water to meet the plant cooling requirements during normal operation, shutdown, during or after a postulated DBA, and during all postulated DBE.

Therefore, the SSW furnishes a reliable and continuous supply of cooling water to the CCW heat exchangers, SI and CCP lube oil coolers, diesel generator jacket water coolers, and the containment spray pump bearing coolers and service water pump motor bearing coolers and pump bearings. In addition to the cooling function, the SSW is designed to provide the auxiliary feed water (AFW) pumps with a long-term source of water.

The SSW also performs the NNS function of supplying the Service Water CLS water requirements and the traveling screen wash pump water requirements.

The SSW consists of two separate and independent full-capacity, nuclear safety related trains. Cross connections between the two trains add operational flexibility to the SSW. The nuclear safety related trains are redundant in that the components supplied by one train are sufficient to perform the minimum required safety functions.

A cross connection between Unit 1 and Unit 2 SSW is provided. However, there is no sharing of any safety related component or safety related function between the two units. General Design Criteria 5 is satisfied by a single locked closed valve in the cross-connection provided between units.

SSW is pumped from the SSI, which is the UHS, and returned to the SSI through a discharge chute structure after picking up waste heat from various nuclear safety related cooling systems. The SSI is an enclosed body of water formed from a cove of the SCR and is retained by a Seismic Category I dam. SSI water enters the SWIS through the trash racks and traveling screens and is chlorinated in the SWIS. A liquid biocide is also added to the SSI water for Asiatic clam control. The traveling screens are periodically washed with service water taken from the discharge of the service water pumps. The screen wash system consists of two horizontal screen wash pumps which supply water to the travelling screen spray headers which wash the travelling screens.

Two full capacity SSW pumps and two full capacity supply and return headers are provided for each unit. These pumps are 24-in, 2-stage, vertical wet pit pumps. Both pumps normally operate. This provides continuous cooling water supply to the two redundant nuclear safety related trains. The service water pump bearings are lubricated by service water taken from the pump discharge line. This water passes through a set of two "Y" type strainers, installed in series, prior to entering the service water pump bearings.

The 24-in diameter pump discharge headers are enlarged to 30-in diameter prior to leaving the SWIS. The four 30-in underground SSW lines rise to EL. 804-ft 3-in in the yard area (below the ground level EL. 810-ft). Prior to entering the FB, the 30-in headers drop at a 45 degree angle to different levels and are stacked vertically. The headers then enter the FB through watertight sleeves. Upon leaving the FB and entering the AB, a 10-in diameter pipe is branched off of each header. After the branch-off, the 30-in headers are reduced to 24-in and connect to the nozzle of the tube side of the CCW heat exchangers. Each train is connected to one full size CCW heat exchanger. The outlet header from each heat exchanger has a flow limiting orifice and a gear operated butterfly type shut-off valve. A flow measuring element is installed in each header upstream of the butterfly valves. This outlet header then enters the FB. Before entering the FB, each 24-in header is enlarged to 30-in and the 10-in return pipe is converged into the header. The piping then enters and exits the FB through watertight sleeves. From this point the supply and return headers run parallel to each other in the pipe tunnel and in the yard for approximately 500-ft where the return headers diverge and continue to the concrete stilling basin which discharges into the service water discharge canal that connects to the SSI.

A separate 10-in line branches from each of the main 30-in SSW supply headers upstream of the CCW heat exchangers and runs through the AB and SGB. Train A and Train B are separated by about eight-ft and run in the same corridor of the AB and SGB. In the AB a 2-in branch from the 10-in line supplies cooling water to the CCPs lube oil coolers. In the SGB, Train A and Train B branches supply cooling water to the SI lube oil coolers and containment spray pumps bearing coolers. The lines then run through a pipe tunnel to supply cooling water for the diesel generator jacket water coolers. Rising through pipe chases in the DBG, the pipes connect to the jacket water cooler inlet nozzles. The 10-in pipes run through the SGB corridor where they connect to the auxiliary feedwater pump emergency suction. The return lines join the SSW discharge headers downstream of the CCW heat exchangers.

Boundary

In-scope components in the SSW are those that maintain the pressure boundary of the system starting from the SSW pumps (downstream of the trash racks and travelling screens) and associated piping and valves including the set of strainers that are used to lubricate the service water pump bearings, up to the interface with the CCW heat exchangers, the CCP lube oil coolers, the containment spray pump bearing coolers, SI pump lube oil coolers, and the EDG jacket water coolers and all associated piping, valves, and strainers. Additionally, the piping up to the interface with the AFWS and the service water discharge canal are also part of the SSW and are included in the scope of LR.

There are in-scope NNS components such as piping, floor drains, drip pans and grab sample sinks which are shown on the LRBDs.

Individual cooling units or heat exchangers supplied by the SSW are not included in this system.

The SSW boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0233-LR
- M1-0233-A-LR
- M1-0234-LR

Unit 2:

- M2-0233-LR
- M2-0233-A-LR
- M2-0234-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Supplies cooling water to meet the plant cooling requirements during normal operation, shutdown, and during or after a postulated DBE

(2) Transfers heat to the UHS or SSI

(3) Provides auxiliary feedwater pumps an alternate, long-term source of water

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Contains components relied upon to perform a function that demonstrates compliance with regulations for EQ (10 CFR 50.49)

(2) Provides cooling water to satisfy the scoping criteria of 10 CFR 54.4(a)(3) relative to regulated events such as FP (10 CFR 50.48) and SBO (10 CFR 50.63).

(3) Provides a secondary source to the Auxiliary Feedwater pumps for decay heat removal during Fire Safe Shutdown events (10 CFR 50.48).

FSAR References

Sections 1.2.2.8.5 and 9.2

Components Subject to AMR

Table 2.3.3-12 lists the SSW component types subject to AMR and their associated component intended functions.

Table 3.3.2-12 provides the results of the AMR.

Table 2.3.3-12
Station Service Water System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flow element	Pressure boundary Throttle
Heat exchanger	Heat transfer Pressure boundary
Orifice	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (service water screen wash)	Leakage boundary (spatial)
Pump casing (station service water pumps)	Pressure boundary
Strainer	Filter Pressure boundary
Thermowell	Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.3.13. Ventilation Chilled Water Systems

Description

Plant Ventilation Chilled Water System

The plant ventilation Chilled Water System consists of two distinct subsystems.

The first subsystem consists of six chillers, four 50 percent capacity chilled water recirculating pumps, three 50 percent capacity chilled water booster pumps, a chilled water surge tank, chilled water cooling coils, and associated piping, valves, and instrumentation. Four chillers are located in the AB and two chillers are located in the Unit 1 TB. The chillers located in the AB are of the centrifugal type with hermetically sealed, electric-motor-driven compressors. The chillers located in the TB are of the centrifugal type with open electric motor driven compressors. The pumps are electric-motor-driven, single stage, centrifugal type. The evaporators of the six chillers are connected in series. The four chilled water recirculating pumps are connected in parallel, as are the three chilled water booster pumps. This subsystem is operated to support simultaneous operation of, mainly, the containments of Unit 1 and Unit 2, which includes normal operation, reactor startup, normal reactor shutdown and reactor hot standby during a LOOP.

During reactor startup, normal operation, and normal reactor shutdown, operators will run a sufficient number of chillers to maintain ambient area temperatures within required limits.

Additionally, two out of four chilled water recirculating pumps and two out of three chilled water booster pumps are required to operate.

The equipment served by this subsystem is as follows:

- Three out of four containment air recirculation and cooling units
- One out of two containment neutron detector well cooling units
- Containment CRDM cooling unit
- Positive Displacement Charging Pump Room fan coil unit
- Secondary plant sampling package
- TB Switchgear Area supply unit
- TB Office and Room Area fan coil units
- Instrument Air System Coolers

The CCW from the non-safeguard loops of the CCW System for both Units is used as the cooling medium for the four chillers located in the AB. The arrangement of the CCW System piping allows the condensers in a specific pair of these chillers to be connected in series. Two chillers are cooled by Unit 1 non-safeguard CCW loop; and the other two chillers are cooled by Unit 2 non-safeguard CCW loop.

The two chiller condensers in the Unit 1 TB are connected in parallel and are supplied with CW as the cooling medium.

During a LOOP, this subsystem is required to serve Unit 1 and Unit 2 containment cooling units and Unit 1 and Unit 2 positive displacement charging pump room fan coil units. It will also serve the secondary plant sampling package. Only the four chillers located in the AB and two associated chilled water recirculating pumps are required to operate. The two Unit 1 TB chillers and their associated chilled water booster pumps are isolated. The four chillers and the two chilled water recirculating pumps which are selected for operation are powered from the Standby Power System during a LOOP.

The second plant ventilation chilled water subsystem consists of three chillers, each sized for 33.33 percent of the total cooling capacity, four 33.33 percent capacity chilled water circulating pumps, a chilled water surge tank (which is shared with the first subsystem), chilled water cooling coils, and associated piping, valves, and instrumentation. The chillers are centrifugal type, with direct open, electric-motor driven compressors. The chilled water circulating pumps are electric-motor-driven, single stage, centrifugal type. The evaporators of the chillers are connected in parallel to common chilled water supply and return headers. The four chilled water circulating pumps are also connected in parallel. This subsystem is operated during normal operation, reactor startup and normal reactor shutdown only. It does not operate during a LOOP. During operation at maximum design load, all three chillers are required to operate. Additionally, three out of four chilled water circulating pumps are required to operate, with the fourth pump remaining on standby.

The equipment served by this subsystem is as follows:

- Six out of eight Primary Plant Ventilation System (PPVS) supply units
- The AB HVAC Equipment Room Supply Unit
- SGB Electrical Area supply unit
- SGB MS and Feedwater Penetration Area supply unit.
- ECB Uncontrolled Access Area supply unit.
- Instrument Air System Coolers

The condensers of the three chillers are connected in parallel and are supplied with CW as the cooling medium. The surge tank is provided to accommodate expansion and contraction within the system and to permit monitoring of the system for leakage. The makeup water to the tank is supplied from the demineralized water system.

Except for cooling units located inside the containment, instrument air system, and those for the TB Office and Room Area, all cooling coils are provided with a thermostatically controlled valve at the outlet of the coil. The thermostatically controlled valve for the TB Switchgear Area cooling coils is located at the inlet of the coils. The outlet air temperature from the coil controls the valve.

The coils for the cooling units located inside the containment, except for the CRDM cooling coils, are provided with an electric-motor-operated-on-off valve which is interlocked with the respective cooling unit fan. Flow through the CRDM coils is not affected when the fans, which can be controlled from the Control Room, are stopped.

Vent and drain connections are provided on piping and equipment where necessary to facilitate testing and maintenance operations. All major components are provided with upstream and downstream isolation valves to facilitate maintenance operation.

The system is not required to function following a DBA. During a DBA, the chilled water supply and return containment penetrations isolation valves are closed, and the system will shut down.

The chilled water is circulated through the system by the chilled water recirculating pumps and circulating pumps.

The operating pumps take suction from their respective chilled water return headers and discharge it to the evaporator sections of the associated operating chillers. The cooled chilled water, after rejecting heat to the refrigerant in the chillers, is discharged into the respective chilled water supply main. The chilled water from the supply main flows through the cooling coils of the various cooling units associated with the subsystems. The warm chilled water from the cooling coils flows via the chilled water piping back to the respective chilled water return header, which feeds the suction of the chilled water recirculating pumps, thus completing the closed system.

I&C incorporating audible and visual annunciation facilitate continuous monitoring of the system performance and alert the operator in the event of a system malfunction. To maintain constant chilled water flow, a valve located in a recirculation loop is modulated by a signal from a flow element in the first subsystem and a pressure differential controller in the second subsystem. The containment isolation valves are motor operated and are powered from the DGs.

Safety Chilled Water System

The system for each unit consists of two-100 percent-capacity hermetic centrifugal chillers, two-100 percent-capacity chilled water recirculation pumps, a chilled water surge tank, chilled water fan coil units, and associated piping, valves, and instrumentation.

The chilled water by the system is supplied to the cooling units, serving the associated rooms/ areas, as follows:

- Component cooling water pump emergency fan coil units
- Charging pump emergency fan coil unit

- SFP heat exchanger and pump emergency fan coil unit (These fan coil units are common for both units, and the piping arrangement will allow chilled water to be supplied from either the Unit 1 or the Unit 2 Chilled Water System.)
- SI pump emergency fan coil unit
- Containment spray pump emergency fan coil unit
- RHR emergency fan coil unit
- Auxiliary Feedwater pump emergency fan coil unit
- Electric area emergency fan coil units
- Uninterruptable Power Supply (UPS) Room Fan Coil Units

The chillers are of the centrifugal type with hermetically sealed, electric-motor-driven compressors. The CCW from the respective trains of the safeguards loop of the CCW System is used as a cooling media for the condensers.

The pumps are electrical-driven, single-stage, centrifugal type. The surge tank is provided to accommodate expansion and contraction within the system and to permit monitoring of the system for leakage. The makeup water to the tank is supplied from either the demineralized water system or the reactor makeup water system, with consideration given to water chemistry for the Safety Chilled Water System corrosion inhibitor. The partition in the surge tank provides separate surge volumes for each safety train. A leak in one train will not affect the other train.

Vent and drain connections are provided on piping and equipment where necessary to facilitate testing and maintenance operations. All major components are provided with upstream and downstream isolation valves to facilitate maintenance operation.

The system is required to operate during post DBA conditions. The system is powered from Class 1E safety buses. During LOOP, the power is provided from DGs.

Chilled water is circulated through each of the two closed-loop safety trains. The recirculation pump takes suction from the chilled water return line and the chilled water surge tank which connects into the return line. The recirculation pump discharges into the evaporator of the chiller. The chilled water from the evaporator enters into the supply header and passes through the fan coil units connected in parallel. The return chilled water from the fan coil units enters into the chilled water line, thus completing the closed system.

<u>Boundary</u>

The evaluation boundaries of the Chilled Water Systems are:

- From the plant ventilation chilled water surge tank connection to the DRMWS through the piping to, and including, the circulating pumps. From the pumps to the coiling coils associated with cooling units serving areas of the AB, FB, SGB, ECB, and RCB returning from these coils to the plant ventilation chilled water chiller packages and back to the plant ventilation chilled water surge tank. All associated piping, valves, and tanks within these system runs are included up to the system interfaces and where the associated piping exits buildings with areas served by the system or enters the TB.

- From the safety chilled water surge tanks connection to the DRMWS through the piping to, and including, the circulating pumps. From the pumps to the safety Chilled Water System chiller packages to the coiling coils associated with cooling units serving areas of the AB, SGB, and ECB returning from these coils back to the circulating pumps. All associated piping, valves, and tanks within these system runs are included up to the system interfaces.

The Chilled Water Systems boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0307-A-LR
- M1-0311-LR
- M1-0311-A-LR
- M1-0311-B-LR

Unit 2:

- M2-0307-LR
- M2-0307-A-LR
- M2-0311-LR
- M2-0311-A-LR
- M2-0311-B-LR

Common:

- M1-0307-LR
- M1-0307-B-LR
- M1-0307-C-LR

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The Chilled Water Systems provide primary containment pressure boundary and isolation. The plant ventilation Chilled Water System supply and return lines supporting the cooling coils inside containment contain isolation valves that close on an isolation signal.

(2) The Chilled Water Systems remove heat rejected by nuclear safety related components to ensure those components perform the intended safety function. The safety Chilled Water System removes heat rejected by nuclear safety related ESF pumps motors and UPS equipment and electrical

switchgear to maintain ambient temperatures below component design limits within the rooms served.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) The Chilled Water Systems maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) The Chilled Water Systems maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) The Chilled Water System is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48). The safety Chilled Water System is required to supply nuclear safety related cooling units for the purpose of cooling CCW, centrifugal charging, motor-driven auxiliary feedwater (MDAFW), and RHR pump rooms and essential electrical areas.

(2) The Chilled Water System is relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). The safety Chilled Water System recirculation pumps are required to start on a Blackout Sequence Signal.

(3) The Chilled Water Systems are relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). The Chilled Water Systems contain nuclear safety related equipment that is located, and required to operate in, a harsh environment.

FSAR References

Appendices 9.4E and 9.4F

Components Subject to AMR

Table 2.3.3-13 lists the Chilled Water Systems component types subject to AMR and their associated component intended functions.

Table 3.3.2-13 provides the results of the AMR.

Table 2.3.3-13
Chilled Water Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flexible connection	Leakage boundary (spatial) Pressure boundary
Flow element	Leakage boundary (spatial) Pressure boundary Throttle
Heat exchanger (oil cooler)	Leakage boundary (spatial)
Heat exchanger (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)
Heat exchanger (safety chilled water chiller – condenser)	Heat transfer Pressure boundary
Heat exchanger (safety chilled water chiller – evaporator)	Heat transfer Pressure boundary
Heat exchanger (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)
Heat exchanger (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Piping element	Leakage boundary (spatial)
Pump casing (safety chilled water recirc pumps)	Pressure boundary
Pump casing (ventilation chilled water recirc pumps)	Leakage boundary (spatial)
Rupture disc	Leakage boundary (spatial) Pressure boundary
Strainer	Leakage boundary (spatial)
Tank (chemical addition)	Leakage boundary (spatial)
Tank (chilled water surge tank – non-safety)	Leakage boundary (spatial)
Tank (chilled water surge tank – safety)	Pressure boundary
Thermowell	Leakage boundary (spatial) Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary

2.3.3.14. Waste Processing Systems

Description

The Waste Processing Systems (WPS) are designed to process liquid, gaseous, and solid waste while achieving the lowest reasonable radioactive release to the environment available through current technology. Liquid and gaseous wastes to be recycled within the plant are first segregated from those to be processed or shipped offsite.

The sub-systems of the WPS are described below.

Liquid Waste Processing System (LWPS)

The LWPS is designed to control, collect, process, handle, store, and dispose of liquid radioactive waste generated as the result of normal operation, including anticipated operation occurrences such as LWPS equipment malfunction, excessive leakage in RCS, and excessive leakage in auxiliary system equipment. Provisions are made to sample and analyze fluids before they are discharged. Based on this analysis, these wastes are either released under controlled conditions via the CW discharge canal or retained for further processing. The circulating waterflow serves to reduce the concentration of radioactivity in the plant effluent by diluting the LWPS discharges.

Normally, radioactive liquids discharged from the RCS are recycled or processed by the BRS, thereby limiting inputs into the LWPS. Water in the RHUT that needs to be processed is sent to the Filter/Demineralizer System (FDS).

The LWPS is designed to segregate different effluents from equipment leaks and drains according to their chemical and radiochemical properties. In addition, interconnecting piping is available to allow for operating flexibility and provide for efficient utilization of purification equipment. The system is divided into subsystems.

In the reactor coolant drain tank (RCDT) subsystem, recyclable reactor-grade effluents enter the system from equipment leaks and drains, valve leakoffs, pump seal leakoffs, loop drain leakoffs, and from other deaerated tritiated water sources inside the containment. Connections are provided for various drains and leakoffs and for cooling the PRT. This deaerated tritiated liquid is normally pumped directly to the RHUTs via the Reactor Coolant Drain Tank Heat Exchanger.

In the drain channel A subsystem, aerated tritiated liquid enters Drain Channel A through lines connected to the waste holdup tank. Sources of aerated liquid include accumulator drainage, sample room sink drains, ion exchanger, filter, pump, and other equipment drains. The Waste Evaporator Feed Pump delivers the contents of the Waste Holdup Tank through a filter to the Waste Evaporator Package, the FDS or Floor Drain Tank 3 for removal of radioisotopes and boron prior to reuse or discharge.

The drain channel B subsystem collects and processes non-reactor-grade liquid wastes. These include floor drains, equipment drains containing non-reactor-grade water, and other non-reactor-grade sources. Drain Channel B equipment includes three floor drain tanks, a common filter and evaporator, two waste monitor tanks with a common demineralizer and filter, and two additional monitor tanks.

Drain Channel C is provided to collect and process waste effluents from onsite vendor laundry, personnel decontamination showers and sinks, and surface decontamination. These liquids may be collected in the Laundry and Hot Shower Tank. Drain Channel C equipment includes a Laundry and Hot Shower Tank, strainer, and filter, two Laundry Holdup and Monitor Tanks, and a Laundry Water Head Tank.

The spent resin handling subsystem collects, handles, and processes spent resins from the primary fluid systems prior to their disposal.

Gaseous Waste Processing System (GWPS)

The GWPS stores fission gases removed from the RCS. This reduces the escape of fission gases from the RCS during maintenance operations or through equipment leakage.

The primary location from which radioactive gases are removed from the RCS is the volume control tank. Smaller quantities are received via the vent connections, from the RCDT, the PRT, and the RHUTs. The waste and recycle evaporator gas strippers are normally vented to the AB exhaust.

The GWPS is shared between Unit 1 and Unit 2. The main flow path in the GWPS is a closed loop comprised of two waste gas compressors, two catalytic hydrogen recombiners, eight gas decay tanks for normal power service and two gas decay tanks for service at shutdown and startup. The eight gas decay tanks used for normal power service can also be used to function as shutdown gas decay tanks at shutdown and startup. The system also includes a gas decay tank drain pump, four gas traps, and a waste gas drain filter. All of the equipment is located in the primary AB.

Solid Waste Management System (SWMS)

The SWMS is designed to control, collect, condition, handle, process, package, and temporarily store, prior to offsite shipment, solid radioactive waste generated as a result of normal operation, including anticipated operational occurrences. The SWMS consists of ATCOR system components and the waste baling system (WBS). The WBS has a baler located in the FB. An additional waste baler was abandoned in place in the Unit 1 RCB.

The originally installed ATCOR Radwaste Solidification System is not used and many of the components have been removed from the facility. Only those components necessary for the collection and conditioning of the various waste streams prior to discharge via the bulk disposal connections on EL. 810-ft of the FB are utilized. The major ATCOR system components which are utilized include the Waste Conditioning Tank, Waste Feeder Pumps, Emergency Waste Return Pump, Powdex Transfer Pump, CAT and their associated valves, piping, and controls.

Boundary

The WPS scoping boundaries include the LWPS Reactor Coolant Drain Tank Subsystem as shown on M1-0264-LR and M2-0264-LR. Boundaries begin at leak-off lines inside containment and continue to the reactor coolant drain tank. This includes collection points for equipment leaks, valve leakoffs, pump seal leakoffs, loop drain leakoffs, and other deaerated tritiated water sources inside containment. Included in this boundary is the circulation loop from the reactor coolant drain tank, through the reactor coolant drain tank pump, to the reactor coolant drain tank heat exchanger, and back to the reactor coolant drain tank. Not included in this boundary is the RCDT gas sample vessel, which has neither a structural integrity nor leakage boundary intended function.

The WPS scoping boundaries include the LWPS Drain Channel A Subsystem as shown on M1-0265-LR and M1-0265-001-LR. Boundaries include lines connected to the waste holdup tank from accumulator drainage, sample room sink drains, ion exchanger, filter, pump, and other equipment drains (at system transitions to “WP” as shown on the LRBDs). The waste holdup tank itself is not within evaluation boundaries as it is housed in a watertight compartment separated from nuclear safety related components. Pipe routing from the waste holdup tank, through a filter and waste evaporator package, to the floor drain system or floor drain tank are within evaluation boundaries.

The WPS scoping boundaries include the LWPS Drain Channel B Subsystem as shown on M1-0266-LR, M1-0266-001-LR, and M1-0266-A-LR. Boundaries include collection lines from non-reactor-grade liquid wastes, including floor drains, equipment drains, and other non-reactor grade sources (at system transitions to “WP” as shown on the LRBDs). Floor drain tanks collecting this liquid waste are included within this boundary. Process flow paths through the floor drain tank pump, strainer, filter, and evaporator are included within evaluation boundaries, as well as waste monitor tanks which collect process effluents.

The WPS scoping boundaries include the LWPS Drain Channel C Subsystem as shown on LRBD M1-0267-LR. Boundaries include the laundry and hot shower tank and associated pump, associated strainers and filters, laundry holdup and monitor tanks and associated pumps, and the laundry water head tank. Not included in evaluation boundaries are reverse osmosis equipment, with the exception of the feed precooler. Reverse osmosis equipment has been physically isolated from other plant equipment and abandoned in place, with the exception of the feed precooler. The reverse osmosis feed precooler has been abandoned in place but still receives chilled water and is therefore within scoping boundaries.

The WPS scoping boundaries include the LWPS Spent Resin Handling Subsystem as shown on M1-0268-LR and M1-0268-001-LR. Boundaries include collection lines to the spent resin storage tank, the spent resin storage tank itself, and spent resin sluice pump.

The WPS scoping boundaries include plant effluent holdup and monitor pumps and associated piping from the plant effluent holdup and monitor tanks, through the pumps, and to the Drain Channel B Subsystem. Not included in scoping boundaries are the plant effluent holdup and monitor tanks themselves, and connected piping located in the yard. These components in the yard are separated from nuclear safety related equipment and do not have spatial interaction concerns.

The WPS scoping boundaries include major SWMS components necessary for the collection and conditioning of various waste streams, including the waste conditioning tank, waste feeder pumps, emergency waste return pump, powdex transfer pump, chemical addition tank, and their associated valves and piping. This equipment is shown on M1-0268-002-LR.

The WPS scoping boundaries include specific sub portions of the GWPS as shown on M1-0269-LR, M1-0269-001-LR, M1-0269-A-LR, M1-0269-B-LR, M1-0270-LR, and M1-0270-A-LR. The waste gas compressor package heat exchanger and compressor package drain lines are within evaluation boundaries. Other portions of the compressor package are air/gas filled and do not have LR intended functions. The catalytic recombiner condenser, component cooling inlet and outlet piping to the condenser, and catalytic recombiner drain lines are within evaluation boundaries. Other portions of the catalytic recombiner are air/gas filled and do not have LR intended functions. Gas decay tanks and associated drain lines, including gas decay tank drain pumps and drain filters, are within evaluation boundaries. Also included within evaluation boundaries are connected lines to the gas decay tanks that have a structural integrity attached intended function. Piping isometrics detailing stress calculations are used to determine the extent of structural integrity attached piping. See the associated LRBDs for further detail.

Not included in scoping boundaries are the GWPS gas analyzer racks. These components are air/gas filled and do not have LR intended functions.

The WPS boundaries for LR are reflected on the LRBDs listed below:

Unit 1:
- M1-0264-LR

Unit 2:
- M2-0264-LR

Common:
- M1-0265-LR
- M1-0265-001-LR
- M1-0266-LR
- M1-0266-001-LR
- M1-0266-A-LR
- M1-0266-B-LR
- M1-0267-LR
- M1-0268-LR
- M1-0268-001-LR
- M1-0268-002-LR
- M1-0269-LR
- M1-0269-001-LR
- M1-0269-A-LR
- M1-0269-B-LR

- M1-0270-LR
- M1-0270-A-LR

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Maintains the reactor containment pressure boundary. The WPS includes piping that penetrates containment. The containment penetrations include containment isolation valves to assure that radioactive material is not inadvertently transferred out of containment.

(2) Maintains CCW pressure boundary. WPS heat exchangers utilize CCW and maintain the CCW pressure boundary. Waste processing coolers, condensers, and heat exchangers are serviced by the CCW System and part of its pressure boundary.

(3) Retain radioactive gases for decay. The WPS gas decay tanks and interconnecting piping and isolation valves provide holdup capacity to comply with site boundary dose requirements and commitments.

(4) Prevent flooding of nuclear safety related equipment. Safeguard building floor drain sump pumps prevent flooding of the SGB via pumping water from the sumps to the WPS floor drain tanks. WPS piping between the pumps and drain tanks aid in this intended function and is nuclear safety related.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49).

FSAR References

Sections 1.2.2.9, 11.2, 11.3 and 11.4

Components Subject to AMR

Table 2.3.3-14 lists the WPS component types subject to AMR and their associated component intended functions.

Table 3.3.2-14 provides the results of the AMR.

Table 2.3.3-14
Waste Processing Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Demineralizer (waste evaporator condensate) (waste monitor tank)	Leakage boundary (spatial)
Eductor	Leakage boundary (spatial)
Filter housing	Leakage boundary (spatial)
Flow element	Leakage boundary (spatial)
Heat exchanger (catalytic recombiner condenser)	Leakage boundary (spatial)
Heat exchanger (distillate cooler)	Leakage boundary (spatial) Pressure boundary
Heat exchanger (evaporator condenser and vent condenser)	Leakage boundary (spatial) Pressure boundary
Heat exchanger (evaporator)	Leakage boundary (spatial)
Heat exchanger (feed precooler)	Leakage boundary (spatial)
Heat exchanger (feed preheater)	Leakage boundary (spatial)
Heat exchanger (reactor coolant drain tank)	Leakage boundary (spatial) Pressure boundary
Heat exchanger (sample cooler)	Leakage boundary (spatial)
Heat exchanger (waste gas compressor seal cooler)	Leakage boundary (spatial) Pressure boundary
Piping	Leakage boundary (spatial) Pressure boundary
Pump casing (chemical drain tank pump) (concentrate canned pump) (distillate canned pump) (emergency waste return pump) (floor drain tank pumps) (gas decay tank drain pumps) (laundry and hot shower tank pumps) (laundry holdup and monitor tank pumps) (plant effluent holdup and monitor tank pumps) (powdex transfer pump) (reactor coolant drain tank pump) (waste evaporator condensate tank pump) (waste evaporator feed pump) (waste feeder pump) (waste monitor tank pumps)	Leakage boundary (spatial)

Table 2.3.3-14
Waste Processing Systems Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Rupture disc	Leakage boundary (spatial)
Steam trap	Leakage boundary (spatial)
Strainer	Leakage boundary (spatial)
Stripping column	Leakage boundary (spatial)
Tank (gas decay)	Pressure boundary
Tank (absorption tower) (chemical addition) (chemical drain) (evaporator reagent) (feeder acid flush system) (floor drain) (laundry and hot shower) (laundry holdup and monitor) (laundry water head) (reactor coolant drain) (spent resin storage) (waste conditioning) (waste evaporator condensate) (waste evaporator reagent) (waste monitor)	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial) Pressure boundary

2.3.4. Steam and Power Conversion Systems

The following systems are addressed in this section:

- Auxiliary Feedwater System (2.3.4.1)
- Condensate and Feedwater Systems (2.3.4.2)
- Main Steam, Reheat, and Steam Dump System (2.3.4.3)
- Main Turbine and Auxiliaries System (2.3.4.4)

2.3.4.1. Auxiliary Feedwater System

Description

The purpose of the Auxiliary Feedwater System (AFWS) is to provide a supply of high-pressure feedwater to the secondary side of the SGs for reactor coolant heat removal following a loss of normal feedwater. The system is also used in lieu of the main feedwater during cooldown and startup operations.

The AFWS is also an ESF system which provides a cooling source in the event of a LOCA and is used in the event of a MS line break, feedwater line break, Control Room evacuation, and SG tube rupture.

Additionally, for Unit 2, the AFWS is also designed to preclude the effects of hydraulic instability due to water hammer by supplying water to the secondary side of the SG through a separate upper auxiliary feedwater nozzle.

The system is classified as nuclear safety related and consists of ANS Safety Class 2 and 3 piping and equipment, except for the NNS condensate transfer pump and associated piping and valves used to provide makeup, recirculation, and drainage for the CST.

The AFWS is comprised of two electric MDAFW pumps and associated valves, piping, and controls and a turbine-driven auxiliary feedwater (TDAFW) pump with associated valves, piping, and controls, which is independent of the electrical power supply to the motor-driven pumps. These three pumps ensure an adequate supply of auxiliary feedwater following an accident.

All three pumps normally draw suction from the CST. A single line supplies water through a common locked-open valve to the suction of the MDAFW pumps, and a second line supplies water to the suction for the TDAFW pump. The CST has a total capacity of 500,000 gallons, wherein approximately 282,000 gallons are available for auxiliary feedwater. The rest of the tank is used as condensate storage for the Condensate System.

While the CST is the preferred water supply, another alternate supply is provided for the AFWS. The AFWS has the capability to draw suction from the SSW in the event of loss of CST. Two normally closed, key-switch activated, motor-operated butterfly valves in the SSW and three motor-operated gate valves in the AFWS prevent contamination of the auxiliary feedwater by SSW. In addition, high- and low-point leakoff connections are provided between the SSW isolation valves and the motor-operated gate valves to allow detection of any SSW in-leakage. An orifice has been installed in the leakoff lines to limit the leakage rate into the SGB.

Each motor-driven pump normally feeds two SGs. A normally closed interconnection between the motor-driven pump discharge lines permits either pump to feed to all four SGs. This interconnection provides the operator with the means to maintain the water level in all SGs on a long-term basis following a LOCA by operating either motor driven pump. The turbine-driven pump discharge line branches into four separate lines, each feeding one SG.

Each of the lines that connects the three auxiliary feedwater pumps to the SGs are provided with: a normally open, pneumatically operated feed regulator control valve; a flow-limiting orifice; a check valve; a motor operated isolation valve; and two manual isolation valves. Air accumulators are provided for the pneumatically operated valves with sufficient capacity to permit remote valve closure in the event of a secondary system break where local valve operation cannot be accomplished within the required time period following the incident. The control valves are located near each AFW pump to allow isolation or local manual flow control as required. The flow limiting orifices are provided to limit flow to any one SG to a maximum of 1380 gpm, in the event of either a main feed line break or a MS line break inside containment.

An orifice-type flow measuring device is located in each of the auxiliary feedwater lines to indicate flow to each SG and to provide a means of detecting grossly uneven flow to the SGs. To avoid the possibility of a single active failure stopping all auxiliary feedwater flow to a SG, there are no valves located in the common main feedwater lines.

Downstream of the last isolation valve, each line from the motor-driven pumps joins with a corresponding line from the turbine-driven pump to form a common line that connects with the feedwater line that connects to the auxiliary nozzle on the Unit 1 SGs. For Unit 2, this common line from the motor and turbine driven pumps connects with the feedwater preheater bypass line, which in turn connects to the auxiliary nozzle on the Unit 2 SGs.

Boundary

The AFWS boundaries for LR are reflected on the LRBDs listed below.

In-scope components in the AFWS are those portions of the system starting from the CST in the yard, through the AFW pumps located within the SGB and all associated piping, valves, moment restraints and other mechanical components up to the interface of the four-inch AFWS piping to the six-inch Feedwater inlet piping for the auxiliary feedwater nozzle for each SG. This includes the nuclear safety related accumulators and associated tubing and valves for the air-operated AFWS control valves.

The AFWS interfaces with other nuclear safety related and NNS systems at isolation valves that serve as the boundary between the systems. The only subject AFWS components that do not include an isolation valve (in one system or the other) at the (mechanical) interface are the:

- Inlet line to each SG auxiliary feedwater nozzle that is separated from other components assigned to the FWS.
- TDAFW Turbine casing which is supplied and drained by MS piping and components; and
- CST fill/makeup line overflow line to the Demineralized and Reactor Make-up Water System.

The AFWS evaluation boundaries for LR also include NNS piping and components that are attached to or located in the vicinity of nuclear safety related components. These NNS AFWS components are assigned a leakage boundary (spatial) function and include the condensate transfer pumps, piping and valves that are located in the seismic pipe tunnel and the SGB. The AFWS boundaries also include NNS lines downstream of relief or other closed valves that by design could contain water that is routed to a drain. Additionally, the LR evaluation boundaries for the AFWS are ended before condensate components enter the TB and at the interface with the CST treatment skid deoxygenation pumps and associated piping and valves.

Also, NNS AFWS components downstream of normally closed drain valves, and vent valves are attached to nuclear safety related components and are normally empty. These AFWS portions are assigned a structural integrity (attached) function and include the entire length of piping.

Unit 1:

- M1-0202-003-LR
- M1-0206-LR
- M1-0206-001-LR
- M1-0206-002-LR

Unit 2:

- M2-0202-003-LR
- M2-0206-LR
- M2-0206-001-LR
- M2-0206-002-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) The AFWS, in conjunction with the Main Steam System, transfers core decay heat, RCP heat, and sensible heat from the RCS to the UHS under accident conditions.

(2) The AFWS enables safe shutdown decay heat removal by maintaining the water levels in the SGs, and thus ensures adequate heat removal capacity, in the event of a LOCA.

(3) The AFWS serves as the emergency feedwater source during hot standby and cooldown from power operations to the RHRS cut-in conditions.

(4) The AFWS also helps to prevent leakage of fission products from the RCS into the secondary plant by maintaining the SG water levels following a LOCA.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Performs a function that demonstrates compliance with the Commission's regulations for EQ (10 CFR 50.49). Contains a large number of components such as the TDAFW pumps which are relied upon in the safety analyses and plant evaluations to remain functional in a harsh environment.

(2) Performs a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62). Receives actuation signals from the ATWS Mitigation System to start the auxiliary feedwater pumps if a reactor trip fails to occur.

(3) Performs a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48) and SBO (10 CFR 50.63). The AFWS consists of nuclear safety related air operated valves that are designed to fail open, in order to permit uninterrupted steam supply to the AFW pump turbine in the event of LOOP. The TDAFW pumps in turn facilitate auxiliary feedwater flow from the CST to the SGs to ensure decay heat removal during Fire Safe Shutdown regulated events (10 CFR 50.48) and a SBO (10 CFR 50.63).

FSAR References

Sections 10.4.9, 6.2.1.4.4 and 7.4.1.1.1

Components Subject to AMR

Table 2.3.4-1 lists the AFWS component types subject to AMR and their associated component intended functions.

Table 3.4.2-1 provides the results of the AMR.

Table 2.3.4-1
Auxiliary Feedwater System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Accumulator (air)	Pressure boundary
Bolting	Mechanical closure
Filter housing	Pressure boundary
Flow element	Leakage boundary Pressure boundary Throttle
Heat exchanger (TDAFW pump lubricating oil cooler)	Heat transfer Pressure boundary
Moment restraint	Pressure boundary
Orifice	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (condensate transfer)	Leakage boundary (spatial)
Pump casing (MDAFW)	Pressure boundary
Pump casing (TDAFW)	Pressure boundary
Tank (TDAFW lube oil cooler reservoir)	Pressure boundary
Tank liner (CST)	Pressure boundary
Tubing	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Turbine casing (TDAFW)	Pressure boundary
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.4.2. Condensate and Feedwater Systems

Description

The Condensate and Feedwater Systems return the condensate from the turbine condenser hot wells through the regenerative feed heating cycle to the SGs while maintaining the water inventories throughout the cycle.

The Condensate and Feedwater Systems are designed to provide FW to the SGs during steady-state operation at the 100 percent NSSS power.

The condensate portion of the system is designed to supply condensate to the suction side of the SG FW pumps during steady-state operation at maximum guaranteed turbine load.

The FW portion of the system is designed to supply the FW required for various loads at steady-state operation and to maintain this flow, as required, during the steam dump conditions following a large load reduction. The system is designed to maintain uniform FW flow to all SGs under all conditions and to maintain proper SG water levels automatically during steady-state and transient conditions.

The CST is designed to store supply water for the Condensate and Feedwater Systems and is included in the AFWS.

The nuclear safety related portions of the Condensate and Feedwater Systems are the FW piping portions between the moment restraints upstream of the FW isolation valves (FWIVs) and the SG FW nozzles. These portions are designed to Seismic Category I requirements and are designed to withstand the worst anticipated environmental phenomena taken individually.

Condensate System Description

Two motor-driven, constant-speed, vertical, canned-type condensate pumps are supplied, each designed for approximately 65 percent of the total condensate flow. These pumps withdraw condensate from the two main condenser hot wells via a common discharge arrangement which cross connects the two condenser shells, minimizing level differences between the two hot wells.

Both pumps are vented to main condenser shell B to prevent air binding in the pumps. Seal and priming water are supplied to the condensate pumps from the CST. The condensate pumps discharge into a common 30-in. header, which carries the flow to the Condensate Polishing System (CPS) or to the main feed pump suction.

The total condensate flow rate is measured in the 30-in. line from the condensate pump discharge header to the condensate filter demineralizers. This measurement is made to ensure that the flow rate does not fall below the minimum flow requirements of the condensate pumps (2900 gpm per pump). Should the demands of the Feedwater System be low, the recirculation line valve upstream from the drain coolers opens, allowing the additional flow to return to the condenser.

At the outlet of the filter demineralizers, the flow divides to provide cooling water to both the main and auxiliary gland steam condensers under normal and minimum recirculation condensate flow conditions. These lines rejoin the balance of the condensate flow in the 30-in. header downstream of the main and auxiliary gland steam condensers. The flow is then divided into two approximately equal streams, each passing in succession through the tube side of the drain cooler and two stages of regenerative heating provided by FW heaters Nos. 5 and 6. A cross connection between the inlets of heaters 4A and 4B promotes equalization of temperature. The flow remains separated as it passes through the next two stages of FW heating provided by the No. 3 and 4 FW heaters.

The condensate flow is then distributed equally to the suction side of the FW pumps after passing through a flow measuring device, located in each pump suction line, used to control FW pump recirculation.

Feedwater System Description

The Feedwater System is of the closed-cycle type and receives water from the Condensate System and the heater drains systems (HDSs) (specifically, drains from heaters 1, 2, and 3, and moisture separator/reheater (MSR) drain tanks). The FW is transported through the final two stages of FW heaters to the SGs.

During power operation each SG FW pump takes suction from the Condensate System and discharges through a common header to the high-pressure FW heaters. One SG FW pump is required to operate during power operation of up to 50 percent of the rated power. From 50 percent power to full power, both SG FW pumps are required, with each pump providing 50 percent of the required flow. Prior to aligning FW pumps to the SGs, water is supplied by the AFWS.

The dual admission FW pump turbine drivers operate with steam from two sources. During low-load conditions, high-pressure steam is supplied to the FW pump turbines from the MS supply steam dump header. During normal operation, low-pressure steam is supplied from the MSR in the Main Steam Supply System. Gland steam is provided to the FW pump turbines from the Turbine Gland Steam Seal Supply System.

The flow from the two SG FW pumps combines at the pump discharge, then divides into two streams for the final two stages of regenerative FW heaters Nos. 1 and 2. The two heater trains and the common bypass join downstream of the high-pressure heaters to form a single common header for temperature equalization. From this common header, an individual FW line supplies each SG which passes through a LEFM.

When originally constructed both Unit 1 and Unit 2 incorporated a FW Bypass System on each main feedwater line to a steam generator. The function of the FW Bypass System is to minimize the potential occurrence of a water hammer in the steam generators, and to mitigate the flow induced tube vibration in the steam generators.

With the installation of Delta 76 steam generators on Unit 1, the FW Bypass System is no longer required for the new feedring steam generators and has been removed from Unit 1 with the exception of the small bypass line around the main feedwater isolation valves (FWIV). (Note: The Unit 1 FW System is operated in a different manner after RSG installation. The FWIV remain open during startup and a small flow through the valve and not the FIBV is used for purging purposes.) Unit 2 still retains the FW Bypass System in its entirety.

The Unit 2 preheater and original FW Bypass System associated with an individual Main FW line consists of three lines with associated I&C as follows.

The Unit 2 FW preheater bypass line connects each main FW line, just upstream of the main isolation valve, to the AFW nozzle in the upper portion (above normal water level) of each SG. Each bypass line has its own containment isolation valve (FW preheater bypass valve) which is air operated. The objective of this bypass line is to minimize the potential occurrence of pressure transients and to prevent FW from entering the main FW nozzle at startup and during certain other operating conditions.

The Unit 2 FW split flow bypass line connects the main feed line to the FW preheater bypass line inside containment to provide a continuous FW split flow during normal plant operating conditions in order to minimize thermal transients in the nozzle and connecting piping when flow is transferred to the auxiliary FW nozzle from the main FW line and to minimize the flow induced tube vibration in the SGs. It contains an Annubar flow element and an air operated butterfly valve.

In addition, a flow restricting orifice has been installed in each Unit 2 main FW line just downstream of the bypass line connection to facilitate the required flow split.

In addition, a small bypass line around the FWIV is provided to purge cold FW from the main FW line between the isolation valve and the SG FW nozzle. This line incorporates a restricting flow orifice and an air operated globe type shutoff valve which also serves as a containment isolation valve.

Connections from the Condensate System are provided both upstream and downstream of the heaters to permit flushing of the heaters. The upstream connection can also be used to fill the system and the SGs and to provide FW directly from the condensate pumps during the early stages of startup.

Full flow flushing of the Condensate and Feedwater Systems is provided to permit piping cleanup before plant startup. Full flow flushing is accomplished through a 24-in. diameter pipe routed from the outlet of the HP FW heaters to the condenser. Bypass lines with isolation valves are provided around each SG FW pump for use during flushing operations.

CO and FW chemistry are controlled using volatile chemical treatment in conjunction with the CPS.

Chemical feed to Unit 2 SGs is introduced at a point upstream of the AFW supply connection to the Feedwater System for adjustments to the water chemistry during SG layup periods only. Chemical feed to the Unit 1 SGs is introduced at the main FW lines which do not interface with the AFW supply connection.

Boundary

The Condensate and Feedwater Systems boundaries begin at the auxiliary feedwater condensate supply from the CST through Class 5 piping connecting to interfacing systems of Auxiliary Steam, Demineralized and Reactor Makeup Water (through the CST treatment skid), Secondary Sampling, SG Blowdown Cleanup, and Liquid Waste Processing. The in-scope boundary continues into each of the above mentioned systems. A leak or spray of treated water from the CST treatment skid piping or pumps would not challenge the intended function of the outdoor CSTs. The external surfaces of the concrete CSTs are managed by the Structures Monitoring

(B.2.3.34) AMP. Therefore, evaluation boundaries for the CST treatment skids begin at the transitions from PVC to carbon steel and stainless steel piping, leading below ground.

Additionally, the main condensers and condensate pumps, which are contained in the Condensate System are not within the scope of LR.

From the SG FW nozzles through the FW isolation valves stopping at each FW moment restraint on the outboard side. Included in these piping sections are connections with the AFWS.

From the TB/SGB interfaces downstream of each of the four FW line isolation valves up to the nuclear safety related moment restraints as well as various miscellaneous vent and drain lines and connections to interfacing chemical feed, secondary sampling, and nitrogen gas systems.

The LR boundaries for LR are reflected on the LRBDs listed below.

Unit 1:

- M1-0203-001-LR
- M1-0203-001A-LR
- M1-0204-LR

Unit 2:

- M2-0203-001-LR
- M2-0203-001A-LR
- M2-0204-LR

Common:

- None.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

Condensate System

(1) None.

Feedwater System

(2) Support containment pressure boundary by providing containment isolation capability with automatic or remote manual closure of the containment isolation valves and the secondary system sampling valves in the event of a LOCA.

(3) Provide a flowpath for auxiliary feedwater to the SGs. On Unit 2, the Feedwater System supports the AF functions by isolating the main FW lines and split-flow bypass lines.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

Condensate System

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function. The CO System includes piping located in the AB, Safeguards Building, and Control Building, which house nuclear safety related components. In addition, the Condensate System includes piping located in the yard near nuclear safety related SSCs (CST).

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

Feedwater System

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function. The FW System includes NNS piping located in Containment and the Safeguards Building, which house nuclear safety related components. Inside Containment, the portion of FW System piping in scope for 10 CFR 54.4(a)(2) are vents and drains.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function. FW System piping upstream of the moment restraints on the main FW lines and downstream of the Turbine Building to Safeguards Building interface are in scope for 10 CFR 54.4(a)(2). Inside the Safeguards Building, the portions of FW System piping in scope for 10 CFR 54.4(a)(2) are drain piping, test connections, and nitrogen supply piping.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

Condensate System

(1) None.

Feedwater System

(2) Relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for EQ (10 CFR 50.49). The Feedwater System includes components

that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(3) The Unit 2 Feedwater System is required to provide system isolation and a flow path for AFW during a SBO (10 CFR 50.63) regulated event.

FSAR References

Sections 3.5.1.4, 10.1 and 10.4.7
Table 17A-1

Components Subject to AMR

Table 2.3.4-2 lists the Condensate and Feedwater Systems component types subject to AMR and their associated component intended functions.

Table 3.4.2-2 provides the results of the AMR.

Table 2.3.4-2
Condensate and Feedwater System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flow element	Leakage boundary (spatial)
Moment restraint	Pressure boundary
Orifice	Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Thermowell	Leakage boundary (spatial) Pressure boundary
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)

2.3.4.3. Main Steam, Reheat, and Steam Dump System

Description

The purpose of the Main Steam, Reheat, and Steam Dump System (MSS) is to utilize saturated steam from the SGs for transporting thermal energy to the turbine, where it is converted to mechanical motion and then to electrical energy. The MSS is also used for providing steam for auxiliary services, SG pressure relief protection, controlled heat release from the reactor, means of limiting steam flow transients during rapid load rejection, and interface connection between the SG, SG blowdown, and PSS. The system is also used to feed the main feedwater feed pump turbines, auxiliary feed pump turbine, Steam Dump System, Turbine Shaft Seal System, and the Plant Process Steam System.

The MSS is used for plant cooldown. This is achieved by progressively lowering the pressure of the SGs; the decay heat and the sensible heat are removed by the generation of steam. When SG pressure has been reduced to 100 psia, the RHRS is placed in operation.

The MSS also includes the SG Blowdown and Cleanup System, which is used to cool, depressurize, filter, and remove dissolved solids and radionuclides by filtration and ion exchange from the SG blowdown.

The system consists of MS isolation valves (MSIV), MS safety valves, MS relief valves, turbine driven auxiliary feedwater pump steam supply isolation valve accumulator tanks and steam flow restrictor and drain pots.

During normal operating conditions, the MSS provides overpressure protection, prevents uncontrolled blowdown of the SGs, delivers steam for use in several other systems and adequate drainage for startup and saturated steam. It also is required to provide the interface connections between the SGs and the SG blowdown and PSSs.

The MSIVs are designed to stop flow from either direction within five seconds after receipt of signal to close to prevent uncontrolled steam release from more than one SG.

The SG Blowdown System (SB) is a subsystem within the MSS. During normal operation, blowdown from each SG is combined together in a common line outside the containment. The total SB flows through the tube side of the SB heat exchanger and after pressure reduction flows through the filters and demineralizers. The cooled, demineralized, low pressure blowdown is then combined with condensate and used as coolant to the SB heat exchanger. After the heat exchanger, the combined condensate and blowdown fluid is directed to the heater drain tank.

Boundary

Nuclear safety related components in the MSS are those that support the 10 CFR 54.4(a)(1) intended functions discussed below. These are the class 2 piping and components on piping runs starting downstream of the SGs to and through the moment restraints and SG sample isolation valves, as well as piping to normally closed valves and MSS safety valves in the system. Nuclear safety related components in the MSS are also those that maintain the pressure boundary of the system that are class 3 components downstream of moment restraints on drawing M1/2-0202-002-LR through both normally open and normally closed drain valves in the system.

NNS components in the MSS evaluation boundaries with the potential to affect nuclear safety related components include the include class 5 piping downstream of both normally open and normally closed drain valves, and normally closed drain and vent valves shown on M1/2-0202-003-LR. It also includes class 5 piping downstream of the moment restraints and SG sample isolation valves. This also includes class 5 piping downstream of normally closed valves and MSS safety valves in the system.

NNS components in the MSS evaluation boundaries that have a 10 CFR 54.4(a)(2) leakage boundary (spatial) intended function are SG Blowdown System components in buildings containing nuclear safety related components. This includes the SG blowdown spent resin storage tank, filter casings, spent resin sluice pump, heat exchangers, piping, and valves in buildings containing nuclear safety related components.

The LR boundaries are reflected on the LRBDs listed below.

Unit 1:

- M1-0202-LR
- M1-0202-002-LR
- M1-0202-003-LR
- M1-0239 -LR
- M1-0239-001-LR

Unit 2:

- M2-0202 -LR
- M2-0202-002-LR
- M2-0202-003-LR
- M2-0239 -LR
- M2-0239-001-LR

Common:

- None.

System Intended Functions

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provide Main Steam pressure boundary.

(2) Providing overpressure protection for the SGs and all other components within the MSS via the MSS safety valves.

(3) Preventing the uncontrolled blowdown of more than one SG via the Main steam isolation valves (MSIVs).

(4) Delivering the required quantity and quality of steam to the auxiliary feedwater pump turbine for the complete range of SG pressures required for cooldown.

(5) Providing controlled heat release from the reactor during normal and emergency plant operating conditions.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48). Actuation of the MSIVs is required in order to ensure decay heat removal during Fire Safe Shutdown regulated events.

(2) Relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for EQ (10 CFR 50.49). The MSS includes components that are nuclear safety related and in a harsh environment and required for DBA mitigation or post-accident and therefore, are environmentally qualified.

(3) Perform a function that demonstrates compliance with the Commission’s regulations for SBO (10 CFR 50.63). MSS safety valves are necessary to maintain decay heat removal functions during a SBO event.

FSAR References

Sections 10.3, 10.3.1, 10.4.8,
Table 17A-1

Components Subject to AMR

Table 2.3.4-3 lists the MSS component types subject to AMR and their associated component intended functions.

Table 3.4.2-3 provides the results of the AMR.

Table 2.3.4-3
Main Steam, Reheat, and Steam Dump System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Drain pot	Pressure boundary
Filter housing	Leakage boundary (spatial)

Table 2.3.4-3
Main Steam, Reheat, and Steam Dump System Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Flexible hose	Leakage boundary (spatial)
Flow element	Leakage boundary (spatial)
Heat exchanger (SG blowdown)	Leakage boundary (spatial)
Knock out pot	Pressure boundary
Moment restraint	Pressure boundary
Orifice	Leakage boundary (spatial) Pressure boundary Throttle
Piping	Leakage boundary (spatial) Pressure boundary Structural integrity (attached)
Pump casing (SG blowdown spent resin sluice pump)	Leakage boundary (spatial)
Tank (auxiliary feedwater turbine drain flash tank)	Leakage boundary (spatial)
Tank (SG blowdown spent resin storage tank)	Leakage boundary (spatial)
Trap	Leakage boundary (spatial) Pressure boundary
Tubing	Leakage boundary (spatial)
Valve body	Pressure boundary Structural integrity (attached) Leakage boundary (spatial) Throttle

2.3.4.4. <u>Main Turbine and Auxiliaries System</u>

<u>Description</u>

Auxiliary Steam

The purpose of the Auxiliary Steam System (SAS) is a shared support system designed to provide a supply of low pressure saturated steam to miscellaneous warm-up, startup, and process services in the TB and AB. The system is also required to collect and return condensate from various equipment to the steam cycle.

Chemical Feed and Hydrazine Injection

The purpose of the Chemical Feed System (CFS) and Hydrazine Injection System (HIS) are to control pH and dissolved oxygen in condensate and SG water during normal operation, hot standby, and wet layup. The primary function of the CFS is to control corrosion in the Secondary System and the SGs. Proper water chemistry in the SGs will also help control deposits in the turbine.

Circulating Water

The purpose of the CWS is to function as the heat sink for heat rejected by the turbine plant. In addition to heat removal, the system maintains the required back pressure in the main condensers and the auxiliary condensers which serve the feedwater pump turbine drivers. The system also supplies cooling water to the turbine plant cooling water heat exchanger, condenser exhausting vacuum pump heat exchangers, and the NNS ventilation chiller condensers.

Condensate Polishing

The purpose of the CPS is the removal of both dissolved and suspended solid contaminants in the condensate to minimize the build-up of sludge and corrosion products in the SG. The system water used for backwashing may be reclaimed.

Condenser Vacuum and Waterbox Priming

The purpose of the Condenser Vacuum and Waterbox Priming System (CVS) is to remove air from the vapor side of the main and auxiliary condensers during startup and normal operation, and to remove trapped air from those parts of the CW System which are above lake level. The latter function is necessary to avoid undesirable hydraulic transients during startup of the CWS and to ensure complete flooding of condenser tubes for proper heat transfer performance during normal operation.

Heater Drains

The purpose of the HDS is to aid in regenerative heating of FW by cascading the higher energy drains through successively lower energy stages of feedwater heaters. The system is also required to return the condensed water from the extraction steam to the Condensate and Feedwater Systems in a manner which results in thermodynamic cycle efficiency.

Turbine Plant Cooling Water

The Purpose of the Turbine Plant Cooling Water (TS and WS) Systems are designed to cool all turbine generator associated equipment and conventional plant equipment and systems which are classified as NNS. The system acts to remove residual heat from all turbine plant associated equipment by means of the turbine plant cooling water heat exchangers and rejects this heat to the Squaw Creek Reservoir, which acts as a heat sink.

<u>Boundary</u>

Auxiliary Steam

Scoping boundaries are shown on LRBDs M1-0213-LR and M1-0213-001-LR. Scoping boundaries include portions of the system within Seismic Category I buildings. Included in these boundaries are Auxiliary Steam supply and outlet piping to and from the floor drain, Waste Processing System, and BRS evaporator packages, as well as the CVCS boric acid batching tank. Outlet piping travels to the auxiliary steam condensate cooler, condensate sample cooler, and Auxiliary Steam drain tank. From the drain tank, drained Auxiliary Steam is pumped through auxiliary steam drain pumps out of the AB to TB Unit 1. Scoping boundaries end at the AB/TB interface.

Chemical Feed and Hydrazine Injection

Scoping boundaries are shown on LRBDs M1-0221-LR, M1-0221-001-LR, and M2-0221-001-LR. Scoping boundaries begin at each unit's reagent head tank and continue to the amine and hydrazine solution tanks. From these tanks fluid is drawn by amine and hydrazine pumps and delivered to the Feedwater System and AFWS. Scoping boundaries end at system supply interfaces with the Feedwater System and AFWS. Also included in scoping boundaries are Unit 2 chemical feed recirculation lines connected to Feedwater System supply lines the SGs. For each of the four Unit 2 SGs, chemical feed piping draws water from the Feedwater System, through chemical feed recirculation pumps, and delivers it back to the Feedwater System. Unit 1 chemical feed recirculation lines have been disconnected, drained, capped, and abandoned in place and are not within scoping boundaries, as these abandoned lines do not perform any LR intended functions.

Circulating Water

There are no CW system mechanical components subject to AMR. Circulating water pump trip logic prevents flooding of the TB, and eventually the ECB on the failure of circulating water expansion joints. As the trip logic is comprised of active mechanical components, they are not subject to AMR whereas the passive cables for this trip function are in the scope of LR, in-scope bounding approach, and subject to AMR. The passive pump casings do not support a flood barrier function and therefore are not within the scope of LR.

Additionally, a portion of the system is located inside the SWIS; however, this portion of the system is not connected to nuclear safety related SSCs and is not liquid-filled, therefore there is no leak/spray potential onto nuclear safety related SSCs. This portion of the CW system (line 30-CW-X-001-100-5) is a high point in the system, is located downstream of locked-closed valves, and has an open drain path through a sparger to the SSI.

Condensate Polishing

Scoping boundaries are shown on LRBD M1-0244-001A-LR. The majority of CPS components are located outside of Seismic Category I buildings and are outside of scoping boundaries. The only portion of the CPS within scoping boundaries is the portion within the FB. This includes inlet and outlet piping to the hot phase separator. The hot phase separator itself is not within the scope of LR. The hot phase separator is located in FB room X-272 which does not contain nuclear safety related equipment, except for an electrical cable protected by conduit, which acts as a spray shield. Therefore, the hot phase separator and other condensate polishing components located within room X-272 do not have leakage boundary intended functions and are not within the scope of LR.

Condenser Vacuum and Waterbox Priming

Scoping boundaries are shown on LRBD M1-0211-LR. The majority of condenser vacuum and waterbox priming components are located outside of Seismic Category I buildings and are outside of scoping boundaries. The portion within scoping boundaries are drain lines within the ECB. Note that the main line connected to the drain lines and directed to primary plant ventilation equipment, is air/condensation filled, and is not within scoping boundaries as it does not have a leakage boundary intended function. Also note that the Unit 2 configuration is not identical to Unit 1. In Unit 2, there are no drain line connections within the ECB. As such there are no Unit 2 portions of the CVS within scoping boundaries.

Heater Drains

Scoping boundaries are shown on LRBDs M1-0207-B-LR and M2-0207-B-LR. Boundaries only include a small portion of the HDS. This portion begins at outlet connections from the SG Blowdown System within the ECB and terminate at the ECB/TB interface.

Turbine Plant Cooling Water

Scoping boundaries are shown on LRBDs M1-0212-B-LR and M2-0212-B-LR. Scoping boundaries include portions of the system within the ECB. This includes the supply and outlet piping to and from the instrument air compressor package and air compressor heat exchanger. The heat exchanger is within the scoping boundaries of the Turbine Plant Cooling Water System, but the instrument air compressor is not. The instrument air compressor enclosure prevents leakage or spray from impacting nuclear safety related components. The components mounted within the enclosure are not in the scope of LR. The instrument air compressor enclosure is evaluated under Structural Commodities – Bulk. Included in scoping boundaries are supply and outlet piping within the AB to and from the auxiliary steam condensate cooler and sample coolers. The coolers themselves are within the scoping boundaries of the Auxiliary Steam System, and not the Turbine Plant Cooling Water System.

<u>System Intended Functions</u>

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None.

NNS components that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Maintain leakage boundary of NNS components such that no spatial interaction with nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(2) Maintain structural integrity of NNS components such that no interaction with attached nuclear safety related components could prevent satisfactory accomplishment of a safety function.

(3) Mitigate the effects of an internal flood. CW pump trip logic prevents flooding of the TB, and the ECB. Failure of the main condenser CW expansion joint can cause rapid flooding of the TB sump. Consequent flooding of nuclear safety related equipment (in the ECB) is prevented by tripping the Circulation Water Pumps before the flooding overflows the TB pit (EL. 778-ft).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) None.

FSAR References

Sections 10.4.2, 10.4.5, 10.4.6, 10.4.11, 10.4.12 and 10.4.13

Components Subject to AMR

Tables 2.3.4-4a through 2.3.4-4f list the system component types subject to AMR and their associated component intended functions.

Tables 3.4.2-4a through 3.4.2-4f provide the corresponding results of the AMR.

Table 2.3.4-4a
Auxiliary Steam Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Drip pot	Leakage boundary (spatial)
Heat exchanger (auxiliary steam condensate cooler, auxiliary steam condensate sample cooler)	Leakage boundary (spatial)
Orifice (restricting)	Leakage boundary (spatial)
Piping	Leakage boundary (spatial)
Pump casing (auxiliary steam drain)	Leakage boundary (spatial)
Steam trap	Leakage boundary (spatial)
Strainer	Leakage boundary (spatial)
Tank (auxiliary steam drain)	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

Table 2.3.4-4b
Chemical Feed and Hydrazine Injection Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Flexible hose	Leakage boundary (spatial)
Piping	Leakage boundary (spatial) Structural integrity (attached)

Table 2.3.4-4b
Chemical Feed and Hydrazine Injection Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Pump casing (chemical feed recirculation, feedwater amine, feedwater hydrazine)	Leakage boundary (spatial)
Strainer	Leakage boundary (spatial)
Tank (feedwater amine, feedwater hydrazine, reagent head)	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial) Structural integrity (attached)

Table 2.3.4-4c
Condensate Polishing Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Piping	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

Table 2.3.4-4d
Condenser Vacuum and Waterbox Priming Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Piping	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

Table 2.3.4-4e
Heater Drains Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Piping	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

Table 2.3.4-4f
Turbine Plant Cooling Water Components Subject to Aging Management Review

Component Type	Component Intended Function(s)
Bolting	Mechanical closure
Filter housing	Leakage boundary (spatial)
Heat exchanger (instrument air compressor TPCW trim cooler)	Leakage boundary (spatial)
Piping	Leakage boundary (spatial)
Tubing	Leakage boundary (spatial)
Valve body	Leakage boundary (spatial)

2.4. SCOPING AND SCREENING RESULTS: STRUCTURES

All CPNPP Seismic Category I structures are designed to withstand the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. Missiles, generated by floods, are not a design consideration as the Probable Maximum Flood (PMF) is lower than grade elevation. The SWIS is designed for tornado generated missiles, among other loads. This provides adequate protection for any low velocity waterborne object. For Seismic Category I buildings other than the RCB, the effects of venting are considered in determining the maximum pressure differential across building wall, floor, and roof systems. Reinforced concrete external roofs and walls of Seismic Category I structures form barriers against tornado generated missiles.

Nuclear safety related structures, except the SWIS and the ECB, are not subject to flooding, wave action, or wave runup and do not require flood or wave protection. The plant grade is at EL. 810-ft, and the peak SCR level is at EL. 789-ft 8-in for the PMF. The plant grade provides 20-ft 4-in of freeboard above the PMF and superimposed wave runup on Squaw Creek Reservoir. The site grade is well above the maximum water levels conceivable on the Brazos River. Hence, the site will be unaffected by river flooding of any kind and will not be affected by tsunami, seiche, or ice flooding. Although some of the Category I foundations are below the PMF level of the reservoir (EL. 789-ft 8-in), groundwater is not expected to reach higher than EL. 775-ft because of the impermeable nature of the rock.

The following structures and commodities are addressed in this section:

- Containment Building (2.4.1)
- Auxiliary Building (2.4.2)
- Diesel Generator Buildings (2.4.3)
- Electrical and Control Building (2.4.4)
- Fuel Building (2.4.5)
- Safeguards Buildings (2.4.6)
- Safe Shutdown Impoundment and Dam (2.4.7)
- Service Water Intake Structure (2.4.8)
- Switchgear Buildings (2.4.9)
- Turbine Buildings (2.4.10)
- Yard Structures (2.4.11)
- Switchyard Structures (2.4.12)
- Component Support Commodity Group (2.4.13)
- Crane/Hoist Commodity Group (2.4.14)
- Fire Barrier Commodity Group (2.4.15)

With the exception of some yard structures, these buildings and structures are shown on FSAR Figure 1.2-1. The buildings and structures that are in scope and subject to AMR are highlighted on the LRBD LR-STRUCT-01.

The evaluation boundaries, in scope of LR, for each structure includes and extends from the foundation to the roof, as applicable. The boundaries also include structural steel elements (framing) and other materials associated with the integrity of the structure, including interior compartment integrity, or that are unique to the structure (such as the

SFP in the FB). Airtight or tornado venting doors, as well as tornado blowout panels and dampers (in exterior and internal walls), are included in the evaluation boundaries of the pertinent structures since they are associated with the integrity of that structure.

2.4.1. Containment Buildings

Description

The Unit 1 and Unit 2 RCBs, including internal structures, are fully continuous, steel-lined, reinforced concrete structures which consist of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit projection. Each containment superstructure is independent of the adjacent interior and exterior structures. Sufficient space is provided between the containment and the adjacent structures to prevent contact under all combinations of loadings, including seismic. Each vertical cylinder has an inside diameter of 135-ft, height of 195-ft, and wall thickness of 4.5-ft. The inside radius of the hemispherical dome is 67.5-ft, and the dome has a thickness of 2.5-ft. The top of the 12-ft thick foundation mats sit approximately 4.5-ft below plant grade. Plant grade elevation is at 810-ft. The reactor cavity pit projections are each 24.3-ft deep and extend down from EL. 805-ft 6-in. The foundation mat beneath the reactor cavity pits has a bottom EL. 769-ft 2-in.

The principal reinforcement used in the mats, walls, and domes are No. 18 bars, made continuous at splices by the use of Cadweld mechanical connectors. The reinforcing steel pattern in the cylinder walls consist of vertical bars at each face, horizontal hoop bars at each face, and 45-degree diagonal bars, in each direction, near the outside faces. The foundation mats are reinforced with top and bottom layers of bars.

The RCBs completely enclose each unit’s reactor and RCS. An interior structure within each RCB supports and provides shielding for the reactors and other components of the NSSS. The containments are designed to withstand the pressures and temperatures resulting from a spectrum of LOCAs and secondary system breaks. Major components of the RCBs and internal structural components include:

- Steel Liner

  The entire inside face of each containment (mat, walls, and dome) is lined with a continuous welded steel liner plate, attached with anchors to the reinforced concrete, to ensure a high degree of leak tightness. The thickness of the wall liner is $^{3}/_{8}$-in, the dome is ½-in, and the foundation mats have a ¼-in thick plate covered with a layer of concrete. Local thickened liner plate sections are provided at penetrations, at major pipe and duct support attachments, at crane and rotating platform girder brackets, and at the bottom of the cylindrical wall’s steel liner. Overlay plates and/or structural shapes may be used on the interior side of the liner for support of minor pipes and ducts, conduits, cable trays, and equipment. Leak-chase channels are provided at liner seams which, after construction, are inaccessible for other means of leak tightness examination with the exception of threaded screw caps.

- Containment Penetrations and Attachments

  Personnel Airlock

  The personnel air lock is an approximately 9-ft inside diameter electro-hydraulically operated double-door assembly. Each door is hinged and gasketed, with leakage test taps aligned to the annulus between the gasket sealing surfaces.

  Emergency Airlock

  The emergency air lock is an approximately 5-ft 9-in inside diameter manually operated double-door assembly, with 2.5-ft diameter doors.

  Equipment Hatch

  The equipment hatch is a 16-ft inside diameter single closure penetration. The bolted hatch cover is mounted on the inside of the containment and is double-gasketed with a leakage test tap between the gaskets. The hatch cover is provided with a hoist for handling. During cold shutdown (Mode 5), refueling (Mode 6) or defueled, an outage equipment hatch may be installed to allow access to containment. The outage equipment hatch is designed to provide a fission product barrier in the event of a design basis fuel handling accident and provides the same level of protection as the permanent inner equipment hatch in Mode 5, 6, or defueled. The outage equipment hatch will not replace the permanent inner equipment hatch during reduced inventory operation.

  Pipe Penetrations

  Other smaller penetrations through the containment include the MS and feedwater lines, hot and cold pipes, the fuel transfer tube, and electrical conductors. All penetration sleeves are welded to the liner and anchored into the reinforced concrete containment wall.

  Fuel Transfer Tube Penetration

  A fuel transfer tube penetration is provided for fuel transfer between the refueling canal in the containment structure and the SFP in the FB. The penetration consists of a 20-in stainless steel pipe inside a carbon steel sleeve. The inner pipe acts as the transfer tube; the outer tube is welded to the containment liner. The bellows expansion joints are provided to permit differential movement. The fuel transfer tube is equipped with a bolted blind flange with a double O-ring seal inside the containment.

  Electrical Penetrations

  Header plate-type penetrations are used for electrical conductors passing through the containment. The penetration header plate with double O-ring gaskets is bolted to a weld neck flange which is welded to a steel penetration sleeve. The steel penetration sleeves are welded to the containment vessel liner.

Containment Alternate Access for the SGs and Reactor Pressure Vessel Head (RVH) Replacement (Unit 1)

The SG and RVH Replacement Project created and restored a construction alternate access in the Unit 1 RCB (Containment Alternate Access) in accordance with administrative procedures and the design control program. The alternate access was used to facilitate movement of the original and replacement SGs and RVH out of and into the RCB. In accordance with the ASME Section XI repair/replacement program, the alternate access was restored consistent with the original containment specifications with any exceptions reconciled to the original specification.

The cut section of the RCB liner plate was rewelded to the liner plate with a full penetration weld. The new liner plate seam welds were examined using NDE methods specified within CC-5520. The liner weld was leak tested by vacuum box test method to satisfy leak-tightness requirements of NRC RG 1.19.

- Primary Shield Wall (PSW)

  The PSW, a heavily reinforced concrete cylinder, is situated at the approximate center of the Containment vessel and extends up from the interior base slab to surround the RV. This reactor cavity structure (cylindrical PSW) provides support for the RV. The vessel supports consist of support pads and shoes which are mounted on support members within the concrete cavity structure (PSW). During normal operation, the PSW provides biological shielding for maintenance inspection. Under seismic loading, this structure serves to provide seismic shear resistance and stiffens the Containment internal structure.

- Primary Loop Compartment Walls (SG Compartment)

  The compartments are formed by the secondary shielding walls on the exterior and by the reactor and refueling canal walls on the interior. These walls extend from the interior base slab up to the operating floor. The compartment houses the SG, RCPs, and the RCLs. The compartment walls provide radiation shielding, isolation of the RCS, and lateral restraint for the SGs, RCPs, and pressurizer.

- Refueling Cavity

  The refueling cavity (canal) provides shielded access for transport of spent fuel and new fuel between the RV and the fuel transfer penetration. It also provides shielding storage space for the RV internals during refueling or maintenance. The cavity is lined with stainless steel.

- Interior Base Slab

  The interior base slab is placed on top of the foundation mat liner plate and is 30-in thick. This slab provides lateral and flexural restraint at the base of the primary loop compartment walls and the PSW. The slab ties the primary loop compartment walls to the PSWs and provides a diaphragm for seismic shear distribution at the bottom of the internal structure. It also protects the foundation mat liner from any missiles generated in the primary loop compartments and from the effects of accident temperatures.

- Operating Floor

  The operating floor is supported by the primary loop compartment walls and concrete columns adjacent to the containment shell which extend down to the interior base slab. The operating floor provides a working and access floor during refueling, maintenance, and repair operations. Vent areas are provided where required.

- Intermediate Floors

  Intermediate floors are provided at several elevations, including a principal floor at EL. 860-ft for miscellaneous equipment supports, access, maintenance, and similar items.

- Recirculation Sumps and Screens

  Two sumps in the containment basement are provided. The sumps are physically separated and are located at the lowest elevation of the RCB exclusive of the RV cavity. Sump covers are provided to protect the sumps against falling debris. Stainless steel strainers are provided to preclude clogging of the recirculation lines and any of the system components.

<u>Boundary</u>

The internal structural components are:

- Associated with the leak tightness of containment; or
- Associated with the integrity of the RCB structure, including interior floors and columns; or
- Unique to the structure (e.g., the PSW, primary loop compartment (secondary shield) walls, and fuel transfer components); or
- Support major RCS components (i.e., RCPs, pressurizer, RV, SGs).

The LR boundaries for this structure are reflected on the LRBD below.

- LR-STRUCT-01

<u>Intended Functions</u>

The RCBs perform the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides primary containment boundary.

(2) Isolates the RCS from postulated environmental conditions including normal wind, tornados, and external tornado generated missiles.

(3) Provides support for the containment liner and penetrations, and nuclear safety related components.

(4) Contains the effects of the full range of postulated accidents, including LOCA, HELB, etc.

(5) Serves as shielding barriers for components and equipment from jet impingement and other postulated missiles.

(6) Provides a vapor barrier that will limit leakage from the containment following a LOCA within the containment.

(7) Provides a source of water for emergency core cooling during the recirculation phase.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs which could potentially affect the satisfactory accomplishment of nuclear safety related functions.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for EQ (10 CFR 50.49).

(3) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for PTS (10 CFR 50.61).

(4) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for ATWS (10 CFR 50.62).

(5) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 1.2.2.3.1, 2.5.4.2, 3.8.1.1, 3.8.1.1.5, 3.8.1.1.6, 3.8.1.6.6, 3.8.3.1.1, 3.8.5.1.1, 6.2.2.2.1, and 12.1

Components Subject to AMR

Table 2.4-1 lists the RCB and internal structures component types subject to AMR and their associated component intended functions.

Table 3.5.2-1 provides the results of the AMR.

Table 2.4-1
Containment Building Components Subject to Aging Management Review

Component Type	Intended Function(s)
Airlocks and accessories	Pressure boundary
Bolting (containment closure)	Pressure boundary Structural support
Bolting (structural)	Structural support
Concrete: Dome, wall, ring girders, buttresses	HELB shielding Missile barrier Pressure boundary Radiation shielding Shelter, protection Structural support
Concrete: Foundation/mat	Structural support
Concrete: Internal columns, beams, slabs, walls	Direct flow Missile barrier Radiation shielding Shelter, protection Structural support
Concrete: Refueling canal	Direct flow Flood barrier Missile barrier Pressure boundary Shelter, protection
Control rod drive shaft missile shield	Missile barrier
Equipment hatch	Pressure boundary
Equipment hatch cover (outage)	Pressure boundary
Equipment hatch missile shield (outer cover)	Missile barrier

Table 2.4-1
Containment Building Components Subject to Aging Management Review

Component Type	Intended Function(s)
Fuel transfer tube (including penetration sleeves, expansion joints, and blind flange)	Pressure boundary Radiation shielding
Fuel transfer tube supports	Structural support
Fuel transfer upender	Structural support
Leak chase channels	Pressure boundary
Leak chase channels (screw caps)	Pressure boundary
Liner (refueling canal)	Pressure boundary Structural support
Liner plate	Pressure boundary Structural support
Liner plate anchors and attachments	Pressure boundary Structural support
Liner plate moisture barrier (sealing compound)	Shelter, protection
Penetration assemblies (electrical)	Pressure boundary Structural support
Penetration assemblies (mechanical piping)	Pressure boundary Structural support
Penetration assemblies (seals)	Pressure boundary Shelter, protection
Primary shield wall (reactor cavity)	Radiation shielding Structural support
RCS Class 1 support bolting	Structural support
RCS Class 1 supports	Structural support
Reactor vessel permanent cavity seal ring	Pressure boundary
Recirculation sump	Direct flow
Recirculation sump cover	Shelter, protection
Recirculation sump effluent guard pipe	Shelter, protection
Recirculation sump liner	Pressure boundary Structural support
Service level I coatings	Maintain adhesion
Sliding surfaces	Structural support
Thermal insulation (high temperature penetrations)	Insulate

2.4.2. Auxiliary Building

Description

The AB is a Seismic Category I structure. The AB is a common building to both Unit 1 and Unit 2. The AB is a multistory, reinforced concrete structure with one story below grade and four stories above grade located between Unit 1 and Unit 2 containments and is approximately 120-ft by 192-ft. The building is divided into two parts, the auxiliary portion, and the electric portion, and they are interconnected. Adequate space is provided between the AB and adjacent structures to avoid the contact of structures, and systems are also designed to accommodate the differential movements of adjacent buildings.

The top of the AB foundation is at El. 790-ft 6-in with portions at El. 785-ft 6-in and is supported directly on bedrock. The slab at El. 900-ft 3-in serves as the roof for the AB. The floor at El. 852-ft 6-in has various floor openings provided with removable concrete slabs/hatches.

Interior and exterior tornado pressure relief dampers and exterior pressure relief blowout panels are installed in the AB. Tornado dampers are parallel multi-blade dampers and are normally closed. These dampers are designed to open in either direction when the differential pressure across the dampers reaches its setpoint.

The electric portion of the AB is referred to as the ECB and is separated from the AB proper by interior walls and doors.

Boundary

The AB structure is highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The AB is a Seismic Category I structure that houses ventilating equipment, waste treatment equipment, and other fluid auxiliary systems. Therefore, the AB performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for EQ (10 CFR 50.49).

(3) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 1.2.2.11.1, 1.2.2.12, 3.2.1.1.1, 3.4.3, 3.5.1.4, and 3.8.4.1.2

Components Subject to AMR

Table 2.4-2 lists the AB components subject to AMR and their associated intended functions.

Table 3.5.2-2 provides the results of the AMR.

Table 2.4-2
Auxiliary Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Compressible joint and seal	Shelter, protection
Concrete: Above-grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	HELB shielding Missile barrier Pressure barrier Shelter, protection Structural support
Door (tornado)	Pressure relief Shelter, protection
Door seal	Pressure barrier
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support
Masonry wall: Interior	Shelter, protection Structural support

Table 2.4-2
Auxiliary Building Components Subject to Aging Management Review

Component type	Intended function
Steel component: All structural members	Shelter, protection Structural support
Tornado blowout panel	Pressure relief Shelter, protection
Tornado pressure relief damper housing	Pressure relief Shelter, protection

2.4.3. Diesel Generator Buildings

Description

CPNPP has two Seismic Category I DGBs, which are part of the SGBs. One building contains two DGs for Unit 1, and the second building contains two DGs for Unit 2. The separation between redundant DGs within each building is accomplished by locating each DG in a separate room partitioned by a concrete wall designed to withstand a safe shutdown earthquake (SSE), fire, or missiles. Each DG and its associated starting equipment and auxiliaries are located in the same room. Each DG is provided with independent room ventilation air intake and independent air discharge and engine inlet and exhaust ducts. The DGB for Unit 2 is on the North side adjacent to the Unit 2 SGB, and the DGB for Unit 1 is on the South side adjacent to the Unit 1 SGB. The mat slab foundation for each DGB is at El. 810-ft 6-in and is supported directly on bedrock. The DGB for each unit shares a common wall with the SGB and the other three walls are external walls. Openings in the external walls of the DGBs (e.g., for intake/exhaust) are protected from tornado generated missiles by a box-like structure made of concrete walls 2-ft 6-in thick and a 1-ft 9-in slab.

Boundary

The DGB structures are highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The DGBs are Seismic Category I structures that provide protection and shelter to the DGs. In addition, the DGs and auxiliary systems shall remain functional and withstand the effects of a PMF. Exhausts and vents of fuel oil and lube oil systems are located outdoors and designed such that seismic events and missiles cannot compromise the DGs nuclear safety related function. Failure of non-seismic structures or components shall not affect the function of the DG. Therefore, the DGBs perform the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 1.2.2.8.6, 1.2.2.11.1, 3.2.1.1.1, 3.3.2.2, 3.8.4.1.1, and 8.3.1.1.14

Components Subject to AMR

Table 2.4-3 lists the DGBs components subject to AMR and their associated intended functions.

Table 3.5.2-3 provides the results of the AMR.

Table 2.4-3
Diesel Generator Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete curb	Direct flow
Concrete: Above-grade exterior (accessible)	Missile barrier Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Missile barrier Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support

Table 2.4-3
Diesel Generator Building Components Subject to Aging Management Review

Component type	Intended function
Concrete: Interior	Missile barrier Shelter, protection Structural support
Door (watertight)	Flood barrier Missile barrier Shelter, protection
Door seal	Flood barrier
Hatch/plug	Missile barrier Shelter, protection Structural support
Louver housing	Pressure relief Shelter, protection
Masonry wall	Shelter, protection
Steel component: All structural members	Shelter, protection Structural support
Tornado/missile shield	Missile barrier Shelter, protection

2.4.4. Electrical and Control Building

Description

The ECB is a Seismic Category I structure designed to resist the effects of a design basis tornado. The ECB is a multistory reinforced concrete structure common to both Unit 1 and Unit 2. The ECB is located between the AB and TB with an approximate plan area of 118-ft by 165-ft. The ECB foundation top is at El. 778-ft and is supported directly on bedrock. The slab at El. 873-ft 4-in serves as the roof slab for the ECB.

The Control Room, for both Units 1 and 2, is located in the ECB at El. 830-ft. The Control Room contains electrical panels/cabinets necessary for safe operation of the plant. Safe occupancy of the Control Room during abnormal conditions is provided for in the design. Adequate shielding is provided for the Control Room in the event of a DBA.

Interior and exterior tornado pressure relief dampers and exterior pressure relief blowout panels are installed in the ECB. Tornado dampers are parallel multi-blade dampers and are normally closed. These dampers are designed to open in either direction when the differential pressure across the dampers reaches its setpoint.

Boundary

The ECB structure is highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The ECB is a Seismic Category I structure. Control Room design is based upon the safe occupation of the CRE during normal operation and for a period of not less than 30 days after a LOCA. Therefore, the ECB performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

(2) Provides a centralized area for I&C necessary for safe plant shutdown.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for EQ (10 CFR 50.49).

(3) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS (10 CFR 50.62).

(4) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 1.2.2.11.1, 2.4.10, 3.2.1.1.1, 3.8.4.1.2, 6.4.1.1, and 6.4.2.1

Components Subject to AMR

Table 2.4-4 lists the ECB components subject to AMR and their associated intended functions.

Table 3.5.2-4 provides the results of the AMR.

Table 2.4-4
Electrical and Control Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Compressible joint and seal	Shelter, protection
Concrete: Above-grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support
Door (air tight, missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection
Door seal	Pressure barrier
Hatch / Removable slab	Missile barrier Shelter, protection Structural support
Masonry wall: Interior	Shelter, protection Structural support
Moisture barrier	Flood barrier
Steel component: All structural members	Shelter, protection Structural support
Tornado blowout panel	Pressure relief Shelter, protection
Tornado pressure relief damper housing	Pressure relief Shelter, protection

2.4.5. Fuel Building

Description

The FB is a reinforced concrete structure whose principal function is to house the new fuel storage area and the two spent fuel storage pools. Both units are serviced by the common FB. The FB is a Seismic Category I structure and is designed to resist the effects of a design basis tornado. The FB is located between the Unit 1 and Unit 2 containment structures and its plan dimensions are approximately 143-ft 6-in by 137-ft 9-in. The bottom of the mat elevation varies with the lowest point at El. 780-ft 6-in and is supported directly on bedrock. The Service Water tunnel is part of the FB foundation and can be accessed from the lower floor of the AB El. 790-ft 6-in.

The FB has an overhead electric crane capable of handling the fuel shipping cask and a fuel handling crane which is mounted on the operating floor to transport new and spent fuel assemblies.

Two pools are provided for CPNPP spent fuel storage. Spent fuel assemblies and irradiated control rods are stored underwater in racks after transfer from the reactor. The fuel assemblies and control rods are held vertically in the racks located on the floor of the spent fuel storage pools. The two reinforced concrete pools are stainless steel lined and are an integral part of the FB.

New fuel assemblies and control rods are stored in a reinforced concrete pit located in the FB. The cask pit, an integral part of the FB, is provided for temporary dry storage and is equipped with storage racks of sufficient capacity for approximately one-third of the core for each unit. All surfaces that come into contact with the fuel assemblies are made of annealed austenitic stainless steel.

The refueling cavities inside the RCB, the SFPs, and the cask pit are all connected with a common transfer canal. Each connection between the transfer canal and the SFPs can be closed by gates. The SFPs, transfer canal, and cask pit are lined with stainless steel plates.

In preparation for refueling, the individual fuel assemblies are transported from the new fuel storage racks to the new fuel elevator using the fuel handling bridge crane or the FB overhead crane equipped with the new fuel handling tool. When an assembly has been lowered by the elevator, the fuel handling bridge crane equipped with the spent fuel handling tool can be used to place it either in the SFP for interim storage or in the Fuel Transfer System fuel basket for immediate transport into the containment.

Boundary

The FB structure is highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The principal function of the FB is to house the new fuel storage area and the two SFPs. The FB is a Seismic Category I structure. The pools, wet cask pit, and transfer canal sections are divided into separate and isolable areas by refueling gates. Therefore, the FB performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

(2) Controls the potential release of fission products to the external environment so that offsite consequences of DBEs are within acceptable limits.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for EQ (10 CFR 50.49).

FSAR References

Sections 1.2.2.11.1, 3.2.1.1.1, 3.8.4.1.3, and 9.1.1

Components Subject to AMR

Table 2.4-5 lists the FB components subject to AMR and their associated intended functions.

Table 3.5.2-5 provides the results of the AMR.

Table 2.4-5
Fuel Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Compressible joint and seal	Shelter, protection

Table 2.4-5
Fuel Building Components Subject to Aging Management Review

Component type	Intended function
Concrete: Above-grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support
Concrete: Above-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support
Concrete: Below-grade exterior (inaccessible)	Pressure barrier Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support
Door (missile resisting, tornado)	Missile barrier Pressure relief Shelter, protection
Door seal	Pressure relief
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support
Masonry wall: Interior	Shelter, protection Shielding Structural support
SFP gate	Water retaining boundary
SFP liner: liner, liner anchor, integral attachments	Structural support Water retaining boundary
Steel component: All structural members	Shelter, protection Structural support
Storage rack (New fuel)	Structural support
Storage rack (Spent fuel)	Absorb neutrons Structural support

2.4.6. Safeguards Buildings

Description

The SGBs are Seismic Category I structures and are designed to resist the effects of the design basis tornado. Each Unit at CPNPP has its own SGB and is approximately 62-ft 6-in by 98-ft including the DG area. All Seismic Category I structures, including the SGBs are founded on rock.

The SGB (for each unit) is a multistory, reinforced concrete structure. There are two stories below grade and four stories above grade. Adequate space is provided between the SGB and adjacent structures to avoid the contact of structures during SSE-induced motions. Piping and other systems crossing from the SGB and ECB to other buildings or structures are designed with sufficient flexibility to maintain their function within applicable code allowable stress limits during the SSE.

The floors below grade house the SI pumps, RHR pumps and coolers, containment spray pumps and coolers, and the auxiliary feedwater pumps. Floors above grade house the emergency DGs, electrical switchgear, MCCs, and CRDM controls.

Interior and exterior tornado pressure relief dampers and exterior pressure relief blowout panels are installed in the SGBs. Tornado dampers are parallel multi-blade dampers and are normally closed. These dampers are designed to open in either direction when the differential pressure across the dampers reaches its setpoint.

Boundary

The SGB structures are reflected on the LRBD below.

- LR-STRUCT-01

Intended Functions

The SGBs perform the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

(2) Controls the potential release of fission products to the external environment so that offsite consequences of DBEs are within acceptable limits.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for EQ (10 CFR 50.49).

(3) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Figures 1.2-1, 10, 11, 12, 13, and 14
Sections 1.2.2.11.1, 1.2.2.12, 3.2.1.1.1, and 3.8.4.1.1

Components Subject to AMR

Table 2.4-6 lists the SGB components subject to AMR and their associated intended functions.

Table 3.5.2-6 provides the results of the AMR.

Table 2.4-6
Safeguards Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Compressible joint and seal	Shelter, protection
Concrete: Above-grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support
Door (missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection
Door seal	Pressure barrier

Table 2.4-6
Safeguards Building Components Subject to Aging Management Review

Component type	Intended function
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support
Masonry wall: Interior	Shelter, protection Shielding Structural support
Steel component: All structural members	Shelter, protection Structural support
Tornado blowout panel	Pressure relief Shelter, protection
Tornado pressure relief damper housing	Pressure relief Shelter, protection

2.4.7. Safe Shutdown Impoundment and Dam

Description

A portion of the arm of the SCR formed by the channel of Panther Branch is utilized as a SSI, which holds water for normal and emergency cooling use. The secondary reservoir is separated from the main body of the reservoir by a rock-fill dam. The SSI Dam is designed and constructed to withstand the most severe postulated natural phenomena. An open spillway channel was excavated through the narrow ridge to the southwest of the SSI Dam, to connect the SSI with the main body of the reservoir. The floor of the channel is at El. 769-ft 6-in, six inches below the normal minimum operating level, such that water will pass back and forth to keep the large and small reservoir surfaces at the same elevation under normal operating conditions.

The SSI is designed to serve as the UHS of the CPNPP and acts to dissipate heat rejected by the SSW during post-accident shutdown and normal cooldown conditions. It has been sized to provide adequate cooling capacity in accordance with the requirements of NRC RG 1.27.

Boundary

The SSI Dam is highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The SSI is an enclosed body of water that is retained by the SSI Dam and serves as the UHS. The function of the UHS is to dissipate heat rejected from the SSW during normal conditions and DBEs. The SSI contains a water supply for a minimum of 30 days of reactor decay heat removal, without outside makeup. During low water levels in the SCR, the SSI is maintained at or above El. 769-ft 6-in by the safe shutdown dam and connecting canal. In addition, the FP makeup is from the SSI. Therefore, the SSI and Dam perform the following LR intended functions.

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides the UHS to dissipate heat rejected from the SSW during post-accident shutdown and normal cooldown conditions.

(2) Provides water to nuclear safety related SSCs for long-term use.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides water to SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

FSAR References

Figures 1.2-1 and 2.4-21
Sections 1.2.2.10, 1.2.2.11.1, 2.5.6.1.2, 2.5.6.4.3, and 3.2.1.1.1

Components Subject to AMR

Table 2.4-7 lists the SSI components subject to AMR and their associated intended functions.

Table 3.5.2-7 provides the results of the AMR.

Table 2.4-7
Safe Shutdown Impoundment and Dam Components Subject to Aging Management Review

Component type	Intended function
Earthen water control Structures: SSI	Heat sink Water retaining boundary
Earthen water control Structures: Spillway	Direct flow Flood barrier

2.4.8. Service Water Intake Structure

Description

The SWIS is a Seismic Category I, reinforced concrete building located on the SSI. The structure foundation is at El. 749-ft with the top of slab at El. 755-ft. The operating deck of the structure is at El. 796-ft with the pump discharge centerline at

El. 800-ft. Access to the SWIS is provided by a personnel door and truck bay entrance at El. 810-ft 6-in.

The SWIS is socketed into rock with soil backfill on three sides above the top of the rock. The SWIS is protected from the effects of wind-wave activity on the SCR by the SSI and Dam.

Cooling water is returned to the SSI. Water from this structure enters the SSI at a point remote enough from the SWIS and at a velocity high enough to ensure adequate mixing, dispersion, and evaporative cooling of the effluent.

The SWIS provides housing to the nuclear safety related service water pumps and a NNS fire pump and is equipped with trash racks, traveling screens, stop gates, and screen wash pumps. Seismic Category I equipment, systems, and components in the SWIS are located above the PMF level and do not require protection from flood. Traveling screens perform their function with moving parts, are “active” and are not subject to AMR.

Boundary

The SWIS is highlighted on the LRBD below:

- LR-STRUCT-01

Intended Functions

The SWIS is designed to Seismic Category I requirements and all Category I structures are designed to withstand the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The SWIS draws water from the SSI and supplies all nuclear safety related cooling systems. The nuclear safety related service water traveling screens provide long-term protection from the accumulation of debris and short-term protection against floating debris. Therefore, the SWIS performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 1.2.2.11.1, 2.4.10, 3.2.1.1.1, and 3.8.4.1.4

Components Subject to AMR

Table 2.4-8 lists the SWIS components subject to AMR and their associated intended functions.

Table 3.5.2-8 provides the results of the AMR.

Table 2.4-8
SWIS Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete: Above-grade exterior (accessible)	Missile barrier Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Direct flow Shelter, protection Structural support Water retaining boundary
Concrete: Foundation, sub-foundation (accessible)	Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support
Hatch / Removable slab	Missile barrier Shelter, protection Structural support
Masonry wall: Interior	Shelter, protection Structural support
Steel component: All structural members	Missile barrier Shelter, protection Structural support
Trash rack	Filter

2.4.9. Switchgear Buildings

Description

The Switchgear Building for each unit are non-Category I buildings located between the TB and SGB for each unit and adjacent to the ECB. The Switchgear Buildings are designed to withstand a seismic event equal to the SSE. The Switchgear Buildings are provided with a reinforced concrete mat foundation with a maximum slab thickness of 6-ft and 3-ft 10-in at other locations. The mat slabs are founded on firm rock. They are independent and not connected to any other building structure. Adequate space is provided between each Switchgear Building and adjacent structures to avoid the contact of structures during an SSE event. The MS/FW lines running outside the SGB are supported on the roof of the Switchgear Buildings. NNS portions of the offsite power system (bus duct) are located in these buildings.

Boundary

The switchgear buildings are highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The Switchgear Buildings house components relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for ATWS and SBO. High-energy MS and Feedwater lines running outside the SGB, whose failure could impact nuclear safety related structures, are supported on the roof of the Switchgear Buildings. NNS portions of the offsite power system (bus duct) are located in these buildings. Therefore, the Switchgear Buildings perform the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for ATWS (10 CFR 50.62).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for SBO (10 CFR 50.63).

FSAR References

Section 3.7B.2.8

Components Subject to AMR

Table 2.4-9 lists the Switchgear Building components subject to AMR and their associated intended functions.

Table 3.5.2-9 provides the results of the AMR.

Table 2.4-9
Switchgear Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete: Above-grade exterior (accessible)	Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Shelter, protection Structural support
Masonry wall: Interior	Shelter, protection Structural support
Metal deck	Structural support
Metal siding	Shelter, protection
Precast panel	Shelter, protection
Steel components: All structural members	Shelter, protection Structural support

2.4.10. Turbine Buildings

Description

The TB for each unit is a non-Category I structure located adjacent to the AB. The TB is approximately 280-ft by 201-ft 9-in. The TB structures do not share a common mat with the adjacent Seismic Category I structure, and all structures are founded on firm rock. Sufficient space is provided between the TB and the adjacent category I structure to prevent contact because of deformations occurring in the structures during a seismic event. The TB is a multi-story reinforced concrete and steel-framed structure that has a steel superstructure with a metal siding enclosure above the turbine operating deck at El. 732-ft. Foundations for the turbine generators are within the TB but are structurally isolated.

The TB houses equipment associated with the main turbine generator. As the TB is a non-Category I structure and not designed for tornado loadings, the metal siding panels may fail at loads below the design tornado loading. The Seismic Category I structures are designed for the effects of tornado generated missiles.

The possibility of structural failure during a seismic event is considered for the TB. Structural failure in the direction of the adjacent Seismic Category I structure is prevented by the bearing of the mezzanine and operating floor slabs on the concrete turbine generator pedestal.

The TB complex houses various steam and power conversion (S&PC) equipment e.g., the main condenser, the moisture separator tanks, the condensate pumps, the heater drain pumps, the main turbines, the main generators, and various auxiliary systems.

Boundary

The TB structures are highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The TB complex is in scope for LR because several Seismic Category II high energy piping segments are located within the TB and are attached to adjacent Seismic Category I structures. These include portions of the SG blowdown lines and heater drain lines. The TB consists of one fire area (TB), divided into fire zones and subzones. Fire Area (TB) extends from EL. 775-ft 4-in to the roof of the TB. This fire area includes both the Unit 1 side and the Unit 2 side of the TB. The TB also houses NNS portions of the offsite power system. Therefore, the TB performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63).

FSAR References

Figures 1.2-1, 22, 23, 24, 25, and 26
Sections 3.7B.2.8 and 8.3.1.4

Components Subject to AMR

Table 2.4-10 lists the TB components subject to AMR and their associated intended functions.

Table 3.5.2-10 provides the results of the AMR.

Table 2.4-10
Turbine Building Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete: Above-grade exterior (accessible)	Shelter, protection Structural support
Concrete: Above-grade exterior (inaccessible)	Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Shelter, protection Structural support
Hatch	Shelter, protection Structural support
Masonry wall: Interior	Shelter, protection Structural support
Metal deck	Structural support
Precast panel	Shelter, protection
Steel components: All structural members	Shelter, protection Structural support

2.4.11. Yard Structures

Description

The Yard Structures includes various concrete and steel buildings and structures in the scope of LR that are spread around the protected area, below and above grade. These include protective features associated with startup and alternate startup transformers, each unit's FWST foundation, firewater valve and pump houses, transformer foundations, duct banks, manholes and handholes, fuel oil storage tank slabs, and missile-protected Seismic Category I Tanks with the associated tunnels (that also cover the piping connections to the tanks). Detailed descriptions for the various yard structures are provided below.

Fire Barrier Walls/Enclosure Pits

The main transformers, unit auxiliary, and startup/alternate startup transformers are oil-cooled and are located outdoors adjacent to the TB. The main transformers are separated from each other, as well as from the TB, by a three-hour rated fire wall. The unit auxiliary transformers, startup transformers and one alternate (spare) startup transformer are separated from the TB by a three-hour rated fire wall. Penetrations in these walls within 50’-0” from each side of the center line of the transformer are protected, by seals or closures having a fire resistance rating equal to the rating assigned to the barrier, to maintain the fire-resistant integrity of the wall. Additional walls are provided extending out from the TB wall to protect the ventilation openings located in the exterior TB wall. The main, unit auxiliary, startup and one spare startup transformers are also surrounded by reinforced concrete enclosures/pits to contain oil spills and prevent the spread of fire.

FWST Foundations

The FWSTs, which are addressed in Section 2.3.3.7 are located on the east side of the FB and are provided to supply water to the Fire Protection Water Supply System. The tanks are provided with a reinforced concrete ring wall type foundation below the tank walls.

Firewater Pumphouse

The fire water pump house is common to both units and is a non-seismic building located on the east side of the FB. The fire water pumphouse is a single story block masonry structure. The building is provided with slab-on-grade reinforced with welded wire fabric (WWF) and a continuous footing for the 12-in thick masonry wall.

The pumphouse consists of five individual rooms which provides housing to the fire pumps, controllers, fuel tanks, and associated equipment located in separate rooms. The walls and seals for openings on the block wall of the fire water pumphouse are approved for a three-hour rated fire. The roof of the fire water pumphouse is a reinforced concrete slab 5.5-in thick on a 3-in metal deck supported by steel beams resting on the masonry wall at both ends. The roof slab is provided with 1-in insulation and built-up roofing protection. The firewater pumphouse is provided with an 8-in thick masonry wall as parapet with precast coping on the top.

Firewater Valve Houses

The Firewater Valve Houses are small metal building structures approximately 10-ft by 10-ft in size installed over a slab-on-grade foundation and provide shelter to the Fire Suppression System.

FOST Slabs

At CPNPP, each Unit is supplied with two full-sized DG sets which are supported by an independent FOSTS train. Each train consists of a buried FOST designed as Seismic Category I. A concrete slab-on-grade is provided as the tornado missile protection for the storage tanks and associated piping. A below-grade foundation slab is designed to provide support for the FOSTs, which are addressed in Section 2.3.3.5.

Manholes, Handholes, Duct Banks

Manholes and handholes consist of reinforced concrete rectangular box structures buried underground with a steel cover. There are nuclear safety related and NNS manholes located in the yard area. Nuclear safety related manholes are provided with a steel plate over the standard manhole cover for missile protection. Handholes are similar to manholes but smaller in size and provided at intersections of duct banks for the ease of cable installation.

Class IE cables are routed between non-adjacent Seismic Category I buildings via Category I duct banks. The duct banks consist of rigid metal conduits encased in concrete resting on bedding and backfill materials. Duct bank rigid conduit ends and building rigid conduit ends are connected by means of flexible metal conduits. Both ends of the flexible conduits are provided with liquid tight and threaded connectors.

Outdoor Seismic Category I Tanks – RWST, CST, RMWST and Associated Piping Tunnels

All Seismic Category I Tanks contain fluid which feed nuclear safety related piping systems such as the AFW and SI Systems. Reinforced concrete tanks are circular in shape, with stainless steel liners to provide leak tightness. For the RWST, the liner also prevents absorption of radioactive material by the concrete structure. Seismic Category I tanks are also designed to resist the effects of the design basis tornado. The RWST, CST and the RMWST for Unit 2 are located on the north side of the plant next to the DGB attached to the SGB. The RWST, CST and the RMWST for Unit 1 are located on the south side of the plant.

The tanks are designed to withstand all credible loadings and to maintain their integrity during operation. These loadings include both normal operating loads such as structure weight, hydrostatic pressure of the contained fluid, live loads on the roof, thermal loads, and environmental loads such as the 1/2 SSE, SSE, normal wind, and tornados (wind, differential pressure, and missiles), and hydrodynamic forces caused by seismic effects on the contained fluid.

These nuclear safety related tanks are also addressed in Sections 2.3.2.3, 2.3.4.1, and 2.3.3.4, respectively, relative to the contained fluid.

A tunnel is provided for each unit which runs between the outdoor Seismic Category I tanks and the SGB for the respective unit. The Seismic Category I pipe tunnel structures protect nuclear safety related piping systems against damage from environmental effects, including the effects of the design basis tornado. At each tank location the tunnel structure extends above ground to EL. 824-ft 6-in and provides access to these tunnels. The tunnel structure is independent of the tank structure and is separated by an expansion joint.

Transformer Foundations

The startup transformers and alternate startup transformer support SBO recovery. Reinforced concrete foundation pads are provided for startup transformers), and alternate startup transformers.

Boundary

Yard structures are highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The Yard Structures perform the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

Fire barrier walls/Enclosure pits

(1) None.

FWST foundations

(2) None.

Firewater Pumphouse

(3) None.

Firewater Valve Houses

(4) None.

FOST slabs

(5) Provides physical support, shelter, and protection for nuclear safety related SSCs.

Manholes, Handholes, Duct Banks

(6) Provides physical support, shelter, and protection for nuclear safety related SSCs.

Outdoor Seismic Category I Tanks –RWST, CST, RMWT and Associated Piping Tunnels

(7) Provides physical support, shelter, and protection for nuclear safety related SSCs.

Transformer Foundations

(8) None.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

Fire barrier walls/Enclosure pits

(1) None.

FWST foundations

(2) None.

Firewater Pumphouse

(3) None.

Firewater Valve Houses

(4) None

FOST slabs

(5) None.

Manholes, Handholes, Duct Banks

(6) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

Outdoor Seismic Category I Tanks –RWST, CST, RMWT and Associated Piping Tunnels

(7) Provides physical support, shelter, and protection for NNS SSCs whose failure could prevent the satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1).

Transformer Foundations

(8) None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

Fire barrier walls/Enclosure pits

(1) Provides physical support, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48).

FWST foundations

(2) Provides physical support, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48).

Firewater Pumphouse

(3) Provides physical support, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48).

Firewater Valve Houses

(4) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

FOST slabs

(5) None.

Manholes, Handholes, Duct Banks

(6) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

Outdoor Seismic Category I Tanks –RWST, CST, RMWT and Associated Piping Tunnels

(7) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(8) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for EQ (10 CFR 50.49).

(9) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63).

Transformer Foundations

(10) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Figure 1.2-1
Section 3.2.1.1.1 and 3.8.4.1.6

Components Subject to AMR

Table 2.4-11 lists the Yard structure components subject to AMR and their associated intended functions.

Table 3.5.2-11 provides the results of the AMR.

Table 2.4-11
Yard Structure Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete: Above-grade exterior (accessible)	Missile barrier Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Concrete: Interior	Flood barrier Missile barrier Shelter, protection Structural support
Elastic joint filler	Shelter, protection
Manhole, handhole & duct bank	Shelter, protection Structural support
Manway seal	Shelter, protection
Masonry wall: Interior/Exterior	Shelter, protection Structural support
Metal deck	Shelter, protection
Metal siding	Shelter, protection
Steel component: structural member, grating, manhole and manway cover, etc.	Missile barrier Shelter, protection Structural support

2.4.12. Switchyard Structures

Description

The CPNPP switchyards are located approximately 600-ft due west of the TB. The 345 kV CPNPP Control House (houses the batteries needed for the SBO 345 kV Switchyard breakers) and the 138 kV Relay House (houses the batteries needed for the SBO 138 kV switchyard breakers) are metal buildings supported by structural steel framing members. The relay houses are single story structures provided with isolated footings for the column members and a slab-on-grade type floor. Internal cable trenches with checkered cover plates are provided to route the cables inside the relay house.

Reinforced concrete foundations are provided for the various six-pole, two-pole, and single-pole structures supporting switchyard electrical apparatus. Precast concrete cable trenches and precast lids are used throughout the switchyard to run the underground cables.

Boundary

The switchyard structures are highlighted on the LRBD below.

- LR-STRUCT-01

Intended Functions

The Switchyard Structures perform the following LR intended function:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for SBO (10 CFR 50.63). 10 CFR 54.4(a)(3)

FSAR References

Figure 1.2-1
Section 8.2.1

Components Subject to AMR

Table 2.4-12 lists the Switchyard components subject to AMR and their associated intended functions.

Table 3.5.2-12 provides the results of the AMR.

Table 2.4-12
Switchyard Structure Components Subject to Aging Management Review

Component type	Intended function
Anchorage to building structure	Structural support
Bolting (structural)	Structural support
Concrete: Above-grade exterior (accessible)	Shelter, protection Structural support
Concrete: Below-grade exterior (inaccessible)	Shelter, protection Structural support
Concrete: Foundation, sub-foundation (inaccessible)	Structural support
Hatch	Shelter, protection
Masonry wall: Interior	Shelter, protection Structural support
Metal siding	Shelter, protection
Precast concrete troughs	Shelter, protection
Steel component: structural member, grating, etc.	Shelter, protection Structural support
Transmission towers	Structural support

2.4.13. Component Support Commodity Group

Description

The component support commodities located within the structures that are in scope for LR include:

- Anchorage/embedment

  Components that facilitate structural attachment to concrete such as grouted-in and through-bolts, cast-in-place anchor bolts, expansion anchors, Richmond inserts, headed studs, base plates, anchor plates, corner angles and miscellaneous bolts and nuts are considered to be anchorage/embedment components within the scope of LR. In-scope bolting also includes (non-containment) liner anchors and penetration anchors.

- Bird screen

  Pest control screens that support ventilation systems to prevent pests such as birds and rodents from entering/interfering with ventilation system functions. Bird screens are attached to air intakes, louvers, and vents and are within the scope of LR.

- Bolting (structural)

  Bolting supporting the intended function of a component, ductwork, and piping support or a structural bulk commodity such as cable trays, conduits or bolting for connections associated with structural steel assemblies such as decking, grating, handrails, ladders, platforms, stairs, vents, and louvers, are within the scope of LR. Structural bolting not included as part of this commodity are:

- Containment closure bolting (associated with the containment liner or penetrations) listed in Section 2.4.1 above,
- Structural bolting associated with building structures such as connections for main beams, columns and other structural frames listed in Sections 2.4.2 to 2.4.12 above, and
- Structural bolting associated with crane members and connections, “hardware”, listed in Section 2.4.14 below.

- Cabinet, panel, rack, and other enclosure

  Electrical and instrumentation enclosures for in-scope cabinets, junction boxes, instrument panels and racks and other electrical equipment are within the scope of LR.

- Cable tray

  Cable trays, and associated hangers, clamps, tray fittings, splices and other cable tray components that provide structural support and shelter/protection for various EIC system cables in the scope of LR are within the scope of LR.

- Conduit

  Conduit systems provide the means of conveying electrical cables to and from termination points at equipment and other electrical raceways (cable trays) in a manner that assures that the cable is protected from mechanical and electrical damage. Conduit systems include rigid conduits, flexible conduits, conduit supports, and conduit fittings such as couplers and unions and are within the scope of LR.

- Door

  Doors/hatches include components that act as structural pressure barriers, radiation shields, flood barriers, and missile resisting doors. Doors/hatches also include other miscellaneous doors such as hollow metal doors, and aluminum doors that separate different areas of the building(s). Fire barrier doors that perform an intended function for FP are addressed as a different commodity group (Section 2.4.15). Watertight doors, hatches, hatch covers, missile barriers, and other miscellaneous doors are limited to certain structures and are addressed with those structures in Sections 2.4.2 to 2.4.12 above. Likewise, containment airlocks and equipment hatches are addressed with that structure in Section 2.4.1 above.

- Equipment foundation pad/pedestal

  The equipment foundation pads/pedestals anchor and support equipment/ components above the floor/grade elevation. Equipment foundation pads/pedestals that support components/equipment within the scope of LR are within the scope of LR.

- Insulation

  Insulation includes insulating cement, thermal insulation, anti-sweat insulation, anti-freeze insulation, heat tracing, and reflective metal insulation. Plastic insulating cement may be used on surfaces operating at a temperature between 100°F and 1000°F. Reflective insulation is not critical to the safety of the plant; however, should any of the component parts of the reflective insulation be dislodged during a design basis earthquake, the operation of critical piping and equipment could be impaired. The reflective insulation assemblies were, therefore, installed to Seismic Category II requirements. Piping and equipment operating at temperatures lower than the dew point of surrounding ambient conditions are provided with anti-sweat insulation. Conservatively, outdoor piping is equipped with insulation for anti-freeze protection. Additionally, certain piping and equipment in select rooms of the SGB and AB require ESF thermal insulation. Except for the piping and equipment in select rooms of the SGB and AB which require ESF thermal insulation, for post-accident operation and anti-sweat/anti-freeze insulation described above, other insulation is for personnel protection rather than for process requirements. Furthermore, insulation is removed from insulated piping that goes through a sealed penetration or sleeve (such as associated with the CRE or pressurization requirements for the Auxiliary, Fuel and SGBs) and there is a minimum clearance between insulation and an unsealed penetration or sleeve. Insulation associated with containment penetrations and PSW tunnels are addressed separately with that structure in Section 2.4.1 above.

- Insulation jacketing

  Insulation jacketing consists of the jacketing/vapor barrier for all insulated plant piping and equipment that are in the scope of LR and includes the associated straps, tie wires and clips.

- Louver and damper

  Louvers and dampers are devices that are used to regulate the flow of air in a structure. Louvers and damper housings that perform a LR intended function of shelter and protection and are located in structures within the scope of LR are included in the scope of LR.

- Miscellaneous steel (e.g., stair, catwalk, handrail, decking, grating, ladder, framing and platform)

  Miscellaneous components such as stairs, catwalks, handrails, decking, grating, ladders, framing, and platforms located within nuclear safety related structures and whose failure during a DBE can cause an impact or spatial interaction concern with nuclear safety related SSCs, are within the scope of LR.

- Moment restraint

  Moment restraints are provided to protect the containment isolation valves, process pipes and penetrations within the break exclusion areas (BEAs) for HELBs. The moment restraints include forgings that are part of the pressure boundary and are addressed in Sections 2.3.1.3, 2.3.3.1, 2.3.4.1, 2.3.4.2, and 2.3.4.3.

- Penetration seal

  Penetration seals within the scope of LR include material seals used for mechanical and electrical penetrations in (non-containment) walls, floors and ceilings that are designed to provide structural support, maintain the structural pressure barrier and act as a flood, radiation, and HELB shielding. Fire barrier penetration seals are included in the Fire barrier commodity group.

- Penetration sleeve

  Penetration sleeves provide a means for supporting and sealing mechanical and electrical penetrations through walls, floors, and other barriers outside of containment. Penetration sleeves are typically provided for openings through barriers for pipe, conduit, instrumentation, bus ducts, HVAC ducts, and cable trays. Seals provide pressure, radiation, fire barrier and environmental integrity.

- Pipe whip restraint and jet impingement shield

  Pipe whip restraints and jet impingement shields are support structures that function to limit the movement of a ruptured pipe and hence protect essential components within the scope of LR from pipe whip and/or jet impingement effects. The pipe whip restraints used by CPNPP are U-bar, crushable pipe (bumper), crushable pad (honeycomb), and elastic restraints. The elastic restraints are moment restraints, hard restraints and pipe supports.

- Roofing membrane

  Roofing membranes in the scope of LR consist of the roofing membranes that perform the LR intended function of providing shelter/protection for structures within the scope of LR. This component type only includes the roofing membranes and does not include the associated structural framing/supports for roofs. Structural components that support the roofs are identified and evaluated with the associated structures.

- Seal, gasket, and moisture barrier (caulking, flashing and other sealant)

  Caulking, flashing, and other sealants used to seal building wall joints, perimeter joints of door frames, windows, louvers, and other opening frames in contact with concrete or masonry construction, interior floor, roof, and wall joints. Caulking, flashing, and sealants used on structures within the scope of LR are within the scope of LR.

- Support bolting for ASME Class 1 piping, and Class 2 and 3 piping and components

  Bolting used for constant and variable load spring hangers; struts; snubbers; guides; and stops that support nuclear safety related components in the scope of LR are included in the scope of LR. Bolting for major RCS Class 1 components is listed in Section 2.4.1 above.

- Support for ASME Class 1, 2, and 3 piping and Class 2 and 3 piping and components

  These constant and variable load spring hangers; struts; snubbers; guides; and stops support nuclear safety related components in the scope of LR and are included in the scope of LR. Supports for ASME Class 1 major components (RV and CRDMs, pressurizer, RCPs and SGs) are not included in this commodity but are addressed in Section 2.4.1 above with the containment structure to which they are attached.

- Support member

  This component group includes support members, as well as hangers, for all other ductwork, piping, tubing, and components (that are not ASME Class 1, 2, or 3 piping and components), including electrical cabinet, rack, panel, enclosure, cable tray, and conduit within the scope of LR.

- Tube track

  Tube track within the scope of LR is associated with various instrumentation tubing that is within the scope of LR.

<u>Boundary</u>

The component support commodities are contained in the structures within scope of LR. These structures are depicted on the LRBD below.

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Intended Functions

The Component Support Commodity group performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support, shelter, and protection for nuclear safety related SSCs that perform nuclear safety related intended functions.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support, shelter, and protection for NNS SSCs whose degradation and failure could impede or prevent a nuclear safety related SSC from accomplishing its intended function(s).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for EQ (10 CFR 50.49).

(2) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for ATWS (10 CFR 50.62).

(3) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for FP (10 CFR 50.48).

(4) Provides physical support, shelter, and protection for SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for SBO (10 CFR 50.63).

FSAR References

Sections 3.1B.3, 3.2, 3.3.1.1, 3.3.2.1, 3.6B.2.3.3, 3.6B.2.2.2, 3.7B, 3.8.1.1.4, 3.8.1.1.6, 3.8.1.4.6, 3.8.1.5.6, 3.8.1.6.5, 3.8.3.4.7,3.8.4.2, 3.8.5.1, 3.9B, 3.10B.3, 6.4.1.6, 12.3.2, and 12.3.3
Appendices IA(B) and/or IA(N) and 17A

Components Subject to AMR

Table 2.4-13 lists the component support commodities subject to AMR and their associated intended functions.

Table 3.5.2-13 provides the results of the component support commodity group AMR.

Table 2.4-13
Component Support Commodity Group Subject to Aging Management Review

Commodity	Intended Function(s)
Anchorage/embedment	Structural support
Bird screen	Filter
Bolting (structural)	Structural support
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support
Cable tray	Shelter, protection Structural support
Conduit	Shelter, protection Structural support
Door	Shelter, protection Structural pressure barrier
Equipment foundation pad/pedestal	Structural support
Insulation	Thermal insulation[1]
Insulation jacketing	Jacket integrity
Louver and damper housing	Shelter, protection[2]
Miscellaneous steel – e.g., stair, handrail, decking, grating, ladder, framing and platform	Shelter, protection Structural support
Moment restraint	HELB shielding Pipe whip restraint Structural support
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier
Penetration sleeve	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier
Pipe whip restraint and jet impingement shield	HELB shielding Pipe whip restraint Shelter, protection Structural support
Roofing membrane	Shelter, protection
Seal, gasket, and moisture barrier (caulking, flashing and other sealants)	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier
Support bolting for ASME Class 1 (piping) and Class 2 and 3 piping and components	Structural support

Table 2.4-13
Component Support Commodity Group Subject to Aging Management Review

Commodity	Intended Function(s)
Support for ASME Class 1 (piping) and Class 2 and 3 piping and components	Structural support
Support member	Structural support
Tube track	Shelter, protection Structural support

[1] Thermal insulation of piping and equipment in select ESF rooms of the SGBs and AB (for the ESF area/room coolers to provide adequate cooling post-accident) and the antifreeze outdoor piping insulation (to keep boron in solution) is required.

[2] Component type does not include louver or damper housings credited with pressure relief for a Tornado, addressed in Tables 2.4-2, 2.4-3, 2.4-4 and 2.4-6, or fire damper housings, addressed in Table 2.4-15.

2.4.14. Crane/Hoist Commodity Group

Description

Cranes and hoists are used to safely move material and equipment supporting operations and maintenance activities and are designed to be in compliance with NUREG-0612. Cranes or hoists which handle a critical load which, if dropped, could prevent safe shutdown, or result in offsite radiation releases comparable to 10 CFR Part 100 limits are designed to prevent that load drop and are designated nuclear safety related and are within the scope of LR.

Additionally, overhead load handling systems (e.g., cranes, hoists, etc.) whose failure could result in damage to a nuclear safety related SSC that could prevent the accomplishment of a safety function are within the scope of LR based on the criterion of 10 CFR 54.4(a)(2).

Overhead load handling systems with the potential for heavy load drop on or near spent fuel or systems required for plant shutdown or decay heat removal are in the scope of LR.

The handling of heavy loads outside of structures by the use of non-permanent load handling systems are subject to engineering evaluation and work control review. Routine use of mobile cranes that have already been identified and evaluated include the removal of equipment from containment (e.g., RCP motors), from the SWIS (e.g., SSW pumps and motors), and between the FB and the ISFSI (e.g., DCSS HI-STORMs).

The following precautions are taken for such non-permanent load handling systems:

- When traversing very heavy loads (e.g., SSW pumps, SSW motors, RCP motors) in the yard, the load should not be carried over underground nuclear safety related facilities unless special precautions are taken to minimize risk.

- When traversing very heavy loads over underground nuclear safety related facilities (Diesel Fuel Oil Storage tanks, Service water Pipe Tunnels and buried piping, and Class 1E duct banks) in the yard, the load should be carried as low as practical.

- When traversing very heavy loads (e.g., SWIS roof hatches, pumps, or motors) over the SWIS, the load should be carried as low as practical and take the shortest route to a safe load area (i.e., not over underground nuclear safety related facilities).

Boundary

The cranes and hoists are contained in the structures that are within the scope of LR. These structures are depicted on the site LRBD.

- LR-STRUCT-01

Intended Functions

The Crane/Hoist Commodity Group performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) Provides physical support for nuclear safety related SSCs.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) Provides physical support for NNS SSCs whose degradation and failure could impede or prevent a nuclear safety related SSC from accomplishing its intended function(s).

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) None.

FSAR References

Sections 3.2.1.1.2, 3.8.1.1.6, 3.8.3.1.2, 3.8.4.1.3, 3.8.3.4.10, 3.8.3.7.3, 9.1.1.2, 9.1.1.3, 9.1.2.1, 9.1.2.2, 9.1.4.2, 9.1.4.2.3, 9.1.4.3.1, 9.2.1.10, 10.4.7.3, 11.4.2.2, 12.3.1.2.1, 15.7.5
Table 17A-1

Components Subject to AMR

Table 2.4-14 lists the crane/hoist commodities subject to AMR and their associated intended functions.

Table 3.5.2-14 provides the results of the crane/hoist commodity AMR.

Table 2.4-14
Crane/Hoist Commodity Group Subject to Aging Management Review

Commodity	Intended Function
Bolting (structural)	Structural support
Bridge/trolley/girder	Structural support
Jib crane/beam/plate/anchorage	Structural support
Monorail and trolley beam/lifting device/plate	Structural support
Rail system (rail, clip, plate, and anchor)	Structural support

2.4.15. Fire Barrier Commodity Group

Description

Fire barriers are those components of construction (walls, floors, or protective covering) that are rated by approved laboratories or are constructed in accordance with the requirements stated by authorities having jurisdiction. Barriers are rated in hours of resistance to fire and are used to prevent the spread of fire. The integrity of a fire barrier may also be substantiated by either a fire test or an FHA (fire hazards analysis) evaluation. Similarly, a fire break is a physical barrier that prevents fire propagation, that is, the spreading of a fire from one component to another or direct exposure of a component to the heat and flames of a fire, or both.

Fire barriers are part of the plant FPS and perform an intended function and are included within the scope for LR per the Commission's regulations for FP (10 CFR 50.48). For LR considerations, fire breaks are considered as fire barriers.

Fire barriers and associated components within the scope of LR include:

- Cable raceway fire barriers

  Cable raceway fire barriers are used to isolate some cable raceways from local fire exposures. The fire barriers used on raceways have a one-hour or three-hour fire rating, as applicable.

- Concrete block (removable) for opening

  Removable concrete block openings are provided in certain walls to facilitate equipment removal and replacement. Thus, in areas where a removable concrete block opening exists in a fire wall, an FHA evaluation justifies the as-built design, and the concrete blocks are installed in such a way that there are no through openings from one side of the barrier to the other. The concrete blocks are also restrained in the openings so that they will remain in place during a fire or seismic condition.

- Damper

  HVAC ductwork which penetrates fire barriers is installed in accordance with NFPA-90A and an Underwriters Laboratory (UL) listed fire damper that has a rating at least commensurate with the barrier in which it is installed is provided in the duct.

- Door

  With the exception of watertight and missile- and bullet-resistant doors, the door openings in fire barriers are provided with approved fire doors which carry a fire rating at least equivalent to the rating of the barrier and comply with the guidance provided by UL or are validated by a fire test from a recognized testing laboratory.

  Primary design criteria for a watertight door is containment of internal flood water to prevent damage to redundant essential equipment and systems. The fire severity in the area for the door location is moderate, and the maximum permissible fire loading value is low to moderate. The fire detection and sprinkler system is relied upon for fire protection in the areas where watertight doors are provided.

  Primary design criteria for the missile- and bullet-resistant doors is resistance to externally generated missiles. The fire severity in the area for the door location is moderate, and the maximum permissible fire loading value is low. Automatic sprinkler suppression is provided where the potential for exposure of nuclear safety related systems exists. Ionization detection is provided throughout the area.

- Hatch

  Hatches are provided through floors in various locations to facilitate equipment removal and replacement. In areas where these hatches pass through a floor which serves as a fire barrier, the hatches are fire rated equal to or greater than that of the fire barrier.

- Insulation and wrap

  This component group includes insulation provided for piping and other components that are non-combustible or have been tested and qualified by UL. This commodity group also include fireproofing material used on cable trays and structural steel fireproofing such as Thermo-Lag and radiant energy shields (RESs).

- Penetration seal

  Penetration seals are used to seal openings through interior fire barriers for pipe, conduit, instrumentation, bus ducts, duct work, and cable trays. Seals provide a fire rating greater than or equal to the barriers in which they are installed except where justifications for deviations have been written.

- Penetration sleeve

  Penetration sleeves provide a means for supporting and sealing mechanical and electrical penetrations through walls, floors, and other barriers outside of

Containment. Penetration sleeves are typically provided for openings through barriers for pipe, conduit, instrumentation, bus ducts, HVAC ducts and cable trays. Seals provide pressure, radiation, fire barrier and environmental integrity.

- Wall, floor, and ceiling
  - Reinforced concrete fire walls, floors, and ceilings comply with either UL listed designs, the Uniform Building Code (UBC), or are a tested configuration.
  - Structural steel associated with the metal siding panels and the internal structure of the TB that are protected with a fire-resistant coating in areas where the steel members are adjacent to a fire barrier, are a part of a fire barrier, or are exposed to a potential fire hazard as identified in the Fire Hazards Analysis.
  - Structural steel supporting fire dampers, tornado vents, and fire barrier penetrations such as doors, vents, etc.
  - Unit masonry is utilized throughout the plant site, usually where reinforced concrete was not feasible. Unit masonry construction provides fire-resistant barriers separating one fire area from another.
  - Gypsum drywall is utilized throughout the plant to provide a fire barrier which is lightweight and where unit masonry or concrete is not feasible.
- FP hose station (including rack, reel, and support)

  Hose stations are located strategically throughout the plant for manual firefighting operation and are installed in nuclear safety related buildings such that an effective hose stream can reach any location in a nuclear safety related building.

Boundary

The fire barriers are contained in the structures that are within the scope of LR. These structures are depicted on the site layout LRBD.

- LR-STRUCT-01

Intended Functions

The Fire Barrier Commodity Group performs the following LR intended functions:

Nuclear safety related functions (10 CFR 54.4(a)(1)):

(1) None.

NNS that could affect nuclear safety related functions (10 CFR 54.4(a)(2)):

(1) None.

FP, EQ, PTS, ATWS, and SBO functions (10 CFR 54.4(a)(3)):

(1) Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for regulated events for FP (10 CFR 50.48). That is, serve as a rated fire barrier or provide structural support for components used for manual firefighting.

FSAR References

Sections 9.5.1.1, 9.5.1.2.3.9, 9.5.1.5, 9.5.1.6.1, and 9.5.1.6.2
Table 17A-1

Components Subject to AMR

Table 2.4-15 lists the fire barrier commodities subject to AMR and their associated intended functions.

Table 3.5.2-15 provides the results of the fire barrier commodity AMR.

Table 2.4-15
Fire Barrier Commodity Group Subject to Aging Management Review

Commodity	Intended Function
Cable raceway	Fire barrier
Concrete block (removable) for opening	Fire barrier
Damper housing	Fire barrier
Door	Fire barrier
Hatch	Fire barrier
Insulation and wrap	Fire barrier
Penetration seal	Fire barrier
Penetration sleeve	Fire barrier
Wall, floor, and ceiling	Fire barrier
FP hose station (rack, reel, and support)	Structural support

2.5. SCOPING AND SCREENING RESULTS: ELECTRICAL

The determination of EIC systems that fall within the scope of LR is made through the application of the process described in Section 2.1. The results of the electrical systems scoping review are contained in Section 2.2 and employ an in-scope bounding approach whereby all EIC systems are included in scope (unless noted otherwise). When used with the plant spaces approach, this encompassing or bounding approach eliminates the need for unique identification of each EIC component and its specific location. Intended functions for EIC systems are not identified since the bounding scoping approach makes it unnecessary to determine if an EIC system has an intended function. This assures components are not improperly excluded from AMR but does not prevent elimination of commodity groups or specific plant systems from AMR in accordance with the screening guidance of 10 CFR 54.21.

The methodology used in identifying EIC components requiring an AMR is discussed in Section 2.1.6.1. The screening for EIC components was performed on a generic component commodity group basis for all EIC systems listed in Table 2.2-1, as well as the EIC component commodity groups associated with mechanical systems and civil structures listed in Table 2.2-1. The methodology employed is consistent with the guidance in NEI 95-10.

The interface of EIC components with other types of components and the assessments of these interfacing components are provided in the appropriate mechanical or structural sections. For example, the assessment of electrical racks, panels, frames, cabinets, cable trays, conduits, and their supports is provided in the structural assessment documented in Sections 2.4 and 3.5.

The EIC components included in the screening are the separate EIC components that are not parts of a larger (active) component or assembly. For example, the wiring, terminal blocks, and connections located internal to a breaker cubicle are considered to be parts of the breaker. Accordingly, the breaker was screened, but the internal parts of the breaker were not screened.

2.5.1. Electrical and I&C Component Commodity Groups

2.5.1.1. Identification of Electrical and I&C Components

The EIC component commodity groups were identified from a review of electrical systems within the scope of 10 CFR Part 54, controlled electrical drawings, the MEL, and interface with the mechanical and structural screening process. This commodity based approach, whereby component types with similar design and/or functional characteristics are grouped together, is consistent with guidance from NEI 95-10 and Table 2.1-5 of NUREG-1800. The in-scope EIC component commodity groups identified at CPNPP Units 1 and 2 are listed in Table 2.5-1.

2.5.1.2. Application of Screening Criterion 10 CFR 54.21(a)(1)(i) to the Electrical and I&C Components and Commodities

Following the identification of the electrical components and commodity groups, the criterion of 10 CFR 54.21(a)(1)(i) is applied to identify EIC commodity groups that perform their functions without moving parts or without a change in configuration or properties. The following EIC commodity groups meet the screening criteria of 10 CFR 54.21(a)(1)(i) for CPNPP:

- Insulated cables and connections
- EIC penetration assemblies
- Metal enclosed bus
- High-voltage insulators
- Switchyard bus and connections
- Transmission conductors and connections
- Uninsulated ground conductors

2.5.1.3. Elimination of Electrical and I&C Commodity Groups Not Applicable to CPNPP

The following EIC commodity groups are not applicable to CPNPP:

Cable Tie-Wraps

At CPNPP, cable fasteners and tie-wraps are intended to be used for training cables, assembling wires or cables into neat bundles and for general housekeeping purposes. Cable fasteners and tie-wraps are not considered a cable support. Electrical cable tie-wraps do not function as cable supports in raceway support analyses; therefore, the installation and inspection criteria are limited to the application of standard practices in providing quality cable bundles and cable placement. The seismic qualification of cable trays does not credit the use of electrical cable tie-wraps. Cable tie-wraps do not have an LR intended function as defined in 10 CFR 54.4, therefore they are not subject to AMR.

Fuse Holders (Metallic Clamps)

The cables and connections commodity group includes fuse holders (fuse blocks). Consistent with NUREG-1801 XI.E5, NEI 95-10 Appendix B Item 77, NUREG-1800 Table 2.1-5 Item 77, and NUREG-1950 Table II-13, the screening of fuse holders (metallic clamps) applies to those that are not part of active equipment. This screening guidance is consistent with the original guidance provided to LR applicants under NRC letter dated March 10, 2003 through ISG-05 (Reference ML030690512). Fuse holders inside the enclosure of active equipment, such as switchgear, power supplies, power inverters, battery chargers, and circuit boards are considered piece parts of the active equipment. Since piece parts and subcomponents in such an enclosure are routinely inspected and regularly maintained as part of normal maintenance and surveillance activities, they are not subject to AMR (Reference 1.7.15).

To discover the population of fuse holders located outside of active equipment, a plant equipment database query was developed. Then, fuse locations were determined utilizing tag information and plant engineering expertise. The results of the equipment database evaluation confirmed there are no fuses which support a system intended function and are not part of an active equipment such as switchgear, power supplies, power inverters, battery chargers, load centers, and circuit boards. It is concluded that fuses, including metallic clamps for the fuse clips of the fuse holders, are considered piece parts of the active equipment and are therefore not subject to AMR.

2.5.1.4. Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups

The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to the specific commodities that remained following application of the 10 CFR 54.21(a)(1)(i) criterion. Criterion 10 CFR 54.21(a)(1)(ii) allows the exclusion of those commodities that are subject to replacement based on a qualified life or specified time period. The only electrical commodities identified for exclusion by the criteria of 10 CFR 54.21(a)(1)(ii) are EIC components and commodities included in the EQ Program (10 CFR 50.49). This is because EIC components and commodities included in the Environmental Qualification of Electric Components (B.2.2.2) AMP have defined qualified lives and are replaced prior to the expiration of their qualified lives. No EIC components and commodities within the Environmental Qualification of Electric Components (B.2.2.2) AMP are subject to AMR in accordance with the screening criterion of 10 CFR 54.21(a)(1)(ii). Note that TLAAs associated with EIC components within the Environmental Qualification of Electric Components (B.2.2.2) AMP are discussed in Section 4.4.

Insulated Cables and Connections

The function of insulated cables and connections is to electrically connect specified sections of an electrical circuit to deliver voltage, current, or signals. Electrical cables and their required terminations (i.e., connections) are reviewed as a single component commodity group. The types of connections included in this review are splices, connectors, and terminal blocks. Numerous insulated cables and connections are included in the Environmental Qualification of Electric Components (B.2.2.2) AMP. The insulated cables and connections that are included in this program have a qualified life that is documented in the Environmental Qualification of Electric Components (B.2.2.2) AMP. Components in the Environmental Qualification of Electric Components (B.2.2.2) AMP are replaced prior to the expiration of their qualified life. Accordingly, all insulated cables and connections within the Environmental Qualification of Electric Components (B.2.2.2) AMP are replacement items under 10 CFR 54.21(a)(1)(ii) and are not subject to AMR. Note that TLAAs associated with electrical/I&C components within the Environmental Qualification of Electric Components (B.2.2.2) AMP are discussed in Section 4.4.

Insulated cables and connections that perform an intended function within the scope of LR but are not included in the Environmental Qualification of Electric Components (B.2.2.2) AMP, meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to AMR.

Switchyard Bus and Connections, High-voltage Insulators, Transmission Conductors and Connections

NUREG-1801, Chapter VI.A addresses components that are relied upon to meet the SBO requirements for restoration of offsite power. This guidance is consistent with the original guidance provided to LR applicants under NRC letter dated April 1, 2002 (Reference ML020920464). Consistent with this guidance, the switchyard commodities of switchyard bus and connections, high-voltage insulators, and transmission conductors and connections perform an intended function for restoration of offsite power following a SBO event. Additionally, none of these commodities are included in the Environmental Qualification of Electric Components

(B.2.2.2) AMP. Thus, these commodities meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to AMR.

Figure 2.5-1 identifies the major components or commodities associated with restoration of off-site power following a SBO event.

Metal Enclosed Bus

Metal enclosed bus (MEB) is used to connect two or more elements (i.e., electrical equipment such as switchgear and transformers) of an electrical circuit. This commodity group includes three broad categories of MEB: isolated (iso) phase bus, non-segregated phase bus, and segregated phase bus. Iso-phase bus is electrical bus in which each phase conductor is enclosed by an individual metal housing separated from adjacent conductor housings by an air space. Non-segregated phase bus is electrical bus constructed with all phase conductors in a common enclosure without barriers (only air space) between the phases. Segregated phase bus is electrical bus constructed with all phase conductors in a common enclosure but segregated by metal barriers between phases. Segregated phase bus is not utilized at CPNPP, and the iso-phase bus does not perform or support an LR intended function. Only non-segregated phase MEB utilized in the restoration power path for offsite power following a SBO event performs an LR intended function, and this MEB is not in the Environmental Qualification of Electric Components (B.2.2.2) AMP. Therefore, non-segregated phase MEB used in the restoration of offsite power meets the criterion of 10 CFR 54.21(a)(1)(ii) and is subject to AMR.

Electrical and I&C Penetration Assemblies

All CPNPP EIC penetration assemblies are included in the Environmental Qualification of Electric Components (B.2.2.2) AMP (10 CFR 50.49). CPNPP EIC penetration assemblies included in the Environmental Qualification of Electric Components (B.2.2.2) AMP are subject to replacement based on their qualified life, therefore they are not subject to AMR. Non-EQ cables and connections to EIC penetrations are evaluated in the insulated cables and connections commodity group.

Uninsulated Ground Conductors and Connections

Uninsulated ground conductors and connections are used in lightning protection applications to protect CPNPP buildings and equipment from lightning strikes by providing a low resistance path to ground. No uninsulated ground conductors and connections are included in the EQ Program. Thus, this commodity group meets the criterion of 10 CFR 54.21(a)(1)(ii) and is subject to AMR.

2.5.2. Electrical and I&C Commodity Groups Subject to Aging Management Review

Table 2.5-2 lists the EIC commodity groups subject to AMR and their associated component intended functions.

Table 3.6.2-1 provides the results of the AMR.

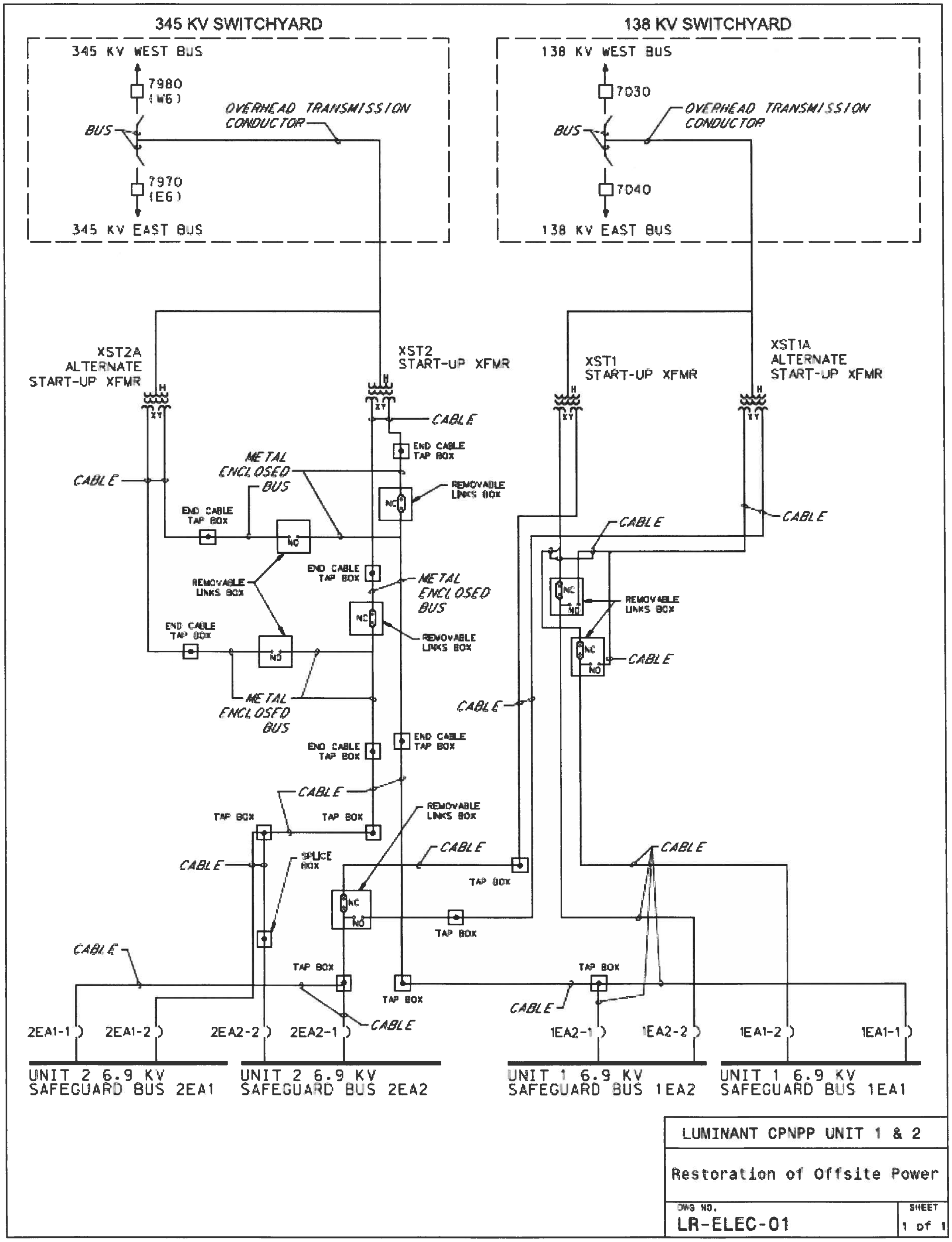
Table 2.5-1
Electrical and I&C Component Commodity Groups Installed at CPNPP

<table>
<tr><td>Alarm Units</td><td>Elements</td><td>Light Bulbs</td><td>Solid State Devices</td></tr>
<tr><td>Analyzers</td><td rowspan="4">Electrical Controls and Panel Internal Component Assemblies</td><td>Load Centers</td><td>Splices</td></tr>
<tr><td>Annunciators</td><td>Loop Controllers</td><td>Surge Arresters</td></tr>
<tr><td>Batteries</td><td>Meters</td><td>Switches</td></tr>
<tr><td rowspan="2">Cables and Connections</td><td rowspan="2">Motor Control Centers</td><td>Switchgear</td></tr>
<tr><td rowspan="3">Electrical/I&C Penetration Assemblies</td><td rowspan="2">Switchyard Bus and Connections</td></tr>
<tr><td>Chargers</td><td>Motors</td></tr>
<tr><td>Circuit Breakers</td><td>Power Supplies</td><td>Terminal Blocks</td></tr>
<tr><td>Converters</td><td>Fuses</td><td>Radiation Monitors</td><td>Thermocouples</td></tr>
<tr><td rowspan="2">Communication Equipment</td><td>Fuse Holders</td><td>Recorders</td><td>Transducers</td></tr>
<tr><td>Generators</td><td>Regulators</td><td>Transformers</td></tr>
<tr><td rowspan="3">Distribution Panel Internal Component Assemblies</td><td>Heat Tracing</td><td>Relays</td><td>Transmitters</td></tr>
<tr><td>High-Voltage Insulators</td><td>RTDs</td><td rowspan="2">Transmission Conductors and Connections</td></tr>
<tr><td>Indicators</td><td>Sensors</td></tr>
<tr><td>Electrical Bus (MEB)</td><td>Inverters</td><td>Signal Conditioners</td><td rowspan="2">Uninsulated Ground Conductors</td></tr>
<tr><td>Electric Heaters</td><td>Isolators</td><td>Solenoid Operators</td></tr>
</table>

Table 2.5-2
Electrical and I&C Systems Components Subject to Aging Management Review

Electrical and I&C Commodity	Component Intended Function(s)
Non-EQ insulated cables and connections	Electrical continuity
Metal enclosed bus (for SBO recovery) • bus and conductors • electrical insulation and internal insulators	 Electrical continuity Insulate (electrical)
High-voltage insulators (for SBO recovery)	Insulate (electrical)
Switchyard bus and connections (for SBO recovery)	Electrical continuity
Transmission conductors and connections (for SBO recovery)	Electrical continuity
Uninsulated ground conductors and connections	Electrical continuity

Figure 2.5-1
Restoration Power Path for Offsite Power Following a SBO Event



3.0. AGING MANAGEMENT REVIEW RESULTS

This chapter provides the results of the AMR for those structures and components identified in Section 2.0 as being subject to AMR. Organization of this chapter is based on Tables 3.1-1 through 3.6-1 of NUREG-1801 Revision 2.

The major sections of this chapter are:

- Aging Management of Reactor Vessel, Internals, and Reactor Coolant System (Section 3.1)
- Aging Management of Engineered Safety Features (Section 3.2)
- Aging Management of Auxiliary Systems (Section 3.3)
- Aging Management of Steam and Power Conversion Systems (Section 3.4)
- Aging Management of Containments, Structures, and Component Supports (Section 3.5)
- Aging Management of Electrical and Instrumentation and Controls (Section 3.6)

Tables 3.0-1, 3.0-2, and 3.0-3 provide descriptions of the mechanical, structural, and electrical service environments, respectively, used in the AMRs to determine aging effects requiring management. The environments used in the AMRs are listed in the first column. The second column includes the definition for the environment and a description of any key relevant conditions, such as temperature in degrees Fahrenheit (°F), in that environment. The third column identifies one or more of the NUREG-1801 environments, as supplemented by LR-ISGs, that are used when comparing the CPNPP AMR results to the NUREG-1801 results. The definitions of those environments correspond to the definitions in NUREG-1801, Section IX.D.

Most of the AMR results information in Section 3 are presented in the following two tables:

Table 3.x-1 - where ‘3’ indicates the LRA section number, ‘x’ indicates the subsection number from NUREG-1801, and ‘1’ indicates that this is the first table type in Section 3. For example, in the Reactor Vessel, Internals, and Reactor Coolant System subsection, this table would be number 3.1-1, in the ESF subsection, this table would be 3.2-1, and so on. For ease of discussion, this Table will, hereafter, be referred to in this Section as “Table 1.”

Table 3.x.2-y - where ‘3’ indicates the LRA section number, ‘x’ indicates the subsection number from NUREG-1801, and ‘2’ indicates that this is the second table type in Section 3; and ‘y’ indicates the table number for a specific system. For example, for the Reactor Vessel, within Section 3.1 for the Reactor Pressure Vessel, this would be Table 3.1.2-1, and for the Reactor Vessel Internals, it would be Table 3.1.2-2. For the Combustible Gas Control System, within the ESF subsection, this table would be 3.2.2-1. For the next system within the ESF subsection, it would be Table 3.2.2-2. For ease of discussion, this Table will, hereafter, be referred to in this section as “Table 2.”

TABLE DESCRIPTION

NUREG-1801 contains the generic evaluation of existing plant programs. It documents the technical basis for determining where existing programs are adequate without modification, and where existing programs should be augmented for the extended period of operation. The evaluation results documented in NUREG-1801 indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components, within the scope of LR, without change. NUREG-1801 also contains recommendations on specific areas for which existing programs should be augmented for LR. In order to take full advantage of NUREG-1801, a comparison between the CPNPP AMR results and the tables of NUREG-1801 has been performed. The results of that comparison are provided in the two tables.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the facility aligns with the corresponding tables of NUREG-1800. The table is essentially the same as Tables 3.1-1 through 3.6-1 provided in NUREG-1800, except that the “ID” and “Type” columns have been replaced by an “Item Number” column, and the “Rev2 Item” and “Rev1 Item” columns have been replaced by a “Discussion” column.

The “Item Number” column provides the reviewer with a means to cross-reference from Table 2 to Table 1.

The “Discussion” column is used to provide clarifying or amplifying information. The following are examples of information that might be contained within this column:

- “Further Evaluation Recommended” information or reference to where that information is located.
- The name of a plant-specific AMP being used, if applicable.
- Exceptions to the NUREG-1800 assumptions, if applicable.
- A discussion of how the line is consistent with the corresponding line item in NUREG-1800, when additional plant-specific detail may provide clarity.
- A discussion of how the item is different than the corresponding line item in NUREG-1800 when it may appear to be consistent (e.g., when there is exception taken to an AMP that is listed in NUREG-1800), if applicable.

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1800 Table row, thereby, allowing for the ease of checking consistency.

Table 2

Table 2 provides the detailed results of the AMRs for those components identified in Section 2 as being subject to AMR.

There will be a Table 2 for each of the systems within a Chapter 3 Section grouping. For example, for CPNPP, the ESF System Group contains tables specific to the CGCS, CSS, RHRS, and SIS.

Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect Requiring Management
- AMPs
- NUREG-1801 Item
- Table 1 Item
- Notes

Component Type – The first column identifies all of the component types from Section 2 of the LRA that are subject to AMR. They are listed in alphabetical order.

Intended Function – The second column contains the LR intended functions for the listed component types. Definitions of intended functions are contained in Table 2.1-1.

Material – The third column lists the particular materials of construction for the component type.

Environment – The fourth column lists the environments to which the component types are exposed. Service environments are indicated, and a list of these environments is provided in Tables 3.0-1, 3.0-2, and 3.0-3.

Aging Effect Requiring Management – As part of the AMR process, the aging effects that are required to be managed in order to maintain the intended function of the component type are identified for the material and environment combination. These aging effects requiring management are listed in the fifth column.

Aging Management Programs – The AMPs used to manage the aging effects requiring management are listed in the sixth column of Table 2. AMPs are described in Appendix B.

NUREG-1801 Item – Each combination of component type, material, environment, aging effect requiring management (AERM), and AMP that is listed in Table 2, is compared to NUREG-1801, with consideration given to the standard notes, to identify consistency. Consistency is documented by noting the appropriate NUREG-1801 item number in the seventh column of Table 2. If there is no corresponding item number in NUREG-1801, this field in column seven is left blank. Thus, a reviewer can readily identify the correlation between the plant-specific tables and the NUREG-1801 tables.

Table 1 Item – Each combination of component, material, environment, AERM, and AMP that has an identified NUREG- 1801 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in the eighth column of Table 2. If there is no corresponding item in NUREG-1801, this field in column eight is left blank. The Table 1 Item allows correlation of the information from the two tables.

Notes – The notes provided in each Table 2 describe how the information in the Table aligns with the information in NUREG-1801. Each Table 2 contains standard lettered notes and, if applicable, plant-specific numbered notes. The standard lettered notes (e.g., A, B, C) provide standard information regarding comparison of the CPNPP AMR results with the NUREG-1801 Aging Management Table line item identified in the seventh column. In addition to the standard lettered notes, numbered plant-specific notes provide additional clarifying information when appropriate.

TABLE USAGE

Table 1

The reviewer evaluates each row in Table 1 by moving from left to right across the table. Since the Component, Aging Effect, AMPs, and FE Recommended information is taken directly from NUREG-1800, no further analysis of those columns is required. The information intended to help the reviewer the most in this Table is contained within the Discussion column. Here the reviewer will be given plant-specific information necessary to determine, in summary, how the CPNPP evaluations and programs align with NUREG-1800. This may be in the form of descriptive information within the Discussion column, or the reviewer may be referred to other locations within the LRA for further information.

Table 2

Table 2 contains all of the AMR information for the plant, whether or not it aligns with NUREG-1801. For a given row within the table, the reviewer is able to see the intended function, material, environment, AERM and AMP combination for a particular component type within a system. In addition, if there is a correlation between the combination in Table 2 and a combination in NUREG-1801, this will be identified by a referenced item number in column seven, NUREG-1801 Item. The reviewer can refer to the item number in NUREG-1801, if desired, to verify the correlation. If the column is blank, no corresponding combination in NUREG-1801 was found. As the reviewer continues across the Table from left to right, within a given row, the next column is labeled Table 1 Item. If there is a reference number in this column, the reviewer is able to use that reference number to locate the corresponding row in Table 1 and see how the AMP for this particular combination aligns with NUREG-1801.

Table 2 provides the reviewer with a means to navigate from the components subject to AMR in Section 2 all the way through the evaluation of the programs that will be used to manage the effects of aging of those components. A listing of the acronyms used in this section is provided in Section 1.6.

Cumulative Fatigue Damage and TLAAs in Table 2

A fatigue analysis is considered to be a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3 when it is within the CLB and is based upon transient cycle assumptions associated with 40 years of plant operation. This includes explicit ASME Section III, Class 1 analyses for piping and components and implicit ASME Section III, Class 2 and 3 and ANSI B31.1 analyses for piping. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1).

Table 1 and Table 2 include an entry in the AMP column indicating "TLAA" for each line item that has a component for which a fatigue TLAA (explicit or implicit) has been identified. See Section 4.3 for details regarding the CPNPP fatigue design bases, fatigue TLAAs identified, and TLAA evaluations for the PEO.

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Air – dry	Compressed air of suitable quality and pressure for operation of instruments and controls, actuation of valves, dampers, and similar devices during various modes of plant operation. That is, air that has been treated to a) reduce its dew point well below the system operating temperature and b) control lubricant content, particulate matter, and other corrosive contaminants.	Air, dry
Air – indoor controlled	Ambient air in a humidity-controlled (i.e., air-conditioned) environment. Air that has been conditioned to reduce the humidity and dew point. Control room habitability encompasses all areas within the control room envelope (CRE) requiring occupancy during a hazardous chemical or radiological release or a smoke challenge.	Air – indoor controlled
Air – indoor uncontrolled	Ambient air for indoor locations that are sheltered/protected from weather (e.g., precipitation). Surfaces are normally dry, except in areas of leakage or water pooling, such as due to leakage or spills (not readily cleaned by housekeeping), which are considered the most susceptible locations for corrosion. Where indoor temperatures are ≥ 95°F, thermal aging of elastomers can occur. Where systems operate below the dew point, a “Condensation” environment is assigned.	Air – indoor uncontrolled; Air – indoor uncontrolled >35°C (>95°F) (Internal/External)
Air – outdoor	The outdoor environment consists of atmospheric air, ambient temperature and humidity, and exposure to weather, including precipitation and wind. Pooling of rainwater or perched water may occur in pits, vaults or tunnels or low points in the yard. The outdoor environment also potentially includes component contamination due to animal infestation including by-products or excrement containing uric acid, ammonia, phosphates, or other compounds.	Air – outdoor

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Air with borated water leakage	A subset of the Air-indoor uncontrolled and Air – outdoor environment that is used only for susceptible component materials located within buildings or areas that have systems containing borated water as they may be exposed to leakage and subsequent boric acid corrosion. Pertinent CPNPP buildings and locations include: • AB • FB • RCB • SGB (including the tunnel from RWST) Select yard locations (e.g., near the RWST)	Air with borated water leakage
Air with steam or water leakage	A subset of Air - indoor uncontrolled or Air – outdoor environments with steam or water leakage, such as onto or from system closure bolting, both below and above the dewpoint.	Air with steam or water leakage
Closed-cycle cooling water	Demineralized, treated water subject to closed-cycle cooling water chemistry control. Closed-cycle cooling water removes heat from various safety and non-safety related heat exchangers/coolers and is transferred in a closed loop to the other systems and then the UHS. Where the temperatures are > 140°F, the environment includes that indication for cracking in stainless steel.	Closed-cycle cooling water; Closed-cycle cooling water > 140°F
Concrete	Components in contact with concrete, that sit on or are embedded in foundations, floors, walls, etc. This does not include wall penetrations. Concrete is also a structural material that is subject to AMR. Embedded/reinforcing components are only susceptible to degradation if there has been groundwater or other water in-leakage; otherwise, the concrete forms a tight seal.	Concrete

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Condensation	Condensation on surfaces of systems at temperatures below the dew point. Moisture in the air is also considered to be condensation as it may promote degradation due to hygroscopic surface contaminants. Condensation can also form between thermal insulation and a component when air intrusion occurs through minor gaps in the insulation and the operating temperature of the component is below the dew point of the penetrating air. In addition, “waste gas” is typically held-up for a time, processed and released to the atmosphere. This waste gas may contain contaminants or moisture and so is included with “Condensation”.	Air, moist; Condensation
Diesel exhaust	Gases, fluids, particulates present in diesel engine exhaust.	Diesel exhaust
Fuel oil	Diesel oil, No. 2 oil, or other liquid hydrocarbons used to fuel diesel engines.	Fuel oil
Gas	Internal dry non-corrosive gas such as argon, halon, hydrogen, oxygen, and nitrogen. Argon, hydrogen, oxygen, and nitrogen gases are supplied to various plant system components on a continuous or intermittent basis. Halon is supplied to pertinent portions of the CPNPP fire suppression system. Refrigerant gas is provided for the safety chilled water and other pertinent systems.	Gas

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Lubricating oil	Lubricating oils are low to medium viscosity hydrocarbons used for bearing, gear, and engine lubrication. Hydraulic fluids are considered with lubricating oil. Lubricating oils can contain contaminants (water or particulates) but otherwise typically coat and protect surfaces. Lubricating oil that leaks from a component such as a RCP/motor is considered to contain potential contaminants such as water and dirt and is therefore, unique.	Lubricating oil
Raw water	Raw, untreated surface or groundwater; fresh, brackish, or saline water from an open, oxygen-rich source. This includes water in open-cycle cooling water systems and potable water for drinking or other personal use.	Raw water
Reactor coolant	Treated borated water in the RCS and connected systems at or near full operating temperature, including wet steam in the Pressurizer. Reactor coolant is >140°F and the temperature is not included in the environment. Also, temperatures are above >482°F and the temperature is not included in the environment.	Reactor coolant; Reactor coolant >250°C (>482°F); Reactor coolant >250°C (>482°F) and neutron flux;
Reactor coolant and neutron flux	The reactor core/vessel environment that will result in a neutron fluence exceeding 10^{17} n/cm^2 (E >1 MeV). For RVI components, high fluence (10^{21} n/cm^2 E > 0.1 MeV) is also a consideration of the environment.	Reactor coolant and neutron flux; Reactor coolant and high fluence (>1 x 10^{21} n/cm^2 E >0.1 MeV)
Soil	External environment for components at the air/soil interface, buried in the soil; or exposed to groundwater in the soil. Soil is a mixture of inorganic materials produced by the weathering of rock and clay minerals, and organic material produced by the decomposition of vegetation. Voids containing air and moisture occupy 30–60 percent of the soil volume. Properties of soil that can affect degradation include moisture content, pH, ion exchange capacity, density, and hydraulic conductivity.	Soil

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Steam	Steam, subject to a water chemistry program. In determining aging effects, steam is considered treated water. Steam is high temperature and defining the temperature is not necessary.	Steam; Reactor coolant and secondary feedwater/steam; Secondary feedwater/steam.
Treated borated water	Treated or demineralized borated water. Above the following thresholds, the temperature may be included with the environment: • >140°F – (SCC of stainless steel) • >270°F – (fatigue of stainless steel) • >482°F – (thermal embrittlement of CASS) • >500°F – (PWSCC of Alloy 600 nickel alloy)	Treated borated water; Treated borated water >60°C (>140°F); Treated borated water >250°C (>482°F); System temperature up to 340°C (644°F)
Treated water	Treated water is demineralized water and is the base water for all clean systems. Generally, contains minimal amounts of any additions and is generally characterized by high purity, low conductivity, and very low oxygen content. May, but need not be based on demineralized water, and contains corrosion inhibitors and also may contain biocides or other additives. This treated water will be comparatively higher in conductivity and oxygen content. Above the following thresholds, the temperature may be included with the environment: • >140°F – (SCC of stainless steel) • >220°F – (fatigue of carbon steel) • >482°F – (thermal embrittlement of CASS)	Treated water; Treated water >60°C (>140°F)

Table 3.0-1
Mechanical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Underground	Underground piping and tanks are below grade but are contained within a tunnel, pit, or vault such that they are in contact with air and are located where access for inspection is limited (e.g., special lifting equipment is required to gain access to the vault). When the underground environment is cited, the term includes exposure to air-outdoor, air-indoor uncontrolled, air, raw water, groundwater, or condensation. For CPNPP, the term underground may also be used to denote location below-grade or buried depending on the context of the statement (and should not be confused with the underground environment).	Underground
Waste water	Waters that are collected from equipment and floor drains. Waste waters may contain contaminants, including oil and boric acid, depending on location, as well as originally treated water that is not monitored by a chemistry program (Water may or may not be radioactive).	Waste water

Table 3.0-2
Structural Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Air – indoor uncontrolled	Ambient air for indoor locations that are sheltered/protected from weather (e.g., precipitation). Surfaces are normally dry, except in areas of leakage or water pooling, such as due to leakage or spills (not readily cleaned by housekeeping), which are considered the most susceptible locations for corrosion. Where indoor temperatures are ≥ 95°F, thermal aging of elastomers can occur. Where systems operate below the dew point, a "Condensation" environment is assigned.	Air – indoor uncontrolled; Air – indoor uncontrolled >35°C (>95°F) (Internal/External)
Air – outdoor	The outdoor environment consists of atmospheric air, ambient temperature and humidity, and exposure to weather, including precipitation and wind. Pooling of rainwater or perched water may occur in pits, vaults or tunnels or low points in the yard. The outdoor environment also potentially includes component contamination due to animal infestation including by-products or excrement containing uric acid, ammonia, phosphates, or other compounds.	Air – outdoor
Air with borated water leakage	A subset of the Air-indoor uncontrolled and Air – outdoor environment that is used only for susceptible component materials located within buildings or areas that have systems containing borated water as they may be exposed to leakage and subsequent boric acid corrosion. Pertinent CPNPP buildings and locations include: • AB • FB • RCB • SGB (including the tunnel from the RWST) Select yard locations (e.g., near the RWST)	Air with borated water leakage

Table 3.0-2
Structural Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Concrete	Components in contact with concrete, that sit on or are embedded in foundations, floors, walls, etc. This does not include wall penetrations. Concrete is also a structural material that is subject to AMR. Embedded/reinforcing components are only susceptible to degradation if there has been groundwater or other water in-leakage; otherwise, the concrete forms a tight seal.	Concrete
Groundwater/soil	Groundwater is subsurface water that can be detected in wells, tunnels, or drainage galleries, or that flows naturally to the earth's surface via seeps or springs. Groundwater is a part of the natural water cycle. Some part of the precipitation that lands on the ground surface infiltrates into the subsurface. The part that continues downward through the soil until it reaches rock material that is saturated is groundwater recharge. Water in the saturated groundwater system moves slowly and may eventually discharge into streams, and lakes. The ground above the water table may be wet to a certain degree, but it does not stay saturated. The dirt and rock in this unsaturated zone contain air and some water. At CPNPP, groundwater is not expected to reach higher than EL. 775-ft. Aggressive contaminants for underground concrete are those which have a pH <5.5 and/or chlorides >500 ppm and/or sulfides >1500 ppm. CPNPP groundwater is non-aggressive, as discussed further in item 4 of Section 3.5.2.2.2.1.	Groundwater/soil
Soil	External environment for components at the air/soil interface, buried in the soil; or exposed to groundwater in the soil. Soil is a mixture of inorganic materials produced by the weathering of rock and clay minerals, and organic material produced by the decomposition of vegetation. Voids containing air and moisture occupy 30–60 percent of the soil volume. Properties of soil that can affect degradation include moisture content, pH, ion exchange capacity, density, and hydraulic conductivity.	Soil

Table 3.0-2
Structural Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Treated borated water	Treated or demineralized borated water. Above the following thresholds, the temperature may be included with the environment: • >140°F – (SCC of stainless steel) • >270°F – (fatigue of stainless steel) • >482°F – (thermal embrittlement of CASS) • >500°F – (PWSCC of Alloy 600 nickel alloy)	Treated borated water; Treated borated water >60°C (>140°F); Treated borated water >250°C (>482°F); System temperature up to 340°C (644°F)
Water - flowing	Water that is refreshed; thus, it has a greater impact on leaching and can include rainwater, raw water, groundwater, or water flowing under a foundation.	Water-flowing
Water - standing	Water that is stagnant and unrefreshed, thus possibly resulting in increased ionic strength up to saturation.	Water-standing

Table 3.0-3
Electrical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Adverse localized environment caused by heat, radiation, or moisture Adverse localized environment caused by significant moisture	An adverse localized environment (ALE) is an environment limited to the immediate vicinity of a component that is hostile to the component material, thereby leading to potential aging effects. As used in GALL, the conductor insulation used for electrical cables in instrumentation circuits can be subjected to an ALE. As represented by a specific GALL AMR Item, an ALE can be due to either of the following: (1) exposure to significant moisture or (2) heat, radiation, or moisture.	Adverse localized environment caused by heat, radiation, or moisture
Air – indoor controlled	This environment is one to which the specified internal or external surface of the component or structure is exposed; a humidity-controlled (i.e., air conditioned) environment. For electrical purposes, control must be sufficient to eliminate the cited aging effects of contamination and oxidation without affecting the resistance.	Air – indoor controlled
Air – indoor uncontrolled	Uncontrolled indoor air is associated with systems with temperatures higher than the dew point (i.e., condensation can occur, but only rarely; equipment surfaces are normally dry).	Air – indoor uncontrolled
Air – outdoor	The outdoor environment consists of atmospheric air, ambient temperature and humidity, and exposure to weather, including precipitation and wind. Pooling of rainwater or perched water may occur in pits, vaults or tunnels or low points in the yard. The outdoor environment also potentially includes component contamination due to animal infestation including by-products or excrement containing uric acid, ammonia, phosphates, or other compounds.	Air – outdoor
Air with borated water leakage	Air and untreated borated water leakage on indoor or outdoor systems with temperatures either above or below the dew point. The water from leakage is considered to be untreated, due to the potential for water contamination at the surface.	Air with borated water leakage

Table 3.0-3
Electrical Service Environments

Environment	Description	Corresponding NUREG-1801 Environments
Soil	Soil is a mixture of inorganic materials produced by the weathering of rock and clay minerals, and organic material produced by the decomposition of vegetation. Voids containing air and moisture occupy 30 to 60 percent of the soil volume. Properties of soil that can affect degradation kinetics include moisture content, pH, ion exchange capacity, density, and hydraulic conductivity. External environments included in the soil category consist of components at the air/soil interface, buried in the soil, or exposed to ground water in the soil.	Soil

3.1. AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1. Introduction

This section provides the results of the AMR for those components identified in Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System, as being subject to AMR". The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Reactor Vessel (2.3.1.1)
- Reactor Vessel Internals (2.3.1.2)
- Reactor Coolant System and Attached Piping (2.3.1.3)
- Steam Generators (2.3.1.4)

3.1.2. Results

The following tables summarize the results of the AMR for the Reactor Vessel, Internals, and Reactor Coolant System.

Table 3.1.2-1: Reactor Vessel - Summary of Aging Management Evaluation

Table 3.1.2-2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Table 3.1.2-3: Reactor Coolant System and Attached Piping - Summary of Aging Management Evaluation

Table 3.1.2-4: Steam Generators - Summary of Aging Management Evaluation

3.1.2.1. Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.1.2.1.1. Reactor Pressure Vessel

Materials

The materials of construction for the RPV components are:

- Carbon steel
- Carbon steel with stainless steel cladding
- Nickel alloy
- Stainless steel

Environments

The RPV components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage

- Reactor coolant
- Reactor coolant with neutron flux

Aging Effects Requiring Management

The following aging effects associated with the RPV require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Reduction in fracture toughness

Aging Management Programs

The following AMPs manage the aging effects for the RPV components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)
- Boric Acid Corrosion (B.2.3.4)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)
- Flux Thimble Tube Inspection (B.2.3.23)
- Reactor Head Closure Stud Bolting (B.2.3.3)
- Reactor Vessel Surveillance (B.2.3.18)
- TLAA (Sections 4.3 and 4.4)
- Water Chemistry (B.2.3.2)

3.1.2.1.2. Reactor Vessel Internals

Materials

The materials of construction for the RVI components are:

- CASS
- Nickel alloy
- Stainless steel

Environment

The RVI components are exposed to:

- Reactor coolant and neutron flux

Aging Effects Requiring Management

The following aging effects associated with the RVI require management:

- Change in dimension
- Cracking

- Cumulative fatigue damage
- Loss of fracture toughness
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the RVI components:

- ASME Section XI, Inservice Inspection, Subsections IWB, IWC and IWD (B.2.3.1)
- PWR Vessel Internals (B.2.3.7)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.1.2.1.3. Reactor Coolant System and Attached Piping

Materials

The materials of construction for the RCS and attached piping are:

- Carbon steel
- Carbon steel with stainless steel cladding
- CASS
- Copper alloy
- Elastomer
- Nickel alloy
- Stainless steel (including CASS, centrifugal)

Environments

The RCS and attached piping are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Gas
- Lubricating oil
- Reactor coolant (including steam)
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RCS and attached piping require management:

- Cracking
- Cumulative fatigue damage

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction in fracture toughness

Aging Management Programs

The following AMPs manage the aging effects for the RCS and attached piping:

- ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD (B.2.3.1)
- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)
- Thermal Aging Embrittlement of CASS (B.2.3.6)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.1.2.1.4. Steam Generators

Materials

The materials of construction for the SG subcomponents are:

- Carbon steel
- Carbon steel with nickel alloy cladding
- Carbon steel with stainless steel cladding
- Nickel alloy
- Stainless steel

Environments

The SG subcomponents are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Reactor coolant
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the SG subcomponents require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the SG subcomponents:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)
- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- Steam Generators (B.2.3.10)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.1.2.2. AMR Results for Which Further Evaluation is Recommended by the GALL Report

The AMR summaries for the CPNPP Reactor Vessel, Internals, and Reactor Coolant System provide the basis for Section 3.1.2.2. NUREG-1801 provides the basis for identifying those programs that warrant FE by the reviewer in the LRA. For the Reactor Vessel, Internals, and Reactor Coolant System, those programs are addressed in the following subsections.

Note - *Italicized* text is taken directly from NUREG-1800 as supplemented by LR-ISG-2011-04, LR-ISG-2011-05, LR-ISG-2016-01, and SLR-ISG-2021-01-PWRVI.

3.1.2.2.1. Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of this SRP-LR.

Where identified as an AERM, in Table 3.1-1, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.1.2.2.2. Loss of Material due to General, Pitting, and Crevice Corrosion

1. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. The existing program relies on control of water chemistry to mitigate corrosion and Inservice Inspection (ISI) to detect loss of material. The extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC Information Notice (IN) 90-04, the program may not be sufficient to detect pitting and crevice corrosion, if general and pitting corrosion of the shell is known to exist. The GALL Report recommends augmented inspection to manage this aging effect. Furthermore, the GALL Report clarifies that this issue is limited to Westinghouse Model 44 and 51 Steam Generators, where a high-stress region exists at the shell to transition cone weld. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR SG upper and lower shell and transition cone exposed to secondary feedwater and steam, but do not require augmented inspection. The CPNPP Unit 1 SGs are Westinghouse Model Delta 76 and the Unit 2 SGs are Westinghouse Model D-5. Augmented inspections recommended for Westinghouse Model 44 and 51 SGs are not required for the CPNPP Delta 76 and D-5 SGs as discussed in item 3.1-1, 012.

2. *Loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam. The existing program relies on control of secondary water chemistry to mitigate corrosion. However, some applicants have replaced only the bottom part of their recirculating steam generators, generating a cut in the middle of the transition cone, and, consequently, a new transition cone closure weld. The GALL Report recommends volumetric examinations performed in accordance with the requirements of ASME Code Section XI for upper shell-to and lower shell-to transition cones with gross structural discontinuities for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 and 51 Steam Generators, where a high-stress region exists at the shell to transition cone weld.*

   The new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the SG transition cone welds containing geometric discontinuities. Control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The new transition area weld is a field-weld as opposed to having been made in a *controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds. Crediting of the ISI program for the new SG transition cone weld may not be an effective basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Section XI requirements. In addition, ASME Section XI does not require licensees to remove insulation when performing visual examination on non-borated treated water systems. Therefore, the effectiveness of the chemistry control program should be verified to ensure that loss of material due to general, pitting and crevice corrosion is not occurring.*

For the new continuous circumferential weld, the GALL Report recommends further evaluation to verify the effectiveness of the chemistry control program. A one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the period of extended operation. Furthermore, the GALL Report clarifies that this issue is limited to replacement recirculating steam generators with a new transition cone closure weld.

The Unit 1 model Delta 76 replacement SGs were complete replacements and therefore the Unit 1 SGs do not have a circumferential field weld. The Unit 2 SGs are original to the plant and therefore also do not have a circumferential field weld. Note that the inspections of the original SG transition cone welds on both units will continue to be performed consistent with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP, as discussed in item 3.1-1, 012.

3.1.2.2.3. <u>Loss of Fracture Toughness due to Neutron Irradiation Embrittlement</u>

1. *Neutron irradiation embrittlement is a TLAA to be evaluated for the period of extended operation for all ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E >1 MeV) at the end of the license renewal term. Certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis," of this SRP-LR.*

As discussed in item 3.1-1, 013, loss of fracture toughness due to neutron irradiation embrittlement is an aging effect and mechanism evaluated for the reactor vessel beltline and extended beltline by a TLAA. The TLAA evaluation of neutron irradiation embrittlement is discussed in Section 4.2, "Reactor Vessel Neutron Embrittlement."

2. *Loss of fracture toughness due to neutron irradiation embrittlement could occur in BWR and PWR reactor vessel beltline shell, nozzle, and welds*

exposed to reactor coolant and neutron flux. A reactor vessel materials surveillance program monitors neutron irradiation embrittlement of the reactor vessel. The reactor vessel surveillance program is plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with NUREG-1800, Rev. 2 3.1-4 December 2010 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in Chapter XI, Section M31 of the GALL Report.

As discussed in item 3.1-1, 014, loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel shells, nozzles, and welds. The neutron fluence TLAA is discussed in Section 4.2.1, "Neutron Analysis". The fluence is a time-limited input to the Reactor Vessel Embrittlement TLAA beltline and extended beltline (e.g., nozzle) materials as discussed in Sections 4.2.2 through 4.2.5. The Reactor Vessel Material Surveillance AMP, which includes an exception to NUREG-1801 Section XI.M31, manages reduction in fracture toughness due to neutron embrittlement of reactor vessel beltline and extended beltline (e.g., nozzle) materials. This program, which uses CPNPP surveillance capsule data, monitors changes in the fracture toughness properties of ferritic materials in the RPV beltline and extended beltline region.

3. *Ductility – Reduction in Fracture Toughness is a plant-specific TLAA for Babcock and Wilcox (B&W) reactor internals to be evaluated for the period of extended operation in accordance with the staff's safety evaluation concerning "Demonstration of the Management of Aging Effects for the Reactor Vessel Internals," Babcock and Wilcox Owners Group report number BAW-2248, which is included in BAW-2248A, March 2000. Plant-specific TLAAs are addressed in Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-LR.*

Not applicable, as discussed in item 3.1-1, 015. This FE item is only applicable to Babcock & Wilcox reactor internals.

3.1.2.2.4. <u>Cracking due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking</u>

1. *Cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC) could occur in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting cracking due to SCC and IGSCC. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Not applicable. This FE item is applicable to BWRs only, as listed in item 3.1-1, 016.

2. Cracking due to SCC and IGSCC could occur in stainless steel BWR isolation *condenser components exposed to reactor coolant. The existing program relies on control of reactor water chemistry to mitigate SCC and on ASME Section XI IS I to detect cracking. However, the existing program should be augmented to detect cracking due to SCC and IGSCC. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that the component's intended function will be maintained during the period of extended operation. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Not applicable. This FE item is applicable to BWRs only, as listed in item 3.1-1, 017.

3.1.2.2.5. Crack Growth due to Cyclic Loading

Crack growth due to cyclic loading could occur in reactor vessel shell forgings clad with stainless steel using a high-heat-input welding process. Growth of intergranular separations (underclad cracks) in the heat-affected zone under austenitic stainless steel cladding is a TLAA to be evaluated for the period of extended operation for all the SA-508-Cl-2 forgings where the cladding was deposited with a high heat input welding process.

All applicable SA-508-Cl-2 forgings at CPNPP Units 1 and 2 are not affected by underclad cracking due to the control of the cladding welding process in accordance with RG 1.43. These applicable components include the Unit 1 reactor vessel flange, Unit 1 primary inlet and outlet nozzles, Unit 2 closure head flange, Unit 2 reactor vessel flange, and Unit 2 primary inlet and outlet nozzles. Welding specifications pertaining to these applicable components were reviewed and determined to meet the intent of RG 1.43, regarding the use of low heat input welding techniques. As a result, the underclad cracking TLAA is not applicable to CPNPP Units 1 and 2 for LR, as discussed in item 3.1-1, 018 and noted in Table 4.1-1.

3.1.2.2.6. Cracking due to Stress Corrosion Cracking

1. *Cracking due to SCC could occur in the PWR stainless steel reactor vessel flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

As discussed in item 3.1-1, 019, the effects of cracking due to SCC in the stainless steel BMI guide tubes (external to the RV bottom head to the seal table) and reactor vessel flange leak detection components will be managed using the Water Chemistry (B.2.3.2) AMP and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP. The Water Chemistry (B.2.3.2)

AMP will minimize the contaminants in the reactor coolant which promote SCC. VT-2 inspections are performed as a part of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP and will identify degradation of the stainless steel BMI guide tubes and reactor vessel flange leak detection components. A plant-specific program is not required.

2. *Cracking due to SCC could occur in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The existing program relies on control of water chemistry to mitigate SCC; however, SCC could occur for CASS components that do not meet the NUREG-0313 guidelines with regard to ferrite and carbon content. The GALL Report recommends further evaluation of a plant-specific program for these components to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

As discussed in item 3.1-1, 020, cracking due to SCC could occur in CASS components that do not meet the NUREG-0313 guidelines regarding ferrite and carbon content. However, review of NUREG-0313 describes industry experience where SCC of CASS components occurred in BWRs primarily due to susceptible CASS components being exposed to BWR water chemistry with high levels of oxygen and other contaminants. NUREG-0313 does not identify SCC of CASS components as being problematic in PWRs like CPNPP. This can be attributed to the very tight controls of PWR water chemistry for dissolved oxygen and other aggressive contaminants. Therefore, the Water Chemistry (B.2.3.2) AMP will manage the aging effect of cracking due to SCC in Class 1 RCS CASS piping and piping components. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking due to SCC in Class 1 RCS CASS piping and piping components. The CPNPP disposition for Section 3.1.2.2.6, Item 2 is consistent with the disposition accepted for the Turkey Point Units 3 and 4 SLRA (Reference ML19191A057).

3.1.2.2.7. Cracking due to Cyclic Loading

Cracking due to cyclic loading could occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program relies on ASME Section XI ISI. However, the existing program should be augmented to detect cracking due to cyclic loading. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that the component's intended function will be maintained during the period of extended operation. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Not applicable. This FE item is applicable to BWRs only, as listed in item 3.1-1, 021.

3.1.2.2.8. Loss of Material due to Erosion

Loss of material due to erosion could occur in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

As discussed in item 3.1-1, 022, SG feedwater impingement plates and supports are not part of the Unit 1 SGs (model Delta 76) used at CPNPP. The Unit 2 SGs (model D-5) have stainless steel feedwater impingement plates and supports. Therefore, this item is not applicable at CPNPP, and a plant-specific program is not required.

3.1.2.2.9. Aging Management of Pressurized Water Reactor Vessel Internals (Applicable to Subsequent License Renewal Periods only)

Electric Power Research Institute (EPRI) Topical Report (TR)-1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)" (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12017A191 through ML12017A197 and ML12017A199), provided the industry's initial set of aging management inspection and evaluation (I&E) recommendations for the reactor vessel internal (RVI) components that are included in the design of a PWR facility. Since the issuance of MRP-227-A on January 9, 2012, EPRI updated its I&E guidelines for the PWR RVI components in Topical Report No. 3002017168, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)" (ADAMS Accession No. ML20175A112). MRP-227, Revision 1-A, incorporated the industry's bases for resolving operating experience and industry lessons learned resulting from component-specific inspections performed since the issuance of MRP-227-A in January 2012. The staff found the guidelines in MRP-227, Revision 1-A, acceptable, as documented in a staff-issued safety evaluation dated April 25, 2019 (ADAMS Accession No. ML19081A001) and approved the topical report for use as documented in the staff's letters to the EPRI Materials Reliability Program (MRP) dated February 19, 2020 and July 7, 2020 (ADAMS Accession Nos. ML20006D152 and ML20175A149).

In MRP-227, Revision 1-A, the EPRI MRP identified that the following aging mechanisms may be applicable to the design of the RVI components in these types of facilities: (a) stress corrosion cracking (SCC), (b) irradiation-assisted stress corrosion cracking (IASCC), (c) fatigue, (d) wear, (e) neutron irradiation embrittlement, (f) thermal aging embrittlement, (g) void swelling and irradiation growth or component distortion, and (h) thermal or irradiation-enhanced stress relaxation or irradiation enhanced creep.

The EPRI MRP's functionality analysis and failure modes, effects, and criticality analysis bases for grouping Westinghouse-designed, B&W-designed and Combustion Engineering (CE)-designed RVI components *into the applicable inspection categories (as evaluated in MRP-227, Revision 1-A) were based on an assessment of aging effects and relevant time-dependent aging parameters through a cumulative 60-year licensing period (i.e., 40 years for the initial operating license period plus an additional 20 years during the initial period of extended operation). The EPRI MRP's assessment in MRP-227, Revision 1-A, did not evaluate whether operation of Westinghouse-designed, B&W-designed and CE-designed reactors during an SLR operating period (60 to 80 years) would have any impact on the existing susceptibility rankings and inspection categorizations for the RVI components in these designs, as defined in MRP-227, Revision 1-A or the applicable MRP background documents (e.g., MRP-191, Revision 1, for Westinghouse-designed or CE-designed RVI components or MRP-189, Revision 2, for B&W-designed components).*

As described in GALL-SLR Report AMP XI.M16A, the applicant may use the MRP-227, Revision 1-A based AMP as an initial reference basis for developing and defining the AMP that will be applied to the RVI components for the subsequent period of extended operation. However, to use this alternative basis, GALL-SLR Report AMP XI.M16A recommends that the MRP-227, Revision 1-A based AMP be enhanced to include a gap analysis of the components that are within the scope of the AMP. The gap analysis is a basis for identifying and justifying changes to the MRP-227, Revision 1-A based program that are necessary to provide reasonable assurance that the effects of age-related degradation will be managed during the subsequent period of extended operation. The criteria for the gap analysis are described in GALL-SLR Report AMP XI.M16A. If a gap analysis is needed to establish the appropriate aging management criteria for the RVI components, the applicant has the option of including the gap analysis in the SLRA or making the gap analysis and any supporting gap analysis documents available in the in-office audit portal for the SLRA review.

Subsequent license renewal (SLR) applicants for units of a PWR design will no longer need to include separate SLRA Appendix C section responses in resolution of the A/LAIs previously issued on MRP-227-A because the A/LAIs were resolved and closed by the staff in the April 25, 2019, safety evaluation for MRP-227, Revision 1-A. The sole A/LAI issued by the staff in the safety evaluation dated April 25, 2019, relates to an applicant's methods and timing of inspections that will be applied to the baffle-to-former bolts or core shroud bolts in the plant design. Since an applicant's resolution of this A/LAI can be appropriately addressed in the "Operating Experience" program element discussion for the AMP and in the applicant's basis document for the AMP, a separate SLRA Appendix C response for the A/LAI is unnecessary.

Alternatively, the PWR SLRA may define a plant-specific AMP for the RVI components to demonstrate that the RVI components will be managed in accordance with the requirements of 10 CFR 54.21(a)(3) during the proposed subsequent period of extended operation. Components to be inspected, parameters monitored, monitoring methods, inspection sample size, frequencies, expansion criteria, and acceptance criteria are justified in the SLRA. If the AMP is a plant-specific program, the NRC staff will assess the adequacy of the plant-specific AMP against the criteria for the 10 AMP *program elements that are defined in Section A.1.2.3 of SRP-SLR Appendix A.1.*

LR-ISG-2011-04 removed FEs 3.1.2.2.9, 3.1.2.2.10, 3.1.2.2.12, 3.1.2.2.13 and 3.1.2.2.14 from NUREG-1800 Revision 2. LR-ISG-2021-01-PWRVI indicates that it supersedes previous guidance in their entirety and that the FE for 3.1.2.2.9 is applicable to SLR Periods Only. However, the MRP-227, Revision 1-A, identified aging mechanisms potentially applicable to the design of the RVI components are applicable to the CPNPP RVI. Furthermore, the RVI aging mechanisms formerly addressed by FE in NUREG-1800 Revision 2 sections 3.1.2.2.9, 3.1.2.2.10, 3.1.2.2.13, and 3.1.2.2.14 are now encompassed by the current 3.1.2.2.9. In addition, the susceptibility rankings and inspection categorizations from RVI components in MRP-227, Revision 1-A for 60 years of operation are applicable to CPNPP LR. As such, a plant-specific AMP (or failure modes and effects criticality analysis) is not necessary.

As discussed in items 3.1-1, 053a, 053b, and 053c, consistent with the guidance of SLR-ISG-2021-01-PWRVI, cracking (SCC/IASCC) will be managed by the PWR Vessel Internals (B.2.3.7) AMP and Water Chemistry (B.2.3.2) AMP for RVI components other than those in the 'no additional measures' MRP-227, Rev. 1-A categorization. Similarly, as discussed in items 3.1-1, 059a, 059b, 059c, and 119, change in dimension, loss of fracture toughness, loss of material and loss of preload of pertinent RVI components will be managed by the PWR Vessel Internals (B.2.3.7) AMP.

Both the flux thimble tubes and CRGT support (split) pins internal to the reactor vessel are categorized as 'no additional measures' components and will be managed by the PWR Vessel Internals (B.2.3.7) AMP, as discussed in item 3.1-1, 055c. The flux thimble tubes also receive an augmented inspection through the ASME Section XI, Subsections IWB, IWC, and IWD AMP.

3.1.2.2.10. Removed as a Result of LR-ISG-2011-04

See further evaluation 3.1.2.2.9 above.

3.1.2.2.11. Cracking due to Primary Water Stress Corrosion Cracking (per LR-ISG-2016-01)

1. *Foreign operating experience in steam generators with a design similar to that of Westinghouse steam generators (particularly Model 51) has identified cracks due to primary water stress corrosion cracking (PWSCC) in steam generator (SG) divider plate assemblies fabricated of Alloy 600 and/or the associated Alloy 600 weld materials, even with proper primary water chemistry. Cracks have been detected in the stub runner with depths typically about 0.08 inches (EPRI 3002002850).*

   All but one of these instances of cracking have been detected in divider plate assemblies that are approximately 1.3 inches in thickness. For the cracks in the 1.3-inch thick divider plate assemblies, the cracks tend to be parallel to the divider-plate-to-stub-runner weld (i.e., run horizontally in parallel to the lower surface of the tubesheet). For the one instance of cracking in a divider *plate assembly with a thickness greater than 1.3 inches, the cracking occurred in a divider plate assembly with a thickness of approximately 2.4 inches near manufacturing marks on the upper end of the stub runner used for locating tubesheet holes. These flaws were estimated to be approximately 0.08-inch deep.*

Although these instances indicate that the water chemistry program may not be sufficient to manage cracking due to PWSCC in SG divider plate assemblies, analyses by the industry indicate that PWSCC in the divider plate assembly does not pose a structural integrity concern for other steam generator components (e.g., tubesheet and tube-to-tubesheet welds) and does not adversely affect other safety analyses (e.g., analyses supporting tube plugging and repairs, tube repair criteria, and design basis accidents). In addition, the industry analyses indicate that flaws in the divider plate assembly will not adversely affect the heat transfer function (as a result of bypass flow) during normal forced flow operation, during natural circulation conditions (assessed in the analyses of various design basis accidents), or in the event of a loss-of-coolant accident (LOCA).

Furthermore, additional industry analyses indicate that PWSCC in the divider plate assembly is unlikely to adversely impact adjacent items, such as the tubesheet cladding, tube-to-tubesheet welds, and channel head. Therefore,

- *For units with divider plate assemblies fabricated of Alloy 690 and Alloy 690 type weld materials, a plant-specific aging management program (AMP) is not necessary.*

- *For units with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials, if the analyses performed by the industry (EPRI 3002002850) are applicable and bounding for the unit, a plant-specific AMP is not necessary.*

- *For units with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials, if the industry analyses (EPRI 3002002850) are not bounding for the applicant's unit, a plant-specific AMP is necessary or a rationale is necessary for why such a program is not needed. A plant-specific AMP (one beyond the primary water chemistry and the steam generator programs) may include a one-time inspection that is capable of detecting cracking to verify the effectiveness of the water chemistry and steam generator programs and the absence of PWSCC in the divider plate assemblies.*

The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and general visual inspections of the channel head interior surfaces (included as part of the steam generator program). The GALL Report recommends further evaluation for a plant-specific AMP to confirm the effectiveness of the primary water chemistry and steam generator programs as described in this section. Acceptance criteria for a plant-specific AMP are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR). In place of a plant-specific AMP, the applicant may provide a rationale to justify why a plant-specific AMP is not necessary.

CPNPP Unit 1 Model Delta 76 SGs have an Alloy 690 divider plate assembly and a plant-specific AMP is not necessary. CPNPP Unit 2 Model D-5 SGs have an Alloy 600 divider plate assembly. The industry analysis (EPRI TR-3002002850) has been determined to be applicable and bounding for CPNPP Unit 2.

Because the analysis is applicable and bounding for CPNPP Unit 2, the Water Chemistry (B.2.3.2) AMP and Steam Generators (B.2.3.10) AMP will manage PWSCC in the divider plate through the PEO. Therefore, as discussed in item 3.1-1, 025, a plant-specific AMP is not necessary to verify the effectiveness of the Water Chemistry (B.2.3.2) AMP and Steam Generators (B.2.3.10) AMP.

2. *Cracking due to PWSCC could occur in steam generator nickel alloy tube-to-tubesheet welds exposed to reactor coolant. The acceptance criteria for this review are:*

    - *For units with Alloy 600 steam generator tubes that have not been thermally treated and for which an alternate repair criteria such as C*, F*, W*, or H* has been permanently approved for both the hot-and cold-leg side of the steam generator, the weld is no longer part of the reactor coolant pressure boundary and a plant-specific AMP is not necessary;*

    - *For units with Alloy 600 steam generator tubes that have not been thermally treated, if there is no permanently approved alternate repair criteria such as C*, F*, W*, or H* or permanent approval applies to only either the hot-or cold-leg side of the steam generator, a plant-specific AMP is necessary;*

    - *For units with thermally treated Alloy 690 steam generator tubes and with tubesheet cladding using Alloy 690 type material, a plant-specific AMP is not necessary;*

    - *For units with thermally treated Alloy 690 steam generator tubes and with tubesheet cladding using Alloy 600 type material, a plant-specific AMP is necessary unless the applicant confirms that the industry's analyses for tube-to-tubesheet weld cracking (e.g., chromium content for the tube-to-tubesheet welds is approximately 22 percent and the tubesheet primary face is in compression as discussed in EPRI 3002002850) are applicable and bounding for the unit, and the applicant will perform general visual inspections of the tubesheet region looking for evidence of cracking (e.g., rust stains on the tubesheet cladding) as part of the steam generator program. In lieu of a plant-specific AMP, the applicant may provide a rationale for why a plant-specific AMP is not necessary.*

    - *The existing programs rely on control of reactor water chemistry to mitigate cracking due to PWSCC and visual inspections of the steam generator head interior surfaces. Along with the primary water chemistry and steam generator programs, the GALL Report recommends further evaluation of a plant-specific AMP to confirm the effectiveness of the primary water chemistry and steam generator* *programs in certain circumstances. A plant-specific AMP may include a one-time inspection that is capable of detecting cracking to confirm the absence of PWSCC in the tube-to-tubesheet welds. Acceptance criteria for a plant-specific AMP are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR). In place of a plant-specific AMP, the applicant may provide a rationale to justify why a plant-specific AMP is not necessary.*

CPNPP Unit 1 Model Delta 76 SGs have an Alloy 690 divider plate assembly with Alloy 690 tubes and tube-to-tubesheet welds. CPNPP Unit 2 Model D-5 SGs have an Alloy 600 divider plate assembly with thermally treated Alloy 600 (A600TT) tubes.

The current examination criteria for Unit 2 comes from Westinghouse guidance for model D-5 SGs, issued in WCAP-17072-NP (Reference 1.7.39). This criteria was approved as a temporary alternate repair criteria (ARC) by the NRC on October 9, 2009 as Amendment 149 (Reference ML092740076) to the technical specification/operating license and approved as a permanent ARC in Amendment 158 (Reference ML12263A036) on October 18, 2012. The technical evaluation for this H* ARC also concludes that the tube-to-tubesheet weld for the Unit 2 SGs is not required to maintain the RCPB, which is an exception to the guidance in NUREG-1801, as the initial hydraulic expansion of the tubes against the tubesheet during construction creates an interference fit between the two components, producing a residual contact pressure which acts normally to the outer surface of the tubes and the inner surface of the tubesheet bore holes. Additional contact pressure between the tubes and tubesheet is further induced by operational conditions (Reference ML12263A036, Section 4.2).

The effectiveness of the Water Chemistry (B.2.3.2) AMP to manage PWSCC in the Unit 1 SG tube-to-tubesheet welds is verified by the Steam Generators (B.2.3.10) AMP. The Unit 2 SG does not require aging management of the tube-to-tubesheet welds because they do not meet the criteria established to be considered a RCPB. Therefore, as discussed in item 3.1-1, 025, a plant-specific AMP is not necessary.

3.1.2.2.12. Removed as a Result of LR-ISG-2011-04

As listed in item 3.1-1, 026, This paragraph was removed from NUREG-1800 by LR-ISG-2011-04. In addition, CPNPP has Westinghouse, vs Combustion Engineering, RVI. See FE 3.1.2.2.9 above.

3.1.2.2.13. Removed as a Result of LR-ISG-2011-04

As listed in item 3.1-1, 027, This paragraph was removed from NUREG-1800 by LR-ISG-2011-04. See FE 3.1.2.2.9 above.

3.1.2.2.14. Removed as a Result of LR-ISG-2011-04

As listed in item 3.1-1, 028, CPNPP split pins have been replaced with cold-worked 316 stainless steel. This paragraph was removed from NUREG-1800 by

LR-ISG-2011-04 and replaced by the current 3.1.2.2.9 in SLR-ISG-2021-01-PWRVI. See FE 3.1.2.2.9 above.

3.1.2.2.15. Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2 of this SRP-LR).

QA provisions applicable to LR are discussed in Section B.1.3.

3.1.2.2.16. Ongoing Review of Operating Experience (per LR-ISG-2011-05)

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

The OE process and acceptance criteria are described in Section B.1.4.

3.1.2.3. Time-Limited Aging Analysis

The TLAAs identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components:

- Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis"
- Section 4.3, "Metal Fatigue"
- Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses"

3.1.3. Conclusion

The Reactor Vessel, Internals, and Reactor Coolant System piping, fittings, and components that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the Reactor Vessel, Internals, and Reactor Coolant System components are identified in the summaries in Section 3.1.2.1 above.

A description of these AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the PEO.

Therefore, based on the conclusions provided in Appendix B, the effects of aging associated with the Reactor Vessel, Internals, and Reactor Coolant System components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the PEO.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 001	High strength, low-alloy steel top head closure stud assembly exposed to air with potential for reactor coolant leakage	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.2. Further evaluation is documented in subsection 3.1.2.2.1.
3.1-1, 002	Nickel alloy tubes and sleeves exposed to reactor coolant and secondary feedwater/steam	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.2 for SG tubes, as well as flow restrictors and feedwater/auxiliary feedwater inlet nozzle dissimilar metal welds (DMWs). Further evaluation is documented in subsection 3.1.2.2.1.
3.1-1, 003	Stainless steel or nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.5. Further evaluation is documented in subsection 3.1.2.2.1.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 004	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Not applicable. The CPNPP reactor vessel is nozzle supported, as described in Section 2.4.1, and does not have a support skirt. The steel support skirt for the Pressurizer and attachment welds are susceptible to cumulative fatigue damage, same as described in item 3.1-1, 009 below.
3.1-1, 005	Steel, stainless steel, or steel (with stainless steel or nickel alloy cladding) steam generator components, pressurizer relief tank components or piping components or bolting	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Sections 4.3.2 and 4.3.3 for SG components and RCS piping components and bolting. Further evaluation is documented in subsection 3.1.2.2.1.
3.1-1, 006	Not applicable. This line item only applies to BWRs.				
3.1-1, 007	Not applicable. This line item only applies to BWRs.				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 008	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy steam generator components exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.2 for SG components. Further evaluation is documented in subsection 3.1.2.2.1.
3.1-1, 009	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy RCPB piping; flanges; nozzles & safe ends; pressurizer shell heads & welds; heater sheaths & sleeves; penetrations; thermal sleeves exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.2 for Pressurizer components. Further evaluation is documented in subsection 3.1.2.2.1.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 010	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy reactor vessel flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.1.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA in Section 4.3.2. Further evaluation is documented in subsection 3.1.2.2.1.
3.1-1, 011	Not applicable. This line item only applies to BWRs.				
3.1-1, 012	Steel steam generator components: upper and lower shells, transition cone; new transition cone closure weld exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and Chapter XI.M2, "Water Chemistry," and, for Westinghouse Model 44 and 51 S/G, if corrosion of the shell is found, additional inspection procedures are developed	Yes, detection of aging effects is to be evaluated (See SRP subsection 3.1.2.2.2.1 and 3.1.2.2.2.2)	Consistent with exception to NUREG-1801. Loss of material of steel SG components is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP. Augmented inspections are not required for CPNPP Delta 76 and D-5 SGs. Further evaluation is documented in subsections 3.1.2.2.2.1 and 3.1.2.2.2.2.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 013	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA is to be evaluated in accordance with Appendix G of 10 CFR Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations	Yes, TLAA (See SRP subsection 3.1.2.2.3.1)	Consistent with NUREG-1801. Loss of fracture toughness is an aging effect assessed by a TLAA in Section 4.2. Further evaluation is documented in subsection 3.1.2.2.3.1.
3.1-1, 014	Steel (with or without cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant-specific or integrated surveillance program (See SRP subsection 3.1.2.2.3.2)	Consistent with NUREG-1801. Loss of fracture toughness of the steel (with stainless steel cladding) reactor vessel beltline shell, nozzles, and welds in the RV are managed by the Reactor Vessel Surveillance (B.2.3.18) AMP. Further evaluation is documented in subsection 3.1.2.2.3.2.
3.1-1, 015	Stainless steel Babcock & Wilcox (including CASS, martensitic SS, and PH SS) and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Reduction of ductility and fracture toughness due to neutron irradiation embrittlement, and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement	Ductility -Reduction in fracture toughness is a TLAA to be evaluated for the period of extended operation, See the SRP, Section 4.7, "Other Plant-Specific TLAAs," for acceptable methods of meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA (See SRP subsection 3.1.2.2.3.3)	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant. Further evaluation is documented in subsection 3.1.2.2.3.3.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 016	Not applicable. This line item only applies to BWRs.				
3.1-1, 017	Not applicable. This line item only applies to BWRs.				
3.1-1, 018	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant	Crack growth due to cyclic loading	Growth of intergranular separations is a TLAA evaluated for the period of extended operation. The Standard Review Plan, Section 4.7, “Other Plant-Specific Time-Limited Aging Analysis,” provides guidance for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA (See SRP subsection 3.1.2.2.5)	Not applicable. CPNPP Units 1 and 2 materials potentially susceptible to underclad cracking were clad using low heat input techniques, which would avoid the formation of underclad cracking. As a result, the underclad cracking TLAA is not applicable to CPNPP Units 1 and 2 for LR as noted in Table 4.1-1. Further evaluation is documented in subsection 3.1.2.2.5.
3.1-1, 019	Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (external to reactor vessel)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes, plant-specific (See SRP subsection 3.1.2.2.6.1)	Consistent with NUREG-1801. Cracking of the stainless steel bottom-mounted instrument guide tubes, seals, and seal table for the RV and reactor vessel flange leak detection components will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP. Further evaluation is documented in subsection 3.1.2.2.6.1.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 020	Cast austenitic stainless steel Class 1 piping, piping components, and piping elements exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry" and, for CASS components that do not meet the NUREG-0313 guidelines, a plant-specific aging management program	Yes, plant-specific (See SRP subsection 3.1.2.2.6.2)	Consistent with exception to NUREG-1801 with an additional AMP to verify effectiveness. Cracking of the CASS Class 1 piping, piping components, and piping elements exposed to reactor coolant will be managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. Additionally, the One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. Further evaluation is documented in subsection 3.1.2.2.6.2
3.1-1, 021	Not applicable. This line item only applies to BWRs.				
3.1-1, 022	Steel steam generator feedwater impingement plate and support exposed to secondary feedwater	Loss of material due to erosion	A plant-specific aging management program is to be evaluated	Yes, plant-specific (See SRP subsection 3.1.2.2.8)	Not applicable. Steam generator feedwater impingement plates and supports are not part of the Unit 1 SGs (model Delta 76) used at CPNPP. The Unit 2 SGs (model D-5) have stainless steel feedwater impingement plates and supports. Further evaluation is documented in subsection 3.1.2.2.8.
3.1-1, 023	[Item 3.1-1, 023 was removed by LR-ISG 2011-04]				
3.1-1, 024	[Item 3.1-1, 024 was removed by LR-ISG 2011-04]				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 025	Steel (with nickel-alloy cladding) or nickel alloy steam generator primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M19, "Steam Generators"	Yes, plant-specific (See SRP subsections 3.1.2.2.11.1 and 3.1.2.2.11.2)	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2016-01 with an additional AMP to verify effectiveness. Cracking of steel (with nickel-alloy cladding) or nickel alloy SG primary side components: divider plate (both units) and tube-to-tubesheet weld (Unit 1 only) exposed to reactor coolant in the RCS will be managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The Steam Generators (B.2.3.10) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. Unit 1 SGs use alloy 690 and do not require an additional inspection or plant-specific program. Unit 2 SGs, which use alloy 600, are bounded under the industry analyses contained in EPRI 3002002850 and do not require an additional inspection or plant-specific program. Additionally, the Unit 2 SGs do not require aging management of the tube-to-tubesheet welds because they do not meet the criteria established to be considered a RCPB. Further evaluation is documented in subsection 3.1.2.2.11.1 and 3.1.2.2.11.2.
3.1-1, 026	[Item 3.1-1, 026 was removed by LR-ISG 2011-04]				
3.1-1, 027	[Item 3.1-1, 027 was removed by LR-ISG 2011-04]				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 028	Westinghouse-specific "Existing Programs" components: Stainless steel, nickel alloy, and X-750 control rod guide tube support pins (split pins) exposed to reactor coolant and neutron flux	Loss of material due to wear; cracking due to SCC, IASCC, fatigue	AMP XI.M16A, "PWR Vessel Internals," and AMP XI.M2, "Water Chemistry" (for SCC mechanisms only)	Yes (See SRP Section 3.1.2.2.9)	Not used. The CPNPP split pins have been replaced with cold-worked 316 stainless steel and, as such, are a No Additional Measures component, consistent with MRP-227, Revision 1-A, and included with item 3.1-1, 055c below. Further evaluation is documented in subsection 3.1.2.2.9.
3.1-1, 029	Not applicable. This line item only applies to BWRs.				
3.1-1, 030	Not applicable. This line item only applies to BWRs.				
3.1-1, 031	Not applicable. This line item only applies to BWRs.				
3.1-1, 032	Deleted by SLR-ISG-2021-01-PWRVI.				
3.1-1, 033	Stainless steel, steel with stainless steel cladding Class 1 reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD” for ASME components, and Chapter XI.M2, “Water Chemistry”	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel and steel with stainless steel cladding Class 1 RCPB components exposed to reactor coolant in the SGs and RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 034	Stainless steel, steel with stainless steel cladding pressurizer relief tank (tank shell and heads, flanges, nozzles) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel components just outside the ASME Class 1 RCPB and downstream in the RCS exposed to treated borated water >60°C (>140°F) is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.
3.1-1, 035	Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Consistent with NUREG-1801. Cracking of the stainless steel and steel with stainless steel cladding RCS cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant in the RCS is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 036	Steel, stainless steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Not used. Supports, including supports for Class 1 components such as the Pressurizer, are a commodity addressed in Table 3.5.2-13 below. Aging of these supports is managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP, such as listed for items 3.5-1, 057 and 3.5-1, 091, and Boric Acid Corrosion (B.2.3.4) AMP, as listed for item 3.5-1, 089. Additionally, cracking of Pressurizer components is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP as listed in item 3.1-1, 040 below.
3.1-1, 037	Steel reactor vessel flange	Loss of material due to wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Consistent with NUREG-1801. Loss of material of the steel reactor vessel flange in the RCS is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 038	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components. For pump casings and valve bodies, screening for susceptibility to thermal aging is not necessary.	No	Consistent with NUREG-1801. Reduction in fracture toughness of the CASS Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 ºC (>482 ºF) in the RCS is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.
3.1-1, 039	Steel, stainless steel, or steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, IGSCC (for stainless steel only), and thermal, mechanical, and vibratory loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, Chapter XI.M2, "Water Chemistry," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping"	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel Class 1 piping, fittings, and branch connections < Nominal Pipe Size (NPS) 4 exposed to reactor coolant in the RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP, and the One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 040	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Cracking of the steel with stainless steel cladding, nickel alloy, or stainless steel pressurizer components exposed to reactor coolant in the RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.
3.1-1, 040.5	Nickel alloy core support pads; core guide lugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Cracking of the nickel alloy core support pads; core guide lugs exposed to reactor coolant in the RV is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.
3.1-1, 041	Not applicable. This line item only applies to BWRs.				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 042	Steel with stainless steel or nickel alloy cladding or stainless steel primary side components; steam generator upper and lower heads, and tube sheet weld; or pressurizer components exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Not used. Cracking of steel with stainless steel or nickel alloy cladding or stainless steel primary side components; SG upper and lower heads, and tube sheet weld; or pressurizer components exposed to reactor coolant in the RCS is addressed by items 3.1-1, 018; 3.1-1, 019; 3.1-1, 020; 3.1-1, 025; 3.1-1, 033; 3.1-1, 034; 3.1-1, 035; 3.1-1, 039; 3.1-1, 040; 3.1-1, 046; 3.1-1, 047; 3.1-1, 070; 3.1-1, 071; 3.1-1, 080; and 3.1-1, 082.
3.1-1, 043	Not applicable. This line item only applies to BWRs.				
3.1-1, 044	Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam	Loss of material due to erosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 2 components	No	Consistent with NUREG-1801. Loss of material of the steel SG secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam in the RCS is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 045	Nickel alloy and steel with nickel-alloy cladding reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI ISI, IWB, IWC & IWD," and Chapter XI.M2, "Water Chemistry," and, for nickel-alloy, Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)"	No	Consistent with exception to NUREG-1801. Cracking of the nickel alloy and steel with nickel alloy cladding RCPB components exposed to reactor coolant in the RV, SGs, and RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP and the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5) AMP.
3.1-1, 046	Stainless steel, nickel-alloy, nickel-alloy welds and/or buttering control rod drive head penetration pressure housing or nozzles safe ends and welds (inlet, outlet, safety injection) exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI ISI, IWB, IWC & IWD," and Chapter XI.M2, "Water Chemistry," and, for nickel-alloy, Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)"	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel nozzle safe ends and welds (inlet, outlet, SI) exposed to reactor coolant in the RV, as listed in Table 3.1.2-1, is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP and, for the DMWs attaching the carbon steel with stainless steel cladding nozzles to the safe ends, the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 047	Stainless steel, nickel-alloy control rod drive head penetration pressure housing exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, “ASME Section XI ISI, IWB, IWC & IWD,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel, nickel alloy CRD head penetration pressure housing exposed to reactor coolant, as listed in Table 3.1.2-1, is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.
3.1-1, 048	Steel external surfaces: reactor vessel top head, reactor vessel bottom head, reactor coolant pressure boundary piping or components adjacent to dissimilar metal (Alloy 82/182) welds exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion," and Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)"	No	Consistent with NUREG-1801. Loss of material of the steel external surfaces: reactor vessel closure head, reactor vessel bottom head, reactor vessel and pressurizer nozzles or components adjacent to dissimilar metal (Alloy 82/182) welds exposed to air with borated water leakage in the RV and Pressurizer, as listed in Tables 3.1.2-1 and 3.1.2-3, respectively, is managed by the Boric Acid Corrosion (B.2.3.4) AMP and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5) AMP.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 049	Steel reactor coolant pressure boundary external surfaces or closure bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. Loss of material of the steel RCPB external surfaces or closure bolting exposed to air with borated water leakage in the RCS is managed by the Boric Acid Corrosion (B.2.3.4) AMP.
3.1-1, 050	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	Consistent with NUREG-1801. Reduction of fracture toughness of the CASS Class 1 piping, piping component (Unit 1 elbows) exposed to reactor coolant >250 °C (>482 °F) in the RCS is managed by the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B.2.3.6) AMP. The CRD pressure housings are made of stainless steel, not CASS.
3.1-1, 051a	Stainless steel or nickel alloy Babcock & Wilcox reactor internal “Primary” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 051b	Stainless steel or nickel alloy Babcock & Wilcox reactor internal "Expansion" components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, fatigue, or overload	Chapter XI.M16A, "PWR Vessel Internals," and Chapter XI.M2, "Water Chemistry" (for SCC mechanisms only)	No	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant.
3.1-1, 052a	Stainless steel or nickel alloy Combustion Engineering reactor internal "Primary" components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, "PWR Vessel Internals," and Chapter XI.M2, "Water Chemistry" (for SCC mechanisms only)	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.
3.1-1, 052b	Stainless steel or nickel alloy Combustion Engineering reactor internal "Expansion" components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, "PWR Vessel Internals," and Chapter XI.M2, "Water Chemistry" (for SCC mechanisms only)	No	Not applicable. CPNPP is a Westinghouse plant, not a Combustion Engineering plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 052c	Stainless steel or nickel alloy Combustion Engineering reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.
3.1-1, 053a	Stainless steel or nickel alloy Westinghouse reactor internal “Primary” components exposed to reactor coolant and neutron flux	Cracking due to SCC, IASCC, fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	Yes (Section 3.1.2.2.9)	Consistent with exception to NUREG-1801 as updated by SLR-ISG-2021-01-PWRVI. Cracking of the stainless steel or nickel alloy Westinghouse reactor internal "Primary" components exposed to reactor coolant, neutron flux will be managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 053b	Stainless steel Westinghouse reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Cracking due to SCC, IASCC, fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	Yes (Section 3.1.2.2.9)	Consistent with exception to NUREG-1801 as updated by SLR-ISG-2021-01-PWRVI. Cracking of the stainless steel Westinghouse reactor internal "Expansion" components exposed to reactor coolant and neutron flux will be managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.
3.1-1, 053c	Stainless steel, nickel alloy, or stellite Westinghouse reactor internal "Existing Programs" components exposed to reactor coolant, neutron flux	Cracking due to SCC, IASCC, fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	Yes (Section 3.1.2.2.9)	Consistent with exception to NUREG-1801 as updated by SLR-ISG-2021-01-PWRVI. Cracking of the stainless steel, nickel alloy Westinghouse reactor internal "Existing Programs" components exposed to reactor coolant; neutron flux is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 054	Stainless steel Westinghouse-design bottom mounted instrument system flux thimble tubes (with or without chrome plating) exposed to reactor coolant and neutron flux (Westinghouse “Existing Programs” components)	Loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals,” or Chapter XI.M37, "Flux Thimble Tube Inspection"	No	Consistent with NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Loss of material of the stainless steel bottom mounted instrument system flux thimble tubes exposed to reactor coolant and neutron flux is managed by the Flux Thimble Tube Inspection (B.2.3.23) AMP.
3.1-1, 055a	Stainless steel or nickel alloy Babcock and Wilcox reactor internal “No Additional Measures” components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal “No Additional Measures” components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience invalidates MRP-227-A.	Chapter XI.M16A, “PWR Vessel Internals”	No	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 055b	Stainless steel or nickel alloy Combustion Engineering reactor internal “No Additional Measures” components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal “No Additional Measures” components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience invalidates MRP-227-A.	Chapter XI.M16A, “PWR Vessel Internals”	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.
3.1-1, 055c	Stainless steel or nickel alloy Westinghouse reactor internal “No Additional Measures” components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal "No Additional Measures" components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience exists	Chapter XI.M16A, “PWR Vessel Internals”	Yes (Section 3.1.2.2.9)	Consistent with NUREG-1801 as supplemented by LR-ISG-2011-04 (in NUREG-2191 but not SLR-ISG-2021-01-PWRVI). The stainless steel “No Additional Measures” components exposed to reactor coolant and neutron flux in the RV internals are managed by the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 056a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal “Primary” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 056b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Combustion Engineering "Expansion" reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 056c	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal "Existing Programs" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Not applicable. CPNPP is a Westinghouse plant, not a CE plant.
3.1-1, 057	[There is no 3.1-1, 057 in NUREG-1800 or SLR-ISG-2021-01-PWRVI.]				
3.1-1, 058a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Babcock & Wilcox reactor internal "Primary" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to wear; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 058b	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Babcock & Wilcox reactor internal "Expansion" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Not applicable. CPNPP is a Westinghouse plant, not a Babcock & Wilcox plant.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 059a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Westinghouse reactor internal “Primary” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	Yes (Section 3.1.2.2.9)	Consistent with NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Loss of fracture toughness, changes in dimensions, loss of preload, and loss of material of the stainless steel or nickel alloy Westinghouse reactor internal “Primary” components exposed to reactor coolant and neutron flux is managed by the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 059b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Westinghouse reactor internal "Expansion" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	Yes (Section 3.1.2.2.9)	Consistent with NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Loss of fracture toughness, changes in dimensions, loss of preload, and loss of material of the stainless steel Westinghouse reactor internal "Expansion" components exposed to reactor coolant and neutron flux is managed by the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 059c	Stainless steel (SS, including CASS, PH SS or martensitic SS), nickel alloy, or stellite Westinghouse reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; changes in dimensions due to void swelling, distortion; loss of preload due to thermal and irradiation- enhanced stress relaxation, creep; loss of material due to wear	AMP XI.M16A, "PWR Vessel Internals"	Yes (Section 3.1.2.2.9)	Consistent with NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Loss of fracture toughness, changes in dimensions, loss of preload, and loss of material of the stainless steel or nickel alloy, Westinghouse reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux is managed by the PWR Vessel Internals (B.2.3.7) AMP. Further evaluation is documented in subsection 3.1.2.2.9.
3.1-1, 060	Not applicable. This line item only applies to BWRs.				
3.1-1, 061	Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with exception to NUREG-1801. Wall thinning of the steel SG MS nozzle, feedwater nozzle, and AFW nozzle exposed to secondary feedwater/steam is managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 062	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Not used. There are no high-strength closure bolting exposed to air with reactor coolant leakage other than the reactor head closure studs addressed in item 3.1-1, 092 below. The CRD head penetrations are welded, not bolted.
3.1-1, 063	Not applicable. This line item only applies to BWRs.				
3.1-1, 064	Steel closure bolting exposed to air – indoor uncontrolled	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material of the steel closure bolting exposed to air – indoor uncontrolled in the SGs and RCS is managed by the Bolting Integrity (B.2.3.9) AMP.
3.1-1, 065	Stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of material due to wear	Chapter XI.M18, "Bolting Integrity"	No	Not used. Loss of material for stainless steel closure bolting in the RCS is included with item 3.2-1, 013 below. A generic note C is used. Furthermore, the CRD head penetrations are welded, not bolted.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 066	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload of the low alloy steel or stainless steel RCS closure bolting exposed to air – indoor controlled, with potential for reactor coolant leakage is managed by the Bolting Integrity (B.2.3.9) AMP. The CRD head penetrations are welded, not bolted.
3.1-1, 067	Steel or stainless steel closure bolting exposed to air – indoor with potential for reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload of the steel closure bolting exposed to air – indoor uncontrolled with potential for reactor coolant leakage in the SGs is managed by the Bolting Integrity (B.2.3.9) AMP. Loss of preload of the stainless steel closure bolting exposed to air – indoor with potential for reactor coolant leakage in the RCS is addressed by item 3.1-1, 066.
3.1-1, 068	Nickel alloy steam generator tubes exposed to secondary feedwater or steam	Changes in dimension ("denting") due to corrosion of carbon steel tube support plate	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	Not used. The nickel alloy SG tubes exposed to secondary feedwater or steam has a stainless steel tube support plate. Furthermore, loss of material due to wear or fretting is addressed in item 3.1-1, 077 below.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 069	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking and intergranular attack	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with exception to NUREG-1801. Cracking of the nickel alloy SG tubes and sleeves exposed to secondary feedwater is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801.
3.1-1, 070	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with exception to NUREG-1801. Cracking of the nickel alloy SG tubes, repair sleeves, and tube plugs exposed to reactor coolant is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 071	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking or other mechanism(s); loss of material due general (steel only), pitting, and crevice corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Cracking and loss of material of the steel, stainless steel, and nickel alloy SG anti-vibration bars, internal discharge piping, Unit 1 feedwater distribution ring, Unit 1 spray nozzle, Unit 2 preheater assembly, as well as tube support plates and tubes exposed to secondary feedwater or steam are managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801. Some of the nickel alloy anti-vibration bars are chrome-plated.
3.1-1, 072	Steel steam generator tube support plate, tube bundle wrapper, supports and mounting hardware exposed to secondary feedwater or steam	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Loss of material of the steel SG tube wrapper, steam separator assembly, and tubesheet exposed to secondary feedwater or steam is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801. The SG tube support plate is stainless steel and is addressed by item 3.1-1, 071.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 073	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater or steam	Loss of material due to wastage and pitting corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Not applicable. Nickel alloy SG tubes and sleeves are not exposed to phosphate chemistry in secondary feedwater or steam.
3.1-1, 074	Steel steam generator upper assembly and separators including feedwater inlet ring and support exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Wall thinning of the steel steam separator assembly exposed to secondary feedwater or steam is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801.
3.1-1, 075	Steel steam generator tube support lattice bars exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion and general corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Not applicable. There are no steel SG tube support lattice bars exposed to secondary feedwater or steam.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 076	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Loss of material due to fretting	Chapter XI.M19, “Steam Generators”	No	Consistent with exception to NUREG-1801. Loss of material of the stainless steel and nickel alloy SG anti-vibration bars exposed to secondary feedwater or steam is managed by the Steam Generators (B.2.3.10) AMP, which takes exception to NUREG-1801. There are no chrome plated steel SG anti-vibration bars exposed to secondary feedwater or steam. Some of the nickel alloy anti-vibration bars are chrome-plated.
3.1-1, 077	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Loss of material due to wear and fretting	Chapter XI.M19, “Steam Generators”	No	Consistent with exception to NUREG-1801. Loss of material of the nickel alloy SG tubes and sleeves exposed to secondary feedwater or steam in the RCS is managed by the Steam Generators (B.2.3.10) AMP, which takes exception to NUREG-1801.
3.1-1, 078	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection," or Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.”	No	Consistent with exception to NUREG-1801. Cracking of the nickel alloy SG nozzle DMWs, thermal sleeves, and flow restrictors exposed to secondary feedwater or steam is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 079	Not applicable. This line item only applies to BWRs.				
3.1-1, 080	Stainless steel or steel with stainless steel cladding pressurizer relief tank: tank shell and heads, flanges, nozzles (none-ASME Section XI components) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel non-ASME Section XI components listed in Table 3.1.2-3 exposed to reactor coolant / treated borated water >60°C (>140°F) is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. There are no steel with stainless steel cladding non-ASME Section XI components exposed to treated borated water >60°C (>140°F) in the RCS. Furthermore, the PRT temperature is maintained and not exposed to temperatures > 60°C (> 140°F) and included with item 3.2-1, 018 below.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 081	Stainless steel pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Cracking of the stainless steel pressurizer spray head and pressurizer sleeve exposed to reactor coolant in the RV, internals, and RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking.
3.1-1, 082	Nickel alloy pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. The pressurizer spray head is made of stainless steel and is addressed by item 3.1-1, 081.
3.1-1, 083	Steel steam generator shell assembly exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Loss of material of the steel SG shell assembly exposed to secondary feedwater or steam is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material.
3.1-1, 084	Not applicable. This line item only applies to BWRs.				
3.1-1, 085	Not applicable. This line item only applies to BWRs.				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 086	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry"	No	Not applicable. The SG primary side divider plate exposed to reactor coolant is made of nickel alloy and is addressed by item 3.1-1, 025 for cracking.
3.1-1, 087	Stainless steel or nickel-alloy PWR reactor internal components exposed to reactor coolant and neutron flux	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Loss of material of the stainless steel or nickel alloy reactor internal components exposed to reactor coolant and neutron flux is managed by the Water Chemistry (B.2.3.2) AMP, which includes an exception to NUREG-1801.
3.1-1, 088	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry"	No	Consistent with exception to NUREG-1801. Loss of material of the stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RCPB components exposed to reactor coolant in the RCS is managed by the Water Chemistry (B.2.3.2) AMP, which includes an exception to NUREG-1801.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 089	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of steel RCP bearing oil cooler channel head exposed to closed cycle cooling water in the RCS is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. A generic note D is used.
3.1-1, 090	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of copper alloy RCP bearing oil cooler tubes and tubesheet exposed to closed cycle cooling water in the RCS is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. A generic note D is used.
3.1-1, 091	Not applicable. This line item only applies to BWRs.				
3.1-1, 092	High-strength low alloy steel closure head stud assembly exposed to air with potential for reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to general, pitting, and crevice corrosion, or wear (PWR)	Chapter XI.M3, “Reactor Head Closure Stud Bolting”	No	Consistent with exception to NUREG-1801. Cracking and loss of material of the steel closure head stud assembly exposed to air – indoor uncontrolled, with potential for reactor coolant leakage, in the RCS are managed by the Reactor Head Closure Stud Bolting (B.2.3.3) AMP, which includes an exception to NUREG-1801. Some of the reactor head closure studs may be high-strength. A plant-specific note is used in Table 3.1.2-1.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 093	Copper alloy >15% Zn or >8% Al piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching "	No	Not applicable. The copper alloy piping components (RCP bearing oil cooler tubes and tubesheet) exposed to closed cycle cooling water in the RCS do not have >15% Zn or >8% Al.
3.1-1, 094	Not applicable. This line item only applies to BWRs.				
3.1-1, 095	Not applicable. This line item only applies to BWRs.				
3.1-1, 096	Not applicable. This line item only applies to BWRs.				
3.1-1, 097	Not applicable. This line item only applies to BWRs.				
3.1-1, 098	Not applicable. This line item only applies to BWRs.				
3.1-1, 099	Not applicable. This line item only applies to BWRs.				
3.1-1, 100	Not applicable. This line item only applies to BWRs.				
3.1-1, 101	Not applicable. This line item only applies to BWRs.				
3.1-1, 102	Not applicable. This line item only applies to BWRs.				
3.1-1, 103	Not applicable. This line item only applies to BWRs.				
3.1-1, 104	Not applicable. This line item only applies to BWRs.				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 105	Steel piping, piping components and piping element exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with American Concrete Institute (ACI) 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. There are no steel piping, piping components and piping element exposed to concrete in the RCS.
3.1-1, 106	Nickel alloy piping, piping components and piping element exposed to air – indoor, uncontrolled, or air with borated water leakage	None	None	NA -No AEM or AMP	Consistent with NUREG-1801.
3.1-1, 107	Stainless steel piping, piping components and piping element exposed to gas, concrete, air with borated water leakage, air – indoors, uncontrolled	None	None	NA -No AEM or AMP	Consistent with NUREG-1801.
3.1-1, 108	[There is no item 108 in Table 3.1-1 of NUREG-1800]				
3.1-1, 109	[There is no item 109 in Table 3.1-1 of NUREG-1800]				

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1-1, 110	Not applicable. This line item, added by LR-ISG-2012-01 (wall thinning due to erosion) only applies to BWRs.				
3.1-1, 114	Reactor coolant system components defined as ASME Section XI Code Class components (ASME Code Class 1 reactor coolant pressure boundary components, reactor vessel interior attachments, or core support structure components; or ASME Class 2 and 3 components – including ASME defined appurtenances, component supports, and associated pressure boundary welds, or components subject to plant-specific equivalent classifications for these ASME code classes)	Cracking due to SCC, IGSCC, PWSCC, IASCC (SCC mechanisms for stainless steel, nickel alloy components only), fatigue, or cyclic loading; loss of material due to general corrosion (steel only), pitting corrosion, crevice corrosion, or wear	AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and AMP XI.M2, "Water Chemistry" (water chemistry-related or corrosion-related aging effect mechanisms only)	No	Consistent with exception to NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Cracking and loss of material of RCS components defined as ASME Section XI Code Class components (Category B-N-3) is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP and Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 118	Stainless steel, nickel alloy PWR reactor vessel internal components or LRA/SLRA-specified reactor vessel internal component exposed to reactor coolant, neutron flux	Cracking due to SCC, IASCC, cyclic loading, fatigue	Plant-specific aging management program or AMP XI.M16A, "PWR Vessel Internals," and AMP XI.M2, "Water Chemistry" (SCC and IASCC only), with an adjusted site-specific or component-specific aging management basis for a specified reactor vessel internal component	Yes (Section 3.1.2.2.9)	Not used. Cracking of stainless steel, nickel alloy PWR reactor vessel internal components or LRA-specified reactor vessel internal component exposed to reactor coolant, neutron flux is addressed in items 3.1-1, 028; 3.1-1, 053a; 3.1-1, 053b; and 3.1-1, 053c. Further evaluation is documented in subsection 3.1.2.2.9.
3.1-1, 119	Stainless steel, nickel alloy, stellite PWR reactor vessel internal components or LRA/SLRA specified reactor vessel internal component exposed to reactor coolant, neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement or thermal aging embrittlement; changes in dimensions due to void swelling or distortion; loss of preload due to thermal and irradiation-enhanced stress relaxation or creep; loss of material due to wear	Plant-specific aging management program or AMP XI.M16A, "PWR Vessel Internals," with an adjusted site-specific or component-specific aging management basis for a specified reactor vessel internal component	Yes (Section 3.1.2.2.9)	Consistent with NUREG-1801 as supplemented by SLR-ISG-2021-01-PWRVI. Loss of fracture toughness and changes in dimensions of the stainless steel BMI: flux thimble tubes exposed to reactor coolant and neutron flux is managed by the PWR Vessel Internals (B.2.3.7) AMP. A plant-specific note is used. Loss of preload is not applicable to these components and loss of material is addressed by item 3.1-1, 054 above. Further evaluation is documented in subsection 3.1.2.2.9.

Table 3.1-1: Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1-1, 127a	Steel (with stainless steel or nickel alloy cladding) steam generator heads and tubesheets exposed to reactor coolant	Loss of material due to boric acid corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M19, “Steam Generators”	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2016-01. Loss of material of the steel with stainless steel or nickel alloy cladding SG heads and tubesheets exposed to reactor coolant in the RCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801, and the Steam Generators (B.2.3.10) AMP, which also takes exception to NUREG-1801.

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bottom head (dome, torus, and welds)	Pressure boundary	Carbon steel with stainless steel cladding	Air - indoor uncontrolled (external)	Loss of material	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.RP-379	3.1-1, 048	A
Bottom head (dome, torus, and welds)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.RP-379	3.1-1, 048	A
Bottom head (dome, torus, and welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	B
Bottom head penetrations (flux thimble tubing)	Pressure boundary	Stainless steel	Reactor coolant (external)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-154	3.1-1, 019	E, 1
Bottom head penetrations (flux thimble tubing)	Pressure boundary	Stainless steel	Reactor coolant (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D
Bottom head penetrations (flux thimble tubing)	Pressure boundary	Stainless steel	Reactor coolant (external)	Loss of material - wear	Flux Thimble Tube Inspection (B.2.3.23)	IV.B2.RP-284	3.1-1, 054	A, 1
Bottom head penetrations (guide tubes, seals)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C
Bottom head penetrations (flux thimble tubing)	Pressure boundary	Stainless steel	Reactor coolant (external)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-154	3.1-1, 019	E, 1

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bottom head penetrations (guide tubes, seals)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-154	3.1-1, 019	E, 1
Bottom head penetrations (guide tubes, seals)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D, 1
Bottom head penetrations (instrumentation tubes/nozzles, welds)	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-03	3.1-1, 106	C
Bottom head penetrations (instrumentation tubes/nozzles, welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-59	3.1-1, 045	A
Bottom head penetrations (instrumentation tubes/nozzles, welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.RP-59	3.1-1, 045	A
Bottom head penetrations (instrumentation tubes/nozzles, welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-59	3.1-1, 045	B
Bottom head penetrations (seal table)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C
Bottom head penetrations (guide tubes, seals)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-154	3.1-1, 019	E, 1

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bottom head penetrations (seal table)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-154	3.1-1, 019	E, 1
Bottom head penetrations (seal table)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-154	3.1-1, 019	E, 1
Bottom head penetrations (seal table)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D, 1
Closure head (Unit 1 forging/flange, Unit 2 dome, torus, and flange)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.RP-379	3.1-1, 048	A
Closure head (Unit 1 forging/flange, Unit 2 dome, torus, and flange)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.RP-379	3.1-1, 048	A
Closure head (Unit 1 forging/flange, Unit 2 dome, torus, and flange)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	B
Closure head adapters (CRDM nozzles welds)	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-03	3.1-1, 106	C
Closure head adapters (CRDM nozzles welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.R-90	3.1-1, 045	A

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Closure head adapters (CRDM nozzles welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.R-90	3.1-1, 045	A
Closure head adapters (CRDM nozzles welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.R-90	3.1-1, 045	B
Closure head adapters (CRDM nozzles welds)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D
Closure head penetrations (CETNA, instrumentation, leakage monitoring, vent)	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-03	3.1-1, 106	C
Closure head penetrations (CETNA, instrumentation, leakage monitoring, vent)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.R-90	3.1-1, 045	A

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Closure head penetrations (CETNA, instrumentation, leakage monitoring, vent)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.R-90	3.1-1, 045	A
Closure head penetrations (CETNA, instrumentation, leakage monitoring, vent)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.R-90	3.1-1, 045	B
Closure head stud assembly (studs, nuts, and washers)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Cracking	Reactor Head Closure Stud Bolting (B.2.3.3)	IV.A2.RP-52	3.1-1, 092	B, 2
Closure head stud assembly (studs, nuts, and washers)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.A2.RP-54	3.1-1, 001	A
Closure head stud assembly (studs, nuts, and washers)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Reactor Head Closure Stud Bolting (B.2.3.3)	IV.A2.RP-53	3.1-1, 092	B
Closure head stud assembly (studs, nuts, and washers)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A
CRDM assembly (pressure boundary components including: one-piece housing (U1), threaded, seal-welded joint (U2), pressure forgings, latch housing, and rod travel housing)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
CRDM assembly (pressure boundary components including: one-piece housing (U1), threaded, seal-welded joint (U2), pressure forgings, latch housing, and rod travel housing)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-55	3.1-1, 047	A
CRDM assembly (pressure boundary components including: one-piece housing (U1), threaded, seal-welded joint (U2), pressure forgings, latch housing, and rod travel housing)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-55	3.1-1, 047	B
CRDM assembly (pressure boundary components including: one-piece housing (U1), threaded, seal-welded joint (U2), pressure forgings, latch housing, and rod travel housing)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	B
CRDM thermal sleeves	Withstand thermal stresses	Stainless steel	Reactor coolant (internal/external)	Loss of material - wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	None	None	H, 3
Nozzle forgings (inlet/outlet)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2-RP-28	3.1-1, 088	B
Nozzle forgings (inlet/outlet)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.RP-379	3.1-1, 048	A, 4

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Nozzle forgings (inlet/outlet)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.RP-379	3.1-1, 048	A, 4
Nozzle forgings (inlet/outlet)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	Reactor Vessel Surveillance (B.2.3.18)	IV.A2.RP-228	3.1-1, 014	B
Nozzle forgings (inlet/outlet)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	TLAA (Section 4.2)	IV.A2.R-81	3.1-1, 013	A
Nozzle safe ends	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C
Nozzle safe ends	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-234	3.1-1, 046	A
Nozzle safe ends	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-234	3.1-1, 046	B
Nozzle safe ends	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	B

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Nozzle to safe end welds	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-03	3.1-1, 106	C, 4
Nozzle to safe end welds	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.A2.RP-234	3.1-1, 046	A, 4
Nozzle to safe end welds	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-234	3.1-1, 046	B
Nozzle to safe end welds	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D
Vessel components (flanges, nozzles, penetrations, pressure housings, safe ends, thermal sleeves, vessel shells, heads and welds)	Pressure boundary	Carbon steel with stainless steel cladding, nickel alloy, stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.A2.R-219	3.1-1, 010	A
Vessel external attachments (support pads, seal ledge and head lifting lugs)	Structural support	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Vessel internal attachments (core support pads)	Structural support	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.RP-57	3.1-1, 040.5	A
Vessel internal attachments (core support pads)	Structural support	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.RP-57	3.1-1, 040.5	B
Vessel shell (flange)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A
Vessel shell (flange)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2-RP-28	3.1-1, 088	B
Vessel shell (flange)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material - wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.R-87	3.1-1, 037	A
Vessel shell (intermediate shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A
Vessel shell (intermediate shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2-RP-28	3.1-1, 088	B
Vessel shell (intermediate shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	Reactor Vessel Surveillance (B.2.3.18)	IV.A2.RP-229	3.1-1, 014	B

Table 3.1.2-1: Reactor Pressure Vessel – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Vessel shell (intermediate shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	TLAA (Section 4.2)	IV.A2.R-84	3.1-1, 013	A
Vessel shell (lower shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A
Vessel shell (lower shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2-RP-28	3.1-1, 088	B
Vessel shell (lower shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	Reactor Vessel Surveillance (B.2.3.18)	IV.A2.RP-229	3.1-1, 014	B
Vessel shell (lower shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant and neutron flux (internal)	Reduction in fracture toughness	TLAA (Section 4.2)	IV.A2.R-84	3.1-1, 013	A
Vessel shell (upper shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.A2.R-17	3.1-1, 049	A
Vessel shell (upper shell plates, circumferential and longitudinal welds)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2-RP-28	3.1-1, 088	B

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. Thimble tubing is exposed externally to reactor coolant downstream of the seal at the bottom head penetration and with potential leakage past the seal into the guide tube. Likewise, the guide tubes and seal table only contain treated borated water (reactor coolant) with leakage past the seal.

2. Only select reactor head closure studs, nuts and washers are considered high strength (yield strength ≥ 150 kilo pounds per square inch (ksi)) (FSAR Tables 5.3-4A, 5.3-4B, and 5.3-4C) and susceptible to cracking.

3. Based on the OE reflected in NUREG-2191 (IV.A2.R-414) and NUREG-2192 (3.1-1, 117), loss of material due to wear can occur in the stainless steel thermal sleeves of PWR CRD head penetration nozzles due to interaction between the nozzle and the thermal sleeve. This SLR OE recommends the use of a plant-specific AMP to manage this aging effect; as such, the ASME Section XI, Subsection IWB, IWC, and IWD (B.2.3.1) AMP includes inspection for the loss of material due to wear of the CRDM thermal sleeves.

4. The Material Stress Improvement Process (MSIP) has been completed for Unit 1 inlet and outlet nozzle welds and some Unit 2 inlet and outlet nozzle welds. As such, these nozzle to safe end welds are less susceptible to cracking due to PWSCC, which is managed by the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5) AMP.

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Alignment and interfacing components: clevis inserts, clevis insert bolts	Structural support	Nickel alloy	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	A
Alignment and interfacing components: clevis inserts, clevis insert bolts	Structural support	Nickel alloy	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-399	3.1-1, 053c	A
Alignment and interfacing components: clevis inserts, clevis insert bolts	Structural support	Nickel alloy	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-399	3.1-1, 053c	B
Alignment and interfacing components: clevis inserts, clevis insert bolts	Structural support	Nickel alloy	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	A
Alignment and interfacing components: clevis inserts, clevis insert bolts	Structural support	Nickel alloy	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Alignment and interfacing components: hold-down spring	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-300	3.1-1, 059a	A
Alignment and interfacing components: hold-down spring	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-271	3.1-1, 053a	C
Alignment and interfacing components: hold-down spring	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-271	3.1-1, 053a	D
Alignment and interfacing components: hold-down spring	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-300	3.1-1, 059a	A
Alignment and interfacing components: hold-down spring	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-300	3.1-1, 059a	A
Alignment and interfacing components: upper core plate alignment pins	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-301	3.1-1, 053c	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Alignment and interfacing components: upper core plate alignment pins	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-301	3.1-1, 053c	B
Alignment and interfacing components: upper core plate alignment pins	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-299	3.1-1, 059c	A
ASME Section XI, examination category B-N-3 reactor vessel internals components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A
ASME Section XI, examination category B-N-3 reactor vessel internals components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
ASME Section XI, examination category B-N-3 reactor vessel internals components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
ASME Section XI, examination category B-N-3 reactor vessel internals components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Nickel alloy	Reactor coolant and neutron flux	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Nickel alloy	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Nickel alloy	Reactor coolant and neutron flux	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Nickel alloy	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.E.R-444	3.1-1, 114	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
ASME Section XI, examination category B-N-3 reactor vessel internals components	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.E.R-444	3.1-1, 114	B
Baffle-to-former assembly: baffle and former plates	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270	3.1-1, 059a	A
Baffle-to-former assembly: baffle and former plates	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270a	3.1-1, 053a	A
Baffle-to-former assembly: baffle and former plates	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-270a	3.1-1, 053a	B
Baffle-to-former assembly: baffle and former plates	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270	3.1-1, 059a	A
Baffle-to-former assembly: baffle and former plates	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270	3.1-1, 059a	A
Baffle-to-former assembly: baffle and former plates	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270a	3.1-1, 053a	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Baffle-to-former assembly: baffle and former plates	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-270a	3.1-1, 053a	B
Baffle-to-former assembly: baffle and former plates	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-270	3.1-1, 059a	A
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-354	3.1-1, 059a	A
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-275	3.1-1, 053a	A
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-275	3.1-1, 053a	B
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-354	3.1-1, 059a	A
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-354	3.1-1, 059a	A
Baffle-to-former assembly: baffle-edge bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-354	3.1-1, 059a	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	A
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-271	3.1-1, 053a	A
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-271	3.1-1, 053a	B
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	A
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	A
Baffle-to-former assembly: baffle-to-former bolts (including corner bolts)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	A
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-274	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-273	3.1-1, 053b	A
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-273	3.1-1, 053b	B
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-274	3.1-1, 059b	A
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-274	3.1-1, 059b	A
Baffle-to-former assembly: barrel-to-former bolts	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-274	3.1-1, 059b	A
BMI: columns (butt type, instrumentation guide columns, lower support columns, off-set instrumentation columns) including U1 wear reduction sleeves	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-293	3.1-1, 053b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
BMI: columns (butt type, instrumentation guide columns, lower support columns, off-set instrumentation columns) including U1 wear reduction sleeves	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-293	3.1-1, 053b	B
BMI: columns (butt type, instrumentation guide columns, lower support columns, off-set instrumentation columns) including U1 wear reduction sleeves	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-292	3.1-1, 059b	A
BMI: columns (butt type, instrumentation guide columns, lower support columns, off-set instrumentation columns) including U1 wear reduction sleeves	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-292	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
BMI: flux thimble tubes	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.R-424	3.1-1, 119	E, 1, 4
BMI: flux thimble tubes	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-345a	3.1-1, 053c	C, 4
BMI: flux thimble tubes	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-345a	3.1-1, 053c	D, 4
BMI: flux thimble tubes	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.R-424	3.1-1, 119	E, 1, 4
Core barrel assembly: barrel flange	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-289	3.1-1, 053c	C
Core barrel assembly: barrel flange	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-289	3.1-1, 053c	D
Core barrel assembly: barrel flange	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-345	3.1-1, 059c	A
Core barrel assembly: barrel flange	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-289	3.1-1, 053c	C
Core barrel assembly: barrel flange	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-289	3.1-1, 053c	D
Core barrel assembly: barrel flange	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-345	3.1-1, 059c	A
Core barrel assembly: lower core barrel flange weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-280a	3.1-1, 059b	A, 4

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core barrel assembly: lower core barrel flange weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-280a	3.1-1, 059b	A, 4
Core barrel assembly: lower core barrel flange weld, upper girth weld, and upper axial weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-280	3.1-1, 053b	A
Core barrel assembly: lower core barrel flange weld, upper girth weld, and upper axial weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-280	3.1-1, 053b	B
Core barrel assembly: lower girth welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-388	3.1-1, 059a	A
Core barrel assembly: lower girth welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-387	3.1-1, 053a	A
Core barrel assembly: lower girth welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-387	3.1-1, 053a	B
Core barrel assembly: lower girth welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-388	3.1-1, 059a	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core barrel assembly: middle and lower axial welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-388a	3.1-1, 059b	A
Core barrel assembly: middle and lower axial welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-387a	3.1-1, 053b	A
Core barrel assembly: middle and lower axial welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-387a	3.1-1, 053b	B
Core barrel assembly: middle and lower axial welds	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-388a	3.1-1, 059b	A
Core barrel assembly: upper flange weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-276	3.1-1, 053a	A
Core barrel assembly: upper flange weld	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-276	3.1-1, 053a	B
CRGT assemblies: CRGT guide cards	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296a	3.1-1, 053a	A, 4

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
CRGT assemblies: CRGT guide cards	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-296a	3.1-1, 053a	B, 4
CRGT assemblies: CRGT guide cards	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296	3.1-1, 059a	A
CRGT assemblies: CRGT guide cards	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296	3.1-1, 059a	A
CRGT assemblies: CRGT guide cards	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296a	3.1-1, 053a	A, 4
CRGT assemblies: CRGT guide cards	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-296a	3.1-1, 053a	B, 4
CRGT assemblies: CRGT guide cards	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296	3.1-1, 059a	A
CRGT assemblies: CRGT guide cards	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-296	3.1-1, 059a	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
CRGT assemblies: lower flange welds in non-peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-298a	3.1-1, 053b	A, 4
CRGT assemblies: lower flange welds in non-peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-298a	3.1-1, 053b	B, 4
CRGT assemblies: lower flange welds in non-peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-297a	3.1-1, 059b	A, 4
CRGT assemblies: lower flange welds in peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-298	3.1-1, 053a	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
CRGT assemblies: lower flange welds in peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-298	3.1-1, 053a	B
CRGT assemblies: lower flange welds in peripheral CRGT assemblies	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-297	3.1-1, 059a	A
Lower internals assembly: lower core plate (including manway cover)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A
Lower internals assembly: lower core plate (including manway cover)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-289	3.1-1, 053c	A
Lower internals assembly: lower core plate (including manway cover)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-289	3.1-1, 053c	B
Lower internals assembly: lower core plate (including manway cover)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower internals assembly: lower core plate (including manway cover)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A
Lower internals assembly: lower core plate (including manway cover)	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A
Lower internals assembly: lower core plate (including manway cover)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-289	3.1-1, 053c	A
Lower internals assembly: lower core plate (including manway cover)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-289	3.1-1, 053c	B
Lower internals assembly: lower core plate (including manway cover)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A
Lower internals assembly: lower core plate (including manway cover)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	A
Lower internals assembly: lower support forging	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-291a	3.1-1, 053b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower internals assembly: lower support forging	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-291a	3.1-1, 053b	B
Lower support assembly: bolts, core support column locking nut	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-287	3.1-1, 059b	A
Lower support assembly: bolts, core support column locking nut	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-286	3.1-1, 053b	A
Lower support assembly: bolts, core support column locking nut	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-286	3.1-1, 053b	B
Lower support assembly: bolts, core support column locking nut	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-287	3.1-1, 059b	A
Lower support assembly: bolts, core support column locking nut	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-287	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Flow distribution	CASS	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290	3.1-1, 059b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Flow distribution	CASS	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-291	3.1-1, 053b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Flow distribution	CASS	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-291	3.1-1, 053b	B

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Flow distribution	CASS	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290	3.1-1, 059b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Structural support	CASS	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290	3.1-1, 059b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Structural support	CASS	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-291	3.1-1, 053b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Structural support	CASS	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-291	3.1-1, 053b	B
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 1)	Structural support	CASS	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290	3.1-1, 059b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-295	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-294	3.1-1, 053b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-294	3.1-1, 053b	B
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-295	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Structural support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-295	3.1-1, 059b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-294	3.1-1, 053b	A
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-294	3.1-1, 053b	B

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Lower support assembly: support columns, off-set instrumentation columns, butt type columns, instrumentation guide columns and sleeves (Unit 2)	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-295	3.1-1, 059b	A
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	C, 2
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-271	3.1-1, 053a	C, 2
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-271	3.1-1, 053a	D, 2
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	C, 2
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	C, 2
Neutron shield panel support pins	Structural Support	Stainless steel	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-272	3.1-1, 059a	C, 2
No additional measures components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	None	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-265	3.1-1, 055c	C

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
No additional measures components	Structural support	Stainless steel	Reactor coolant and neutron flux	None	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-265	3.1-1, 055c	C, 3
Radial support: key bolts	Structural Support	Nickel alloy	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	C
Radial support: key bolts	Structural Support	Nickel alloy	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-399	3.1-1, 053c	C
Radial support: key bolts	Structural Support	Nickel alloy	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-399	3.1-1, 053c	D
Radial support: key bolts	Structural Support	Nickel alloy	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	C
Radial support: key bolts	Structural Support	Nickel alloy	Reactor coolant and neutron flux	Loss of preload	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	C
Radial support: radial support key	Structural Support	Stainless steel	Reactor coolant and neutron flux	Change in dimension	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	C
Radial support: radial support key	Structural Support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-399	3.1-1, 053c	C
Radial support: radial support key	Structural Support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-399	3.1-1, 053c	D
Radial support: radial support key	Structural Support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-285	3.1-1, 059c	C
Reactor vessel internal components	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.B2.RP-24	3.1-1, 087	B
Reactor vessel internal components	Structural support	Nickel alloy	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.B2.RP-24	3.1-1, 087	B

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Reactor vessel internal components	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	Water Chemistry (B.2.3.2)	IV.B2.RP-24	3.1-1, 087	B
Reactor vessel internals components with a fatigue analysis	Structural Support	CASS	Reactor coolant and neutron flux	Cumulative fatigue damage	TLAA (Section 4.3)	IV.B2.RP-303	3.1-1, 003	A, 5
Reactor vessel internals components with a fatigue analysis	Structural Support	Stainless steel	Reactor coolant and neutron flux	Cumulative fatigue damage	TLAA (Section 4.3)	IV.B2.RP-303	3.1-1, 003	A, 5
Upper internals assembly: support ring	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-346	3.1-1, 053c	A
Upper internals assembly: support ring	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-346	3.1-1, 053c	B
Upper internals assembly: support ring	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	C
Upper internals assembly: support ring	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-288	3.1-1, 059c	C
Upper internals assembly: upper core plate	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-291b	3.1-1, 053b	A
Upper internals assembly: upper core plate	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-291b	3.1-1, 053b	B
Upper internals assembly: upper core plate	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290b	3.1-1, 059b	A

Table 3.1.2-2: Reactor Vessel Internals – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Upper internals assembly: upper core plate	Flow distribution	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290b	3.1-1, 059b	A
Upper internals assembly: upper core plate	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-291b	3.1-1, 053b	A
Upper internals assembly: upper core plate	Structural support	Stainless steel	Reactor coolant and neutron flux	Cracking	Water Chemistry (B.2.3.2)	IV.B2.RP-291b	3.1-1, 053b	B
Upper internals assembly: upper core plate	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290b	3.1-1, 059b	A
Upper internals assembly: upper core plate	Structural support	Stainless steel	Reactor coolant and neutron flux	Loss of material	PWR Vessel Internals (B.2.3.7)	IV.B2.RP-290b	3.1-1, 059b	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. The PWR Vessel Internals (B.2.3.7) Program manages change in dimension and loss of fracture toughness for stainless steel flux thimble tubes. Loss of preload is not applicable to flux thimble tubes, and loss of material is addressed by NUREG-1801 item IV.B2.RP-284. Flux thimble tubes are existing program components.

2. The annular thermal shields for both units have been replaced with neutron shielding panels.

3. There are three incore flux thimble tubes plugged in Unit 2. Flux thimble tube plugs are no additional measures components.

4. Denotes a new line item added by SLR-ISG-2021-01-PWRVI, not previously captured in NUREG-1801, including corresponding LR-ISGs, and NUREG-2191.

5. Core barrel, LCP, lower support column, lower support plate, and upper core plate have an existing fatigue analysis as described in Section 4.3.5.

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	C
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	IV.C2.R-12	3.1-1, 066	A
Bolting (Class 1)	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Bolting (Class 1)	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	C
Bolting (Class 1)	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	IV.C2.R-12	3.1-1, 066	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	IV.C2.RP-166	3.1-1, 064	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	IV.C2.R-12	3.1-1, 066	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Condensate pot	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Condensate pot	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-231	3.1-1, 034	C
Condensate pot	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-231	3.1-1, 034	D
Condensate pot	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Flow element	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Flow element	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Flow element	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B
Flow element	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Flow element	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Flow element	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element	Throttle	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Flow element	Throttle	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B
Flow element	Throttle	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Heat exchanger (motor air cooler) tubes	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C, 5
Heat exchanger (motor air cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	D, 5
Heat exchanger (RCP bearing oil cooler) channel head	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C, 5
Heat exchanger (RCP bearing oil cooler) channel head	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A, 5
Heat exchanger (RCP bearing oil cooler) channel head	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	IV.C2.RP-221	3.1-1, 089	D, 5

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (RCP bearing oil cooler) shell	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C, 5
Heat exchanger (RCP bearing oil cooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A, 5
Heat exchanger (RCP bearing oil cooler) shell	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	C, 5
Heat exchanger (RCP bearing oil cooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	IV.C2.RP-222	3.1-1, 090	D, 5
Heat exchanger (RCP bearing oil cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-76	3.2-1, 050	C, 5
Heat exchanger (RCP bearing oil cooler) tubesheet	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	IV.C2.RP-222	3.1-1, 090	D, 5

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (RCP bearing oil cooler) tubesheet	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-76	3.2-1, 050	C, 5
Heat exchanger (RCP thermal barrier) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C, 5
Heat exchanger (RCP thermal barrier) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	D, 5
Heat exchanger (RCP thermal barrier) coils	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	D, 5
Heat exchanger (RCP thermal barrier) coils	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D, 5 C
Heat exchanger (RCP thermal barrier) coils	Pressure boundary	Stainless steel	Treated borated water >140°F (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D, 5 C
Heat exchanger (RCP thermal barrier) shell	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	C, 5

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (RCP thermal barrier) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D, 5 C
Heat exchanger (RCP thermal barrier) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D, 5 C
Heat exchanger (RCP thermal barrier) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	D, 5
Heat exchanger (RCP thermal barrier) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D, 5 C
Heat exchanger (RCP thermal barrier) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D, 5 C
Moment restraint	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A, 12
Moment restraint	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A, 12

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Moment restraint	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A, 12
Moment restraint	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B, 12
Moment restraint	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A, 12
Moment restraint	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B, 12
Orifice (scoop)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-235	3.1-1, 039	A, 3
Orifice (scoop)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)	IV.C2.RP-235	3.1-1, 039	A, 3
Orifice (scoop)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-235	3.1-1, 039	B, 3
Orifice (scoop)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice (scoop)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Orifice (scoop)	Throttle	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-235	3.1-1, 039	A, 3
Orifice (scoop)	Throttle	Stainless steel	Reactor coolant (internal)	Cracking	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)	IV.C2.RP-235	3.1-1, 039	A, 3
Orifice (scoop)	Throttle	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-235	3.1-1, 039	B, 3
Orifice (scoop)	Throttle	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Orifice (scoop)	Throttle	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Piping	Leakage boundary (spatial)	Stainless steel	Gas (Internal)	None	None	IV.E.RP-07	3.1-1, 107	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2-RP-383	3.1-1, 080	D C
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D C
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	IV.E.RP-07	3.1-1, 107	A
Piping	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-231	3.1-1, 034	C
Piping	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-231	3.1-1, 034	D
Piping	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-231	3.1-1, 034	C
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-231	3.1-1, 034	D
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 11
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D C
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A, 2
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	IV.E.RP-04	3.1-1, 107	A, 2
Piping (Class 1 < 4" NPS)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-235	3.1-1, 039	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping (Class 1 < 4" NPS)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)	IV.C2.RP-235	3.1-1, 039	A
Piping (Class 1 < 4" NPS)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-235	3.1-1, 039	B
Piping (Class 1 < 4" NPS)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-235	3.1-1, 039	A
Piping (Class 1 < 4" NPS)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)	IV.C2.RP-235	3.1-1, 039	A
Piping (Class 1 < 4" NPS)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-235	3.1-1, 039	B
Piping (Class 1 < 4" NPS)	Pressure boundary	CASS	Reactor coolant (internal)	Reduction in fracture toughness	Thermal Embrittlement of CASS	IV.C2.R-52	3.1-1, 050	A
Piping (Class 1)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Piping (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Piping (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B
Piping (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Piping (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Piping (Class 1)	Pressure boundary	CASS	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Piping (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Piping (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.R-05	3.1-1, 020	B, 1 A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Piping (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Piping (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Reduction in fracture toughness	Thermal Embrittlement of CASS	IV.C2.R-52	3.1-1, 050	A
Piping (RCP oil-lift)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Piping (RCP oil-lift)	Leakage boundary (spatial)	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Piping (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Piping (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Piping (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping (vessel flange leak detection)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Piping (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.R-74	3.1-1, 019	E, 9
Piping (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.R-74	3.1-1, 019	E, 9
Piping (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-58	3.1-1, 040	A
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-58	3.1-1, 040	B
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-223	3.1-1, 009	A
Pressurizer	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer baffles	Direct flow	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	B A
Pressurizer baffles	Direct flow	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-03	3.1-1, 106	A
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-58	3.1-1, 040	A
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-156	3.1-1, 045	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.C2.RP-156	3.1-1, 045	A, 10
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-58	3.1-1, 040	B
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-156	3.1-1, 045	B
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-223	3.1-1, 009	A
Pressurizer DMW (SWOL)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-58	3.1-1, 040	A
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-58	3.1-1, 040	B
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-223	3.1-1, 009	A
Pressurizer manway/insert	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer manway/insert	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-379	3.1-1, 048	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.C2.RP-379	3.1-1, 048	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-223	3.1-1, 009	A
Pressurizer nozzle (surge/spray)	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer safe end	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Pressurizer safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-30	3.1-1, 033	A
Pressurizer safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Pressurizer safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-30	3.1-1, 033	B
Pressurizer safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-223	3.1-1, 009	A
Pressurizer safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer screen/basket	Filter	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	B A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressurizer screen/basket	Filter	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer spray head	Spray	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-41	3.1-1, 081	B A
Pressurizer spray head	Spray	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pressurizer thermal sleeve	Withstand thermal stresses	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-41	3.1-1, 081	B, 4 A
Pressurizer thermal sleeve	Withstand thermal stresses	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B, 4
Pump casing (RCP oil integral viscosity)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Pump casing (RCP oil integral viscosity)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Pump casing (RCP oil integral viscosity)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Pump casing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Pump casing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A
Pump casing (RCP)	Pressure boundary	CASS	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Pump casing (RCP)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-09	3.1-1, 033	A
Pump casing (RCP)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Pump casing (RCP)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-09	3.1-1, 033	B

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (RCP)	Pressure boundary	CASS	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Pump casing (RCP)	Pressure boundary	CASS	Reactor coolant (internal)	Reduction in fracture toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2-R-08	3.1-1, 038	A
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-09	3.1-1, 033	A
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-09	3.1-1, 033	B
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Pump casing (RCP) forging	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump seal housing (RCP)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Pump seal housing (RCP)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Rupture disc	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Rupture disc	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D C
Tank (pressurizer relief)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Tank (pressurizer relief)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D, 8 C
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)	Elastomer	Air - indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	C, 6
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)	Elastomer	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	C, 6

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)	Elastomer	Lubricating oil (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 7
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Tank (RCP oil-lift pot/reservoir)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A
Thermowell	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Thermowell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Thermowell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Thermowell	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D C

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Trap	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Trap	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Trap	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D C
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D C
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Tubing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.RP-383	3.1-1, 080	D C
Tubing (RCP oil-lift)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Tubing (RCP oil-lift)	Leakage boundary (spatial)	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Tubing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Tubing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.C2.RP-167	3.1-1, 049	A
Tubing (RCP oil-lift)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2-RP-383	3.1-1, 080	D C
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D C
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Valve body	Pressure boundary	Stainless steel	Gas (Internal)	None	None	IV.E.RP-07	3.1-1, 107	A
Valve body	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-231	3.1-1, 034	C
Valve body	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-231	3.1-1, 034	D
Valve body	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.RP-231	3.1-1, 034	C
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.RP-231	3.1-1, 034	D
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.C.EP-63	3.2-1, 018	D C
Valve body (Class 1)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Valve body (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-09	3.1-1, 033	A
Valve body (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation

Component Type	Intended Function (IF)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.C2.R-09	3.1-1, 033	B
Valve body (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Valve body (Class 1)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Valve body (Class 1)	Pressure boundary	CASS	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Valve body (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2.R-56	3.1-1, 035	A
Valve body (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.C2.R-05	3.1-1, 020	B, 1 A
Valve body (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Valve body (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Valve body (Class 1)	Pressure boundary	CASS	Reactor coolant (internal)	Reduction in fracture toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.C2-R-08	3.1-1, 038	A

Table 3.1.2-3: Reactor Coolant System and Attached Piping – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body (vessel flange leak detection)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Valve body (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.A2.R-74	3.1-1, 019	E, 9
Valve body (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.A2.R-74	3.1-1, 019	E, 9
Valve body (vessel flange leak detection)	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.A2.RP-28	3.1-1, 088	D

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG 1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 for material, environment, and aging effect but a different AMP is credited.

H. Neither the component nor the material and environment combination are evaluated in NUREG-1801.

Plant-Specific Notes

1. Per Section 3.1.2.2.6.2, the One-Time Inspection will include detection of cracking for CASS exposed to reactor coolant and will be based on screening for carbon and ferrite content.
2. Piping downstream of closed isolation valves are empty during normal operation and contain the same internal and external environment.
3. Orifices/scoops for transition from Class 1 to Class 2 include small-bore socket welds.
4. Thermal sleeves are inserted in the Pressurizer spray and surge line nozzles per FSAR Sections 5.4.10.2.2 and 5.4.3.4.
5. With natural circulation considerations, RCPs are not required for accident mitigation; therefore, RCP coolers are subject to AMR as part of the CCW pressure boundary (tubes/coils, tube sheets and channel heads) or as a leakage boundary (shells).
6. Each RCP oil system includes an elastomer seal on the upper oil reservoir and on the lower oil reservoir.
7. Though not in NUREG-1801 Rev 2, OE reflected in NUREG-2191 item VII.H2.A-677 indicates that elastomer degradation could conservatively occur with prolonged exposure to lubricating oil.
8. PRT temperature is limited to no greater than 113ºF by standard operating procedure; therefore, the relief tank is not susceptible to SCC.
9. Cracking of the vessel flange leak detection components is managed by the ASME Section XI Inservice Inspections, Subsection IWB, IWC, and IWD (B.2.3.1) AMP and Water Chemistry (B.2.3.2) AMP.
10. SWOL of the Alloy 82/182 (600) with Alloy 52/52M (690) has been performed for both the Unit 1 and 2 pressurizer surge line, spray line, PORV line, and the three safety relief lines, at the DMWs between the nozzles and piping. As such, the Alloy 690 SWOLs serve as the pressure boundary and the base Alloy 600 weld is removed from the scope of LR.
11. Pressurizer safety and relief valve inlet line piping has an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4.
12. Structural support functions of Class 1 moment restraints are managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP and evaluated in Table 3.5.2-1.

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anti-vibration bars (Unit 1)	Structural integrity (attached)	Stainless steel	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	B
Anti-vibration bars (Unit 1)	Structural integrity (attached)	Stainless steel	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	B
Anti-vibration bars (Unit 1)	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-225	3.1-1, 076	B
Anti-vibration bars (Unit 1)	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	B
Anti-vibration bars (Unit 1)	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	B
Anti-vibration bars (Unit 2)	Structural integrity (attached)	Nickel alloy	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	B
Anti-vibration bars (Unit 2)	Structural integrity (attached)	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	B
Anti-vibration bars (Unit 2)	Structural integrity (attached)	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-225	3.1-1, 076	B
Anti-vibration bars (Unit 2)	Structural integrity (attached)	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	B
Anti-vibration bars (Unit 2)	Structural integrity (attached)	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	B
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Auxiliary feedwater internal discharge pipe	Direct flow	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	IV.C2.RP-166	3.1-1, 064	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	IV.D1.RP-46	3.1-1, 067	A
Bolting (Class 1)	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A
Bolting (Secondary side)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting (Secondary side)	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting (Secondary side)	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.R-436a	3.1-1, 127a	B
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Channel head	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.R-436a	3.1-1, 127a	B
Channel head divider plate	Direct flow	Nickel alloy	Reactor coolant (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-367	3.1-1, 025	B
Channel head divider plate	Direct flow	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-367	3.1-1, 025	B
Channel head divider plate	Direct flow	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Feedwater and auxiliary feedwater inlet nozzle	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Feedwater and auxiliary feedwater inlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-33	3.1-1, 005	A
Feedwater and auxiliary feedwater inlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-368	3.1-1, 012	C
Feedwater and auxiliary feedwater inlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-368	3.1-1, 012	D
Feedwater and auxiliary feedwater inlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	IV.D1.R-37	3.1-1, 061	B
Feedwater and auxiliary feedwater inlet nozzle dissimilar metal weld	Pressure boundary	Nickel alloy	Air - indoor uncontrolled (external)	None	None	IV.E.RP-378	3.1-1, 106	A
Feedwater and auxiliary feedwater inlet nozzle dissimilar metal weld	Pressure boundary	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Feedwater and auxiliary feedwater inlet nozzle dissimilar metal weld	Pressure boundary	Nickel alloy	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-46	3.1-1, 002	C

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Feedwater and auxiliary feedwater inlet nozzle dissimilar metal weld	Pressure boundary	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Feedwater and auxiliary feedwater inlet nozzle thermal sleeve	Withstand thermal stresses	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Feedwater and auxiliary feedwater inlet nozzle thermal sleeve	Withstand thermal stresses	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Feedwater and auxiliary feedwater inlet nozzle thermal sleeve	Withstand thermal stresses	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Feedwater and auxiliary feedwater inlet nozzle thermal sleeve	Withstand thermal stresses	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Feedwater distribution ring (Unit 1 only)	Direct flow	Carbon steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Feedwater distribution ring (Unit 1 only)	Direct flow	Carbon steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Feedwater distribution ring (Unit 1 only)	Direct flow	Carbon steel	Treated water (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Feedwater distribution ring (Unit 1 only)	Direct flow	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Feedwater inlet nozzle flow restrictor (Unit 2 only)	Throttle	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Feedwater inlet nozzle flow restrictor (Unit 2 only)	Throttle	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Feedwater inlet nozzle flow restrictor (Unit 2 only)	Throttle	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Feedwater inlet nozzle flow restrictor (Unit 2 only)	Throttle	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Feedwater spray nozzle (Unit 1 only)	Direct flow	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Lower shell, cone, and upper shell/head	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Lower shell, cone, and upper shell/head	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-33	3.1-1, 005	A
Lower shell, cone, and upper shell/head	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-368	3.1-1, 012	A
Lower shell, cone, and upper shell/head	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-368	3.1-1, 012	B
Main steam outlet nozzle	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Main steam outlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-33	3.1-1, 005	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Main steam outlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-368	3.1-1, 012	C
Main steam outlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-368	3.1-1, 012	D
Main steam outlet nozzle	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	IV.D1.R-37	3.1-1, 061	B
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-46	3.1-1, 002	C
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D2.R-36	3.1-1, 078	D C
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-46	3.1-1, 002	C

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice (steam outlet flow restrictor)	Throttle	Nickel alloy	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-157	3.4-1, 016	D C
Preheater assembly (Unit 2 only)	Direct flow	Stainless steel	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	D
Preheater assembly (Unit 2 only)	Direct flow	Stainless steel	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	D
Preheater assembly (Unit 2 only)	Direct flow	Stainless steel	Treated water (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 005	C
Preheater assembly (Unit 2 only)	Direct flow	Stainless steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Preheater assembly (Unit 2 only)	Direct flow	Stainless steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Primary drain and plug	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A
Primary drain and plug	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A
Primary drain and plug	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Primary drain and plug	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Primary drain and plug	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Primary inlet and outlet closure ring	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-36	3.1-1, 045	A
Primary inlet and outlet closure ring	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)	IV.D1.RP-36	3.1-1, 045	A
Primary inlet and outlet closure ring	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-36	3.1-1, 045	B
Primary inlet and outlet closure ring	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A
Primary inlet and outlet closure ring	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Primary inlet and outlet nozzle	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Primary inlet and outlet nozzle	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Primary inlet and outlet nozzle	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Primary inlet and outlet nozzle	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A
Primary inlet and outlet nozzle	Pressure boundary	Carbon steel with stainless steel cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-378	3.1-1, 107	A
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A
Primary inlet and outlet nozzle dissimilar metal weld	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Primary inlet and outlet nozzle safe end	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	IV.E.RP-04	3.1-1, 107	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Primary inlet and outlet nozzle safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A
Primary inlet and outlet nozzle safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Primary inlet and outlet nozzle safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A
Primary inlet and outlet nozzle safe end	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	B
Primary manway insert plate and cover	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	A
Primary manway insert plate and cover	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Primary manway insert plate and cover	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D1.RP-232	3.1-1, 033	A
Primary manway insert plate and cover	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-232	3.1-1, 033	B
Primary manway insert plate and cover	Pressure boundary	Stainless steel	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Primary manway insert plate and cover	Pressure boundary	Stainless steel	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D
Secondary inspection port, instrument tap, sample tap, blowdown tap, and drain tap	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1
Secondary inspection port, instrument tap, sample tap, blowdown tap, and drain tap	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-33	3.1-1, 005	A
Secondary inspection port, instrument tap, sample tap, blowdown tap, and drain tap	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D1.RP-372	3.1-1, 083	D C
Secondary manway and handhole cover	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.C2.R-18	3.1-1, 005	C
Secondary manway and handhole cover	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	IV.D2.R-31	3.1-1, 044	A
Secondary manway and handhole cover	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	IV.D1.R-17	3.1-1, 049	A, 1

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Secondary manway and handhole cover	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-33	3.1-1, 005	A
Secondary manway and handhole cover	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	IV.D1.RP-372	3.1-1, 083	D C
Steam separator assembly	Direct flow	Carbon steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-161	3.1-1, 072	D
Steam separator assembly	Direct flow	Carbon steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-161	3.1-1, 072	D
Steam separator assembly	Direct flow	Carbon steel	Treated water (external)	Wall thinning	Steam Generators (B.2.3.10)	IV.D1.RP-49	3.1-1, 074	B
Steam separator assembly	Direct flow	Carbon steel	Treated water (external)	Wall thinning	Water Chemistry (B.2.3.2)	IV.D1.RP-49	3.1-1, 074	B
Steam separator assembly	Direct flow	Carbon steel	Treated water (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-161	3.1-1, 072	D
Steam separator assembly	Direct flow	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-161	3.1-1, 072	D
Steam separator assembly	Direct flow	Carbon steel	Treated water (internal)	Wall thinning	Steam Generators (B.2.3.10)	IV.D1.RP-49	3.1-1, 074	B
Steam separator assembly	Direct flow	Carbon steel	Treated water (internal)	Wall thinning	Water Chemistry (B.2.3.2)	IV.D1.RP-49	3.1-1, 074	B
Tube plug	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.R-40	3.1-1, 070	B
Tube plug	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.R-40	3.1-1, 070	B
Tube plug	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D
Tube support plate	Structural integrity (attached)	Stainless steel	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-384	3.1-1, 071	B

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tube support plate	Structural integrity (attached)	Stainless steel	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-384	3.1-1, 071	B
Tube support plate	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-225	3.1-1, 076	B
Tube support plate	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	B
Tube support plate	Structural integrity (attached)	Stainless steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	B
Tube wrapper	Direct flow	Carbon steel	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-161	3.1-1, 072	B
Tube wrapper	Direct flow	Carbon steel	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-161	3.1-1, 072	B
Tubes	Heat transfer	Nickel alloy	Treated water (external)	Reduction of heat transfer	Steam Generators (B.2.3.10)	None	None	H, 2
Tubes	Heat transfer	Nickel alloy	Treated water (external)	Reduction of heat transfer	Water Chemistry (B.2.3.2)	None	None	H, 2
Tubes	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.R-44	3.1-1, 070	B
Tubes	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.R-44	3.1-1, 070	B
Tubes	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-46	3.1-1, 002	A
Tubes	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.R-47	3.1-1, 069	B
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Cracking	Steam Generators (B.2.3.10)	IV.D1.R-48	3.1-1, 069	B
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.R-47	3.1-1, 069	B
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.R-48	3.1-1, 069	B

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-226	3.1-1, 071	D
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-233	3.1-1, 077	B
Tubes	Pressure boundary	Nickel alloy	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-226	3.1-1, 071	D
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.R-44	3.1-1, 070	D
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.R-44	3.1-1, 070	D
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	C
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.R-436a	3.1-1, 127a	B
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.R-436a	3.1-1, 127a	B
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Treated water (external)	Loss of material	Steam Generators (B.2.3.10)	IV.D1.RP-161	3.1-1, 072	D
Tubesheet	Pressure boundary	Carbon steel with nickel alloy cladding	Treated water (external)	Loss of material	Water Chemistry (B.2.3.2)	IV.D1.RP-161	3.1-1, 072	D
Tube-to-tubesheet weld (Unit 1 only)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Steam Generators (B.2.3.10)	IV.D1.RP-385	3.1-1, 025	B, 3
Tube-to-tubesheet weld (Unit 1 only)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cracking	Water Chemistry (B.2.3.2)	IV.D1.RP-385	3.1-1, 025	B, 3

Table 3.1.2-4: Steam Generators – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tube-to-tubesheet weld (Unit 1 only)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	IV.D1.R-221	3.1-1, 008	A, 3
Tube-to-tubesheet weld (Unit 1 only)	Pressure boundary	Nickel alloy	Reactor coolant (internal)	Loss of material	Water Chemistry (B.2.3.2)	IV.C2.RP-23	3.1-1, 088	D, 3

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG 1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 for material, environment, and aging effect but a different AMP is credited.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. The carbon steel components of the SGs, including the shell, nozzles, taps, and manways, have an external temperature greater than 212°F and are at a higher temperature than the air-indoor uncontrolled and air with borated water leakage environment. Therefore, condensation and moisture accumulation will not occur and loss of material due to general, pitting, and crevice corrosion does not apply.

2. The aging effect and mechanism of reduction of heat transfer due to fouling is not in NUREG-1801 for this component, material, and environment; however, it is applicable to this combination. Based on OE reflected in NUREG-2191 (IV.D1.R-407), the Water Chemistry (B.2.3.2) AMP and Steam Generators (B.2.3.10) AMP are used to manage the aging effects for this component, material, and environment combination.

3. Unit 2 SG tube-to-tubesheet welds are not required to maintain the RCPB as per permanent alternate repair criterion H* (Reference ML12263A036).

3.2. AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1. Introduction

This section provides the results of the AMR for those components identified in Section 2.3.2, "Engineered Safety Features", as being subject to AMR. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Combustible Gas Control System (2.3.2.1)
- Containment Isolation System (2.3.2.2)
- Containment Spray System (2.3.2.3)
- Residual Heat Removal System (2.3.2.4)
- Safety Injection System (2.3.2.5)

Note – Habitability and filtration engineered safety features are addressed in Section 3.3.2 with other auxiliary plant ventilation systems.

3.2.2. Results

The following tables summarize the results of the AMR for ESF Systems.

Table 3.2.2-1: Combustible Gas Control System - Summary of Aging Management Evaluation

Table 3.2.2-2: Containment Isolation System - Summary of Aging Management Evaluation

Table 3.2.2-3: Containment Spray System - Summary of Aging Management Evaluation

Table 3.2.2-4: Residual Heat Removal System - Summary of Aging Management Evaluation[1]

Table 3.2.2-5: Safety Injection System - Summary of Aging Management Evaluation[2]

[1] See Table 3.1.2-3 for portions of the RHRS included in the RCPB (ASME Class 1).
[2] See Table 3.1.2-3 for portions of the SIS included in the RCPB (ASME Class 1).

3.2.2.1. Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.2.2.1.1. Combustible Gas Control System

Materials

The materials of construction for the CGCS components are:

- Carbon steel
- Stainless steel

Environments

The CGCS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects associated with the CGCS require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the CGCS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

3.2.2.1.2. Containment Isolation System

Materials

The materials of construction for the CIS components are:

- Carbon steel
- Stainless steel

Environments

The CIS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Lubricating oil

Aging Effects Requiring Management

The following aging effects associated with the CIS require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the CIS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)

3.2.2.1.3. Containment Spray System

Materials

The materials of construction for the CSS components are:

- Carbon steel
- Stainless steel

Environments

The CSS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air - outdoor
- Air with borated water leakage
- Closed-cycle cooling water
- Concrete
- Gas
- Lubricating oil
- Raw water
- Treated borated water

Aging Effects Requiring Management

The following aging effects associated with the CSS require management:

- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the CSS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Open-Cycle Cooling Water System (B.2.3.11)
- Water Chemistry (B.2.3.2)

3.2.2.1.4. Residual Heat Removal System

Materials

The materials of construction for the RHRS components are:

- Carbon steel
- Stainless steel

Environments

The RHRS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Treated borated water
- Treated borated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the RHRS require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the RHRS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.2.2.1.5. Safety Injection System

Materials

The materials of construction for the SIS components are:

- Carbon steel
- Carbon steel with internal coating/lining
- Carbon steel with stainless steel cladding
- Copper alloy
- Gray cast iron
- Stainless steel

Environments

The SIS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Gas
- Lubricating oil
- Raw water
- Treated borated water
- Treated borated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the SIS require management:

- Cracking
- Cumulative fatigue damage
- Loss of coating or lining integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the SIS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Open-Cycle Cooling Water System (B.2.3.11)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.2.2.2. AMR Results for Which Further Evaluation is Recommended by the GALL Report

The AMR summaries for the CPNPP ESF provides the basis for Section 3.2.2.2 and are compiled from Section 3.2.2.1. NUREG-1801 provides the basis for identifying those programs that warrant FE by the reviewer in the LRA. For the ESF, those programs are addressed in the following subsections.

Note - *Italicized* text is taken directly from NUREG-1800 as supplemented by LR-ISG-2011-05 and LR-ISG-2012-02.

3.2.2.2.1. Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of this SRP-LR.

Where identified as an AERM, as summarized in item 3.2-1, 001, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA for RHR, SI, and (non-ASME Class 1) reactor coolant piping is addressed in Section 4.3.3.

3.2.2.2.2. Loss of Material due to Cladding Breach

Loss of material due to cladding breach could occur for PWR steel pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references NRC Information Notice 94-63, Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks, and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

There are no steel pump casings with stainless steel cladding in the ESF Systems at CPNPP. Pump casings are stainless steel as summarized in item 3.2-1, 002.

3.2.2.2.3. Loss of Material due to Pitting and Crevice Corrosion

1. *Loss of material due to pitting and crevice corrosion could occur in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated because moisture and water can egress under the tank if the perimeter seal is degraded. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).*

As summarized in item 3.2-1, 003, there are no partially encased tanks exposed to weathering in the ESF Systems at CPNPP. Other than the RWST, tanks and valve isolation tanks (associated with containment sump recirculation components) are located indoors and sheltered from the weather. As listed in Section 2.3.2.3 and described in Section 2.4.11, the RWST for each unit is a missile-protected, Seismic Category I concrete structure with an internal lining that is fully encased and sheltered from the weather.

2. *Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.*

   GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an aging management program is needed to manage this aging effect based on the environmental conditions applicable to the plant and requirements applicable to the components.

Located in Somervell County in North Central Texas, CPNPP is about 65 miles southwest of the Dallas-Fort Worth Metropolitan Area. In addition, the Squaw Creek Reservoir (SCR), built for station cooling, extends northward into Hood County. The site is situated along Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. The station site is over 30 miles southwest of the nearest portion of Fort Worth and approximately 4.5 miles north-northwest of Glen

Rose, the nearest community. Hood and Somervell counties are essentially rural, sparsely populated areas. The sparsely settled rural character extends well beyond the 10-mile radius. The area extending from 10 to 20 miles out from the CPNPP site is even more sparsely populated than the 0 to 10-mile area. As such, CPNPP is located inland in a rural area and away from potentially chloride heavy coastal environments or sulfate heavy industrial environments. As confirmed by OE, samples of groundwater and rainwater show chloride and sulfate concentrations less than 500 parts per million (ppm) and 1,500 PPM, respectively, with adequate pH. Furthermore, the CPNPP does not incorporate cooling towers. Also, the closest highway is U.S. Highway 67 that passes through Glen Rose (as shown on google/maps) and the use of salt/ash to de-ice roadways is a rare occurrence in the moderate north-central Texas environs.

As such, the general ambient outdoor and indoor air is considered to be benign, non-aggressive lacking sufficient halides for corrosion of stainless steel.

Therefore, stainless steel components exposed to air environments (including condensation) in the ESF Systems are not susceptible to loss of material and do not require management.

As summarized in item 3.2-1, 004, there are select instances where corrosion of stainless steel in air is considered possible and managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. A plant-specific note is used for these instances.

3.2.2.2.4. Loss of Material due to Erosion

Loss of material due to erosion could occur in the stainless steel high-pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. The GALL Report recommends a plant-specific AMP be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. The GALL Report references Licensee Event Report (LER) 50- 275/94-023 for evidence of erosion. Further evaluation is recommended to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).

As summarized in item 3.2-1, 005, CPNPP will implement a One-Time Inspection (B.2.3.19) AMP to verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage the loss of material due to erosion in stainless steel SI and CCP minimum flow recirculation orifices exposed to treated borated water in the SIS and CVCS. CPNPP will perform a one-time inspection of one orifice on each unit associated with the CCP minimum flow recirculation orifice (which are considered bounding because of the frequency of operation of the CCPs compared with the SI pumps) prior to entering the PEO.

3.2.2.2.5. Loss of Material due to General Corrosion and Fouling that Leads to Corrosion

Loss of material due to general corrosion and fouling that leads to corrosion can occur for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air -indoor uncontrolled. This could result in *plugging of the spray nozzles and flow orifices. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted, even though the majority of the time this system is on standby. The wetting and drying of these components can accelerate corrosion and fouling. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this SRP-LR).*

This paragraph in NUREG-1800 applies to BWRs only.

3.2.2.2.6. Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an aging management program is needed to manage this aging effect based on the environmental conditions applicable to the plant and requirements applicable to the components.

The outdoor environment at CPNPP is described in Section 3.2.2.2.3, item 2 above. As described there, the outdoor air does not contain sufficient halides for degradation of stainless steel components in air. A review of CPNPP OE and evaluation of the location and surroundings of the plant have determined that the air at CPNPP does not contain sufficient halides nor are there events that would likely increase the halide content in the air to make SCC an AERM. As such, and as summarized in item 3.2-1, 006, stainless steel components exposed to air environments (including condensation) in the ESF Systems are not susceptible to cracking and do not require management for SCC. The RWSTs are outdoor reinforced concrete tanks with stainless steel liners as described in Section 2.4.11.

3.2.2.2.7. Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2 of this SRP-LR.)

QA provisions applicable to LR are discussed in Section B.1.3.

3.2.2.2.8. Ongoing Review of Operating Experience (per LR-ISG-2011-05)

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

The OE process and acceptance criteria are described in Section B.1.4.

3.2.2.2.9. Loss of Material due to Recurring Internal Corrosion (per LR-ISG-2012-02)

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or more sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.

The CPNPP corrective action program (CAP) tracks and trends recurring issues, extent of condition (EOC), and includes recommendations to prevent recurrence, where appropriate. None of the ESF Systems have demonstrated corrosion that meets the criteria to be considered recurring internal corrosion (RIC). Therefore, as summarized in item 3.2-1, 066, RIC is not an applicable aging effect for metals in CPNPP ESF Systems containing raw water. The only ESF components containing raw water are the tube-side components of the SI pump bearing and lubrication oil coolers. As such, credited AMPs, such as Fire Water, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, and Open Cycle Cooling Water, do not require enhancements to address RIC in ESF Systems.

3.2.2.3. Time-Limited Aging Analysis

The TLAAs identified below are associated with the ESF:

- Section 4.3, “Metal Fatigue”
- Section 4.4, “Environmental Qualification of Electrical Equipment”

3.2.3. Conclusion

The ESF System piping, fittings, and components that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the ESF System components are identified in the summaries in Section 3.2.2.1 above.

A description of these AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the PEO.

Therefore, based on the conclusions provided in Appendix B, the effects of aging associated with the ESF components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the PEO.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 001	Stainless steel, Steel Piping, piping components, and piping elements exposed to Treated water (borated)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA (See SRP subsection 3.2.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect assessed by a fatigue TLAA (Section 4.3). Further evaluation is documented in subsection 3.2.2.2.1.
3.2-1, 002	Steel (with stainless steel cladding) Pump casings exposed to Treated water (borated)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated Reference NRC IN 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses clad breach (See SRP subsection 3.2.2.2.2)	Not applicable. There are no pump casings with stainless steel cladding in the ESF Systems. As listed in Tables 3.2.2-3, 3.2.2-4, and 3.2.2-5 ESF pumps exposed to treated borated water are stainless steel.
3.2-1, 003	Stainless steel Partially-encased tanks with breached moisture barrier exposed to Raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottom because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant-specific (See SRP subsection 3.2.2.2.3.1)	Not applicable. There are no partially encased tanks with breached moisture barriers in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 004	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See SRP subsection 3.2.2.2.3.2)	Consistent with NUREG-1801. Loss of material for stainless steel vents and top of the liner inside the concrete RWST is exposed to outdoor air through tank vents and contaminants may collect. Loss of material for the containment spray components is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. A plant-specific note is used. In general, air at CPNPP does not contain sufficient halides to make loss of material due to pitting and crevice corrosion a concern. Further evaluation is documented in subsection 3.2.2.2.3, item 2.
3.2-1, 005	Stainless steel Orifice (miniflow recirculation) exposed to Treated water (borated)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. See LER 50-275/94-023 for evidence of erosion.	Yes, plant-specific (See SRP subsection 3.2.2.2.4)	Consistent with NUREG-1801. Loss of material of the stainless steel orifice (mini-flow recirculation) exposed to treated borated water in the SIS is managed by the One-Time Inspection (B.2.3.19) AMP. Further evaluation is documented in subsection 3.2.2.2.4.
3.2-1, 006	Not applicable. This line item only applies to BWRs.				

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 007	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See SRP subsection 3.2.2.2.6)	Not applicable. Air does not contain sufficient halides to make SCC a concern. Further evaluation is documented in subsection 3.2.2.2.6.
3.2-1, 008	Aluminum, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No	Not applicable. There are no aluminum or copper alloy (>15% Zn or >8% Al) ESF components exposed to air with borated water leakage.
3.2-1, 009	Steel External surfaces, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-1801. Loss of material of steel external surfaces and bolting exposed to air with borated water leakage in the ESF Systems is managed by the Boric Acid Corrosion (B.2.3.4) AMP.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 010	Cast austenitic stainless steel Piping, piping components, and piping elements exposed to Treated water (borated) >250°C (>482°F), Treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel"	No	Not applicable. There are no CASS components exposed to treated water (borated) >250°C (>482°F) or treated water >250°C (>482°F) in the ESF Systems.
3.2-1, 011	Not applicable. This line item only applies to BWRs.				
3.2-1, 012	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Not applicable. There is no high-strength steel closure bolting in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 013	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material of steel and stainless steel bolting and closure bolting exposed to air – indoor, uncontrolled (external) in the ESF Systems is managed by the Bolting Integrity (B.2.3.9) AMP. Loss of material of stainless steel bolting and closure bolting exposed to air – indoor, uncontrolled (external) in the RCS and attached piping is managed by the Bolting Integrity (B.2.3.9) AMP. There are no steel or stainless steel bolting or closure bolting exposed to air – outdoor (external) in the ESF Systems.
3.2-1, 014	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	Not used. As stated in item 3.2-1, 013, loss of material of steel bolting exposed to air in the ESF Systems is managed by the Bolting Integrity (B.2.3.9) AMP. However, steam or water leakage is not considered as a separate aspect of the indoor air environment.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 015	Copper alloy, Nickel alloy, Steel; stainless steel, Stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water, Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload of steel and stainless steel bolting in the ESF Systems is managed by the Bolting Integrity (B.2.3.9) AMP. There are no copper alloy or nickel alloy bolting in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 016	Steel Containment isolation piping and components (Internal surfaces), Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not used. Loss of material of steel containment isolation components (piping and valve bodies) exposed to treated water is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. However, steel containment isolation components exposed to treated water are evaluated as part of their respective auxiliary or steam and power conversion systems and compared to items 3.4-1, 013 and 3.4-1, 014.
3.2-1, 017	Not applicable. This line item only applies to BWRs.				

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 018	Stainless steel Containment isolation piping and components (Internal surfaces) exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel containment isolation components (piping and valve bodies) exposed to treated water in the non-ASME Class 1 portion of the RCS, as well as for other components inside containment, is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Other stainless steel containment isolation components (piping and valve bodies) exposed to treated water are evaluated as part of their respective auxiliary or steam and power conversion systems and compared to item 3.4-1, 016.
3.2-1, 019	Stainless steel Heat exchanger tubes exposed to Treated water, Treated water (borated)	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2011-01. Reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water and treated borated water in the ESF Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage reduction of heat transfer.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 020	Stainless steel Piping, piping components, and piping elements; tanks exposed to Treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry" and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2011-01. Cracking of stainless steel components exposed to treated borated water >140°F in the ESF Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking.
3.2-1, 021	Steel (with stainless steel or nickel-alloy cladding) Safety injection tank (accumulator) exposed to Treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry" and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. The CPNPP SI accumulators are maintained at containment ambient conditions (<140°F).

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 022	Stainless steel Piping, piping components, and piping elements; tanks exposed to Treated water (borated)	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2011-01. Loss of material of stainless steel components exposed to treated borated water in the ESF Systems, as well as RCS components that are not ASME Class 1, is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material.
3.2-1, 023	Steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no steel heat exchangers in the ESF Systems exposed to raw water.
3.2-1, 024	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no stainless steel piping, piping components, and piping elements exposed to raw water in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 025	Stainless steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Loss of material of stainless steel heat exchanger components exposed to raw water in the ESF Systems is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP.
3.2-1, 026	Not applicable. This line item only applies to BWRs.				
3.2-1, 027	Stainless steel, Steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Reduction of heat transfer of stainless steel heat exchanger (pump bearing oil cooler) tubes exposed to raw water in the CSS is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP.
3.2-1, 028	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F) in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 029	Steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no steel piping, piping components, and piping elements exposed to closed-cycle cooling water in the ESF Systems.
3.2-1, 030	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of steel heat exchanger components exposed to closed-cycle cooling water in the ESF Systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801.
3.2-1, 031	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel heat exchanger components exposed to closed-cycle cooling water in the ESF Systems, as well as RCP thermal barrier heat exchanger components in the RCS, is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. There are no stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 032	Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no copper alloy heat exchanger components, piping, piping components, and piping elements exposed to closed-cycle cooling water in the ESF Systems.
3.2-1, 033	Copper alloy, Stainless steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Reduction of heat transfer of stainless steel heat exchanger tubes exposed to closed-cycle cooling water in the ESF Systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. There are no copper alloy heat exchanger tubes exposed to closed cycle cooling water in the ESF Systems.
3.2-1, 034	Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Not applicable. There are no copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements, heat exchanger components exposed to closed-cycle cooling water in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 035	Gray cast iron Motor cooler exposed to Treated water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Not applicable. There are no gray cast iron motor coolers exposed to treated water in the ESF Systems.
3.2-1, 036	Gray cast iron Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Not applicable. There are no gray cast iron piping, piping components, and piping elements exposed to closed-cycle cooling water in the ESF Systems.
3.2-1, 037	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Not applicable. There are no gray cast iron piping, piping components, and piping elements exposed to soil in the ESF Systems.
3.2-1, 038	Not applicable. This line item only applies to BWRs.				

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 039	Steel Containment isolation piping and components (External surfaces) exposed to Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not used. As stated in item 3.2-1, 040, loss of material of containment isolation piping and piping components (External surfaces) exposed to air in the ESF Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Furthermore, steel containment isolation piping and components exposed to condensation are evaluated as part of the Auxiliary System to which they are assigned and compared to a different NUREG-1801 item, such as 3.3-1, 132.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 040	Steel Ducting, piping, and components (External surfaces), Ducting, closure bolting, Containment isolation piping and components (External surfaces) exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material of steel ducting, piping, and components (external surfaces), ducting, containment isolation piping and piping components (external surfaces) exposed to air – indoor, uncontrolled (external) in the ESF Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Loss of material of steel piping and piping components (external surfaces) exposed to air – indoor, uncontrolled (external) in the non-ASME Class 1 portion of the RCS is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Loss of material for steel closure bolting exposed to air – indoor, uncontrolled (external) in the ESF Systems is addressed by item 3.2-1, 013.
3.2-1, 041	Steel External surfaces exposed to Air – outdoor (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no steel surfaces exposed to air – outdoor (external) in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 042	Aluminum Piping, piping components, and piping elements exposed to Air -outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no aluminum piping, piping components, and piping elements exposed to air – outdoor (external) in the ESF Systems.
3.2-1, 043	Not applicable. This line item only applies to BWRs.				
3.2-1, 044	Steel Piping and components (Internal surfaces), Ducting and components (Internal surfaces) exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material of steel piping and piping components (internal surfaces) exposed to air – indoor, uncontrolled (internal) in the ESF Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Loss of material of steel piping and piping components (internal surfaces) and ducting and components (internal surfaces) exposed to air – indoor, uncontrolled (internal) in the Containment Ventilation, Control Room Ventilation Systems, Miscellaneous Ventilation Systems, Primary Plant Ventilation Systems, SSW, CCW System, Compressed Air and Gas Systems, EDG and Auxiliary Systems, Ventilation Chilled Water Systems, and AFWS is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 045	Steel Encapsulation components exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not used. The encapsulation (valve isolation) components exposed to air – indoor, uncontrolled (internal) in the ESF Systems are stainless steel and addressed in item 3.2-1, 063. A plant-specific note is used. Loss of material for the steel recirculation sump effluent guard pipe exposed to air – indoor uncontrolled (internal), which with the valve isolation components encapsulates ESF recirculation piping and valves, is addressed in item 3.5-1, 077. A plant-specific note is used.
3.2-1, 046	Not applicable. This line item only applies to BWRs.				
3.2-1, 047	Steel Encapsulation components exposed to Air with borated water leakage (Internal)	Loss of material due to general, pitting, crevice, and boric acid corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. There are no steel encapsulation components exposed to air – indoor, uncontrolled (internal) in the ESF Systems. Steel recirculation sump effluent guard are not exposed internally to borated water leakage during normal operation.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 048	Stainless steel Piping, piping components, and piping elements (Internal surfaces); tanks exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. There are no stainless steel piping, piping components, and piping elements (internal surfaces); tanks exposed to condensation (internal) in the ESF Systems.
3.2-1, 049	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material of steel piping, piping components, as well as tank and heat exchanger shell, exposed to lubricating oil in the ESF Systems is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 050	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of copper alloy, and stainless steel piping, piping components, and piping elements exposed to lubricating oil in the ESF Systems, as well as piping and heat exchangers in non-ASME Class 1 portion of the RCS, is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 051	Steel, Copper alloy, Stainless steel Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Reduction of heat transfer of copper alloy and stainless steel heat exchanger tubes exposed to lubricating oil in the ESF Systems is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage reduction of heat transfer. Reduction of heat transfer of copper alloy heat exchanger tubes exposed to lubricating oil in the CVCS and EDG and Auxiliary Systems, as well as stainless steel heat exchanger tubes in the SSW System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage reduction of heat transfer.
3.2-1, 052	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or Concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no steel (with coating or wrapping) piping, piping components, and piping elements exposed to soil or concrete in the ESF Systems, as clarified below. The steel recirculation sump effluent guard pipe, which encapsulates ESF recirculation components, is embedded in the concrete of the containment and addressed in item 3.3-1, 112. A plant-specific note is used.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 053	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not used. There are no stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil in the ESF Systems. Stainless steel tubing exposed to concrete in the CSS is addressed by item 3.2-1, 063.
3.2-1, 053.5	Steel, stainless steel, nickel alloy underground piping, piping components, and piping elements exposed to air-indoor uncontrolled or condensation (external)	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not used. There are no steel or nickel alloy underground piping, piping components, and piping elements exposed to air-indoor uncontrolled or condensation (external) in the ESF Systems. As noted in Table 2.2-3, the connected tunnel to the concrete RWST, for each unit, are accessible and considered another room/area of the Safeguards Building. As such, stainless steel piping and valves in the CSS, that are below-grade in the tunnel, are included in item 3.2-1, 063 along with other ESF piping and piping components.
3.2-1, 054	Not applicable. This line item only applies to BWRs.				

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 055	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. There are no steel piping and piping components exposed to concrete in the ESF Systems. The steel recirculation sump effluent guard pipe, which encapsulates ESF recirculation components, is embedded in the concrete of the containment and addressed in item 3.3-1, 112.
3.2-1, 056	Aluminum Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External)	None	None	NA -No AEM or AMP	Not applicable. There are no aluminum piping and piping components exposed to air – indoor, uncontrolled (internal/external) in the ESF Systems.
3.2-1, 057	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Gas	None	None	NA -No AEM or AMP	Not applicable. There are no copper alloy piping and piping components exposed to air – indoor, uncontrolled (external) or gas in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 058	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA -No AEM or AMP	Not applicable. There are no copper alloy (≤15% Zn and ≤8% Al) piping, piping components, and piping elements exposed to air with borated water leakage in the ESF Systems. Copper alloy ESF filtration components are included with plant ventilation systems addressed in item 3.3-1, 115.
3.2-1, 059	Galvanized steel Ducting, piping, and components exposed to Air – indoor, controlled (External)	None	None	NA -No AEM or AMP	Not applicable. There are no galvanized steel ducting, piping, and components exposed to air – indoor, controlled (external) in the ESF Systems. Galvanized steel ESF filtration components are included with Plant Ventilation Systems addressed in item 3.3-1, 116.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 060	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Raw water, Treated water, Treated water (borated), Air with borated water leakage, Condensation (Internal/External), Gas, Closed-cycle cooling water, Air – outdoor	None	None	NA -No AEM or AMP	Not applicable. There are no glass piping elements exposed to air – indoor, uncontrolled (external), lubricating oil, raw water, treated water, treated water (borated), air with borated water leakage, condensation (internal/external), gas, closed-cycle cooling water, or air – outdoor in the ESF Systems.
3.2-1, 061	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA -No AEM or AMP	Not applicable. There are no nickel alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external) in the ESF Systems.
3.2-1, 062	Nickel alloy Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA -No AEM or AMP	Not applicable. There are no nickel alloy piping, piping components, and piping elements exposed to air with borated water leakage in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 063	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA -No AEM or AMP	Consistent with NUREG-1801. Includes stainless steel ESF piping and piping components, pump casings, tanks, heat exchanger components, and valve isolation components (which encapsulate ESF recirculation components) exposed to air – indoor uncontrolled and gas (and air with borated water leakage that is not listed for stainless steel). Includes the RWST liner that is encased in the concrete of the tank. Also includes stainless steel piping and components in the SSW System that are empty (contains Air – indoor, uncontrolled).
3.2-1, 064	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Gas	None	None	NA -No AEM or AMP	Consistent with NUREG-1801.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 065	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated)	Wall thinning due to erosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2012-01. Wall thinning of stainless steel piping, piping components, and piping elements exposed to treated borated water in the ESF Systems is managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801.
3.2-1, 066	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific (See SRP subsection 3.2.2.2.9)	Not applicable. Loss of material due to recurring internal corrosion has not been identified in metallic piping, piping components, and tanks exposed to raw water or waste water in the ESF Systems. Further evaluation is documented in subsection 3.2.2.2.9.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 067	Stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Cracking due to stress corrosion cracking	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete in the ESF Systems. Aboveground outdoor tanks in the ESF Systems include the missile-protected, stainless steel-lined concrete RWST in the CSS. The RWST lining exposed to air -outdoor (above water line through vents in the concrete tank) and concrete is included in items 3.2-1, 004, and 3.2-1, 063, respectively. The concrete RWST components are addressed in items 3.5-1, 043, 3.5-1, 044, 3.5-1, 054, 3.5-1, 063, 3.5-1, 066, and 3.5-1, 067.
3.2-1, 068	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, or condensation in the ESF Systems. The stainless steel lined concrete RWST in the CSS is addressed in item 3.2-1, 067 above.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 069	Insulated steel, stainless steel, copper alloy, or aluminum, piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks," (for tanks only)	No	Not applicable. There are no insulated steel, stainless steel, copper alloy, or aluminum, piping, piping components, and tanks exposed to condensation, air-outdoor in the ESF Systems, as clarified in item 3.2-1, 039 above.
3.2-1, 070	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water, treated borated water	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water or treated borated water in the ESF Systems. Loss of material for the stainless steel liner of the concrete RWST in the CSS exposed to treated borated water is addressed in item 3.2-1, 022. Other than the stainless steel-lined concrete RWST, tanks in the ESF Systems are located indoors with volumes less than 100,000 gallons and do not meet the scope of XI.M29 as supplemented by LR-ISG-2012-02.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2-1, 071	Insulated stainless steel, aluminum, or copper alloy (>15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks," (for tanks only)	No	Not applicable. There are no insulated stainless steel, aluminum, or copper alloy (>15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor in the ESF Systems.
3.2-1, 072	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Loss of coating or lining integrity for the SI pump lubricating oil cooler reservoir exposed to lubricating oil is managed by the Lubricating Oil Analysis (B.2.3.25) AMP and One-Time Inspection (B.2.3.19) AMP. A generic note E and a plant-specific note are used. There are no metallic components with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, or treated borated water in the ESF Systems.

Table 3.2-1: Summary of Aging Management Programs for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2-1, 073	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Loss of material for the SI pump lubricating oil cooler reservoir exposed to lubricating oil is managed by the Lubricating Oil Analysis (B.2.3.25) AMP and One-Time Inspection (B.2.3.19) AMP. A generic note E and a plant-specific note are used.
3.2-1, 074	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. There are no gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water in the ESF Systems.

Table 3.2.2-1: Combustible Gas Control Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.E.E-41	3.2-1, 009	A
Damper housing	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	A
Damper housing	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Damper housing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A

Table 3.2.2-1: Combustible Gas Control Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A

Table 3.2.2-1: Combustible Gas Control Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-1: Combustible Gas Control Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

None.

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure–	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure–	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.E.E-41	3.2-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Piping	Leakage boundary (spatial–	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-77	3.2-1, 049	A, 1

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A
Piping	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-77	3.2-1, 049	A, 1
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A
Tank (airlock hydraulic)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A
Tank (airlock hydraulic)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A
Tank (airlock hydraulic)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-77	3.2-1, 049	A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Leakage boundary (spatial)	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	A, 1
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	A, 1
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-77	3.2-1, 049	A, 1
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.A.E-28	3.2-1, 009	A
Valve body	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-77	3.2-1, 049	A, 1
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.C.E-35	3.2-1, 040	A

Table 3.2.2-2 Containment Isolation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. Components are associated with the containment personnel airlock hydraulics. Hydraulic fluid is included with the lubricating oil environment as stated in Table 3.0-1.

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.E.E-41	3.2-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Eductor	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Eductor	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	C
Eductor	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Flow element	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Flow element	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Heat exchanger (containment spray) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (containment spray) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Heat exchanger (containment spray) shell	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Heat exchanger (containment spray) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Heat exchanger (containment spray) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-92	3.2-1, 030	B
Heat exchanger (containment spray) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	V.A.EP-96	3.2-1, 033	B
Heat exchanger (containment spray) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-74	3.2-1, 019	B A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (containment spray) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	B
Heat exchanger (containment spray) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Heat exchanger (containment spray) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	B
Heat exchanger (containment spray) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Heat exchanger (pump bearing cooler) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (pump bearing cooler) channel head	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	V.A.EP-91	3.2-1, 025	A
Heat exchanger (pump bearing cooler) shell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (pump bearing cooler) shell	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Heat exchanger (pump bearing cooler) tubes	Heat transfer	Stainless steel	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-79	3.2-1, 051	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (pump bearing cooler) tubes	Heat transfer	Stainless steel	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	V.A.E-21	3.2-1, 027	A
Heat exchanger (pump bearing cooler) tubes	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Heat exchanger (pump bearing cooler) tubes	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	V.A.EP-91	3.2-1, 025	A
Heat exchanger (pump bearing cooler) tubesheet	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Heat exchanger (pump bearing cooler) tubesheet	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	V.A.EP-91	3.2-1, 025	A
Heat exchanger (pump seal cooler) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (pump seal cooler) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Heat exchanger (pump seal cooler) shell	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.A.E-26	3.2-1, 040	C
Heat exchanger (pump seal cooler) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (pump seal cooler) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-92	3.2-1, 030	B
Heat exchanger (pump seal cooler) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	V.A.EP-96	3.2-1, 033	B
Heat exchanger (pump seal cooler) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-74	3.2-1, 019	B A
Heat exchanger (pump seal cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	B
Heat exchanger (pump seal cooler) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Heat exchanger (pump seal cooler) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.A.EP-93	3.2-1, 031	B
Heat exchanger (pump seal cooler) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	D C
Nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Nozzle	Spray	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Nozzle	Spray	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Orifice	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	C
Orifice	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.D2.EP-107	3.2-1, 004	A, 2
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Piping	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Piping	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Pump casing (containment spray)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Pump casing (containment spray)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Strainer (emergency sump suction)	Filter	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Strainer (emergency sump suction)	Filter	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Strainer (emergency sump suction)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Strainer (emergency sump suction)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Tank (chemical additive)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tank (chemical additive)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank liner (RWST)	Pressure boundary	Stainless steel	Air - outdoor (internal)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.D2.EP-107	3.2-1, 004	A, 2
Tank liner (RWST)	Pressure boundary	Stainless steel	Concrete (external)	None	None	V.F.EP-20	3.2-1, 063	A, 1
Tank liner (RWST)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Thermowell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-82	3.2-1, 063	A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Concrete (external)	None	None	V.F.EP-20	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-41	3.2-1, 022	B A
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Valve body	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Valve isolation expansion joint	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 3
Valve isolation expansion joint	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A, 3
Valve isolation expansion joint	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 3
Valve isolation expansion joint	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A, 3

Table 3.2.2-3: Containment Spray System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve isolation tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 3
Valve isolation tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A, 3
Valve isolation tank	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 3
Valve isolation tank	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A, 3

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant-Specific Notes

1. The internal stainless steel liner associated with the missile protected RWST is evaluated in this AMR. The concrete portion of the RWST, including the roof, is evaluated with the Yard structures in Table 3.5.2-11. Furthermore, the configuration does not allow water to get between the liner and the concrete.

2. Vent piping atop the concrete roof of the RWST are open to the outdoor air as, conservatively, are the liner and makeup/vent lines inside the RWST above the waterline.

3. Valve isolation tank and associated components are designed to contain leakage during recirculation from the containment recirculation sumps. In addition, the tank and associated components are attached to the guard pipe and containment penetrations MS-3 and MS-4, which are addressed in Table 3.5.2-1 and contain nuclear safety related recirculation piping and valves. As such, the valve isolation tank, and associated components (e.g., draining and level) are assigned both a leakage boundary (spatial) and structural integrity (attached) function.

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.E.E-41	3.2-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Flow element	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Flow element	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Flow element	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Flow element	Throttle	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Heat exchanger (RHR pump seal cooler) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (RHR pump seal cooler) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Heat exchanger (RHR pump seal cooler) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (RHR pump seal cooler) shell	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Heat exchanger (RHR pump seal cooler) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Heat exchanger (RHR pump seal cooler) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-92	3.2-1, 030	B
Heat exchanger (RHR pump seal cooler) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Heat exchanger (RHR pump seal cooler) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	C
Heat exchanger (RHR pump seal cooler) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-96	3.2-1, 033	B
Heat exchanger (RHR pump seal cooler) tubes	Heat transfer	Stainless steel	Treated borated water >140°F (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-74	3.2-1, 019	B A
Heat exchanger (RHR pump seal cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-93	3.2-1, 031	B
Heat exchanger (RHR pump seal cooler) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (RHR pump seal cooler) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C
Heat exchanger (RHR pump seal cooler) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-93	3.2-1, 031	B
Heat exchanger (RHR pump seal cooler) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Heat exchanger (RHR pump seal cooler) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C
Heat exchanger (RHR) channel head	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (RHR) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (RHR) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C
Heat exchanger (RHR) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	C
Heat exchanger (RHR) shell	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Heat exchanger (RHR) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Heat exchanger (RHR) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-92	3.2-1, 030	B
Heat exchanger (RHR) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-96	3.2-1, 033	B
Heat exchanger (RHR) tubes	Heat transfer	Stainless steel	Treated borated water >140°F (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.A.EP-74	3.2-1, 019	B A
Heat exchanger (RHR) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-93	3.2-1, 031	B
Heat exchanger (RHR) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (RHR) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C
Heat exchanger (RHR) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	V.D1.EP-93	3.2-1, 031	B
Heat exchanger (RHR) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	D C
Heat exchanger (RHR) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	D C
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	V.D1.E-407	3.2-1, 065	B
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	V.D1.E-407	3.2-1, 065	B
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Pump casing (RHR)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Pump casing (RHR)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Pump casing (RHR)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Thermowell	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Tubing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Tubing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A

Table 3.2.2-4: Residual Heat Removal System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B A
Valve isolation expansion joint	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation expansion joint	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation expansion joint	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation expansion joint	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation tank	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A, 1
Valve isolation tank	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	V.F.EP-18	3.2-1, 063	A, 1

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant-Specific Notes

1. Valve isolation tank and associated components are designed to contain leakage during recirculation from the Containment recirculation sumps. In addition, the tank and associated components are attached to the guard pipe and Containment penetrations MS-1 and MS-2, which are addressed in Table 3.5.2-1 and contain safety related recirculation piping and valve. As such, the valve isolation tank, and associated components (e.g., draining and level) are assigned both a leakage boundary (spatial) and structural integrity (attached) function.

2. Piping and tubing associated with the following components have an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4: RHR hot leg loops 1 and 4, RCP seal water injection line.

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Accumulator	Pressure boundary	Carbon steel with stainless steel cladding	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Accumulator	Pressure boundary	Carbon steel with stainless steel cladding	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Accumulator	Pressure boundary	Carbon steel with stainless steel cladding	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Accumulator (nitrogen)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Accumulator (nitrogen)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Accumulator (nitrogen)	Pressure boundary	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.E.E-41	3.2-1, 009	A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	V.E.EP-70	3.2-1, 013	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	V.E.EP-69	3.2-1, 015	A
Filter housing	Pressure boundary	Gray cast iron	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Filter housing	Pressure boundary	Gray cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Filter housing	Pressure boundary	Gray cast iron	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-77	3.2-1, 049	A
Flow element	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Flow element	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Flow element	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Flow element	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Flow element	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Flow element	Throttle	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Heat exchanger (SI pump lube oil cooler) shell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	C
Heat exchanger (SI pump lube oil cooler) shell	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Heat exchanger (SI pump lube oil cooler) tubes	Heat transfer	Copper alloy	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-78	3.2-1, 051	A
Heat exchanger (SI pump lube oil cooler) tubes	Heat transfer	Copper alloy	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-72	3.3-1, 042	A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (SI pump lube oil cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-76	3.2-1, 050	A
Heat exchanger (SI pump lube oil cooler) tubes	Pressure boundary	Copper alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-179	3.3-1, 038	A
Heat exchanger (SI pump lube oil cooler) tubes	Pressure boundary	Copper alloy	Raw water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	A
Heat exchanger (SI pump lube oil cooler) tubesheet	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-80	3.2-1, 050	C
Heat exchanger (SI pump lube oil cooler) tubesheet	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	V.A.EP-91	3.2-1, 025	A
Heat exchanger (SI pump lube oil cooler) tubesheet	Pressure boundary	Stainless steel	Raw water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	A
Orifice (mini-flow)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice (mini-flow)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	One-Time Inspection (B.2.3.19)	V.D1.E-24	3.2-1, 005	A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Orifice (mini-flow)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B, 1 A
Orifice (mini-flow)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Orifice (mini-flow)	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Orifice (mini-flow)	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	One-Time Inspection (B.2.3.19)	V.D1.E-24	3.2-1, 005	A
Orifice (mini-flow)	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B, 1 A
Orifice (mini-flow)	Throttle	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	V.D1.E-407	3.2-1, 065	B

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Piping	Pressure boundary	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A
Piping	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-77	3.2-1, 049	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 2
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B, 1 A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	V.D1.E-407	3.2-1, 065	B

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	V.D1.E-13	3.2-1, 001	A, 1, 2
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Piping	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Piping	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Pump casing (SI pump)	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Pump casing (SI pump)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tank (SI pump lube oil cooler reservoir)	Pressure boundary	Carbon steel with internal coating/lining	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Tank (SI pump lube oil cooler reservoir)	Pressure boundary	Carbon steel with internal coating/lining	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Tank (SI pump lube oil cooler reservoir)	Pressure boundary	Carbon steel with internal coating/lining	Lubricating oil (internal)	Loss of coating/lining integrity	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.E-401	3.2-1, 072	E, 3
Tank (SI pump lube oil cooler reservoir)	Pressure boundary	Carbon steel with internal coating/lining	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.E-414	3.2-1, 073	E, 3
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Leakage boundary (spatial)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Pressure boundary	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Tubing	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	V.F.EP-22	3.2-1, 063	A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Valve body	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	V.F.EP-18	3.2-1, 063	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.EP-41	3.2-1, 022	B, 1 A
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	V.D1.E-12	3.2-1, 020	B, 1 A

Table 3.2.2-5: Safety Injection System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	V.E.E-44	3.2-1, 040	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	V.D1.E-28	3.2-1, 009	A
Valve body	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	V.F.EP-7	3.2-1, 064	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. Components listed with environments of internal borated water above 140°F are only applicable for those components attached or connected to the RCS that are cycled during plant startup/cooldown.

2. Piping associated with the following components has an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4: ECCS/boron Injection tank (BIT) cold legs 1, 2, 3, and 4; accumulator cold legs 1, 2, 3, and 4; SI/RHR return; SIS connection to accumulator.

3. Exception taken in the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP to manage aging effects of the internally coated SI pump lube oil cooler reservoirs under the Lubricating Oil Analysis (B.2.3.25) and One-Time Inspection (B.2.3.19) AMPs.

3.3. AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1. Introduction

This section provides the results of the AMR for those components identified in Section 2.3.3, "Auxiliary Systems", as being subject to AMR. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Chemical and Volume Control System (2.3.3.1)
- Component Cooling Water System (2.3.3.2)
- Compressed Air and Gas Systems (2.3.3.3)
- Demineralized and Reactor Makeup Water System (2.3.3.4)
- Emergency Diesel Generator and Auxiliary Systems (2.3.3.5)
- Equipment and Floor Drainage System (2.3.3.6)
- Fire Protection System (2.3.3.7)
- Plant Ventilation Systems (2.3.3.8)
- Potable and Sanitary Water System (2.3.3.9)
- Process and Effluent Radiological Monitoring and Sampling System (2.3.3.10)
- Spent Fuel Pool Cooling and Cleanup System (2.3.3.11)
- Station Service Water System (2.3.3.12)
- Ventilation Chilled Water Systems (2.3.3.13)
- Waste Processing Systems (2.3.3.14)

3.3.2. Results

The following tables summarize the results of the AMR for Auxiliary Systems.

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation

Table 3.3.2-7: Fire Protection System – Summary of Aging Management Evaluation

Table 3.3.2-8a: Containment Ventilation System – Summary of Aging Management Evaluation

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Table 3.3.2-9a: Chlorination System – Summary of Aging Management Evaluation

Table 3.3.2-9b: Potable and Sanitary Water System – Summary of Aging Management Evaluation

Table 3.3.2-10: Process and Effluent Radiological Monitoring and Sampling System – Summary of Aging Management Evaluation

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

3.3.2.1. Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.3.2.1.1. Chemical and Volume Control System

Materials

The materials of construction for the CVCS components are:

- Carbon steel
- Copper alloy
- Copper alloy > 15% Zn or > 8% Al
- Glass
- Stainless steel

Environments

The CVCS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Closed-cycle cooling water > 140°F
- Condensation
- Gas
- Lubricating oil
- Raw water
- Treated borated water
- Treated borated water > 140°F
- Treated water
- Treated water > 140°F
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the CVCS require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the CVCS components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)
- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Open-Cycle Cooling Water (B.2.3.11)
- Selective Leaching (B.2.3.20)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.3.2.1.2. <u>Component Cooling Water System</u>

Materials

The materials of construction for the CCW System components are:

- Carbon steel
- Carbon steel with internal coating
- Cast iron
- Copper alloy
- Glass
- Nickel alloy
- Stainless alloy

Environments

The CCW System components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Condensation
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the CCW System require management:

- Loss of coating/lining integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the CCW System components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)
- Open-Cycle Cooling Water (B.2.3.11)
- Selective Leaching (B.2.3.20)

3.3.2.1.3. Compressed Air and Gas Systems

Materials

The materials of construction for the Compressed Air and Gas Systems components are:

- Carbon steel
- Copper alloy
- Copper alloy > 15% Zn or > 8% Al
- Elastomer
- Stainless steel

Environments

The Compressed Air and Gas Systems components are exposed to the following environments:

- Air – dry
- Air – indoor uncontrolled
- Air with borated water leakage
- Gas

Aging Effects Requiring Management

The following aging effects associated with the Compressed Air and Gas Systems require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the Compressed Air and Gas Systems components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Compressed Air Monitoring (B.2.3.14)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

3.3.2.1.4. Demineralized and Reactor Makeup Water System

Materials

The materials of construction for the DRMWS components are:

- Carbon steel
- Elastomer
- Stainless steel

Environments

The DRMWS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Concrete
- Gas
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the DRMWS require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the DRMWS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- One-Time Inspection (B.2.3.19)
- Water Chemistry (B.2.3.2)

3.3.2.1.5. Emergency Diesel Generator and Auxiliary Systems

Materials

The materials of construction for the EDG and Auxiliary Systems components are:

- Aluminum
- Carbon steel
- Carbon steel with internal coating/lining
- Cast iron
- Copper alloy
- Elastomer
- Glass
- Stainless steel

Environments

The EDG and Auxiliary Systems components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Closed-cycle cooling water
- Closed-cycle cooling water >140°F
- Condensation
- Diesel exhaust
- Fuel oil
- Lubricating oil
- Raw water
- Soil
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the EDG and Auxiliary Systems require management:

- Cracking
- Hardening and loss of strength
- Loss of coating/lining integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the EDG and Auxiliary components:

- Bolting Integrity (B.2.3.9)
- Buried and Underground Piping and Tanks (B.2.3.27)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Fuel Oil Chemistry (B.2.3.17)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Internal Coatings/Lining for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Open-Cycle Cooling Water System (B.2.3.11)
- Selective Leaching (B.2.3.20)
- Water Chemistry (B.2.3.2)

3.3.2.1.6. Equipment and Floor Drainage Systems

Materials

The materials of construction for the Equipment and Floor Drainage System components are:

- Carbon steel
- Cast iron
- Stainless steel

Environments

The Equipment and Floor Drainage System components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the Equipment and Floor Drainage System require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the Equipment and Floor Drainage System components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Selective Leaching (B.2.3.20)

3.3.2.1.7. Fire Protection System

Materials

The materials of construction for the FPS components are:

- Carbon steel
- Carbon steel with internal coating/lining
- Cast iron
- Cement-lined ductile iron
- Copper alloy
- Copper alloy > 15% Zn or > 8% Al
- Elastomer
- Glass
- Stainless steel

Environments

The FPS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Concrete
- Condensation
- Diesel exhaust
- Fuel oil
- Gas
- Raw water
- Soil
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the FPS require management:

- Cracking
- Flow blockage
- Hardening and loss of strength
- Loss of coating/lining integrity
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the FPS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Buried and Underground Piping and Tanks (B.2.3.27)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Fire Protection (B.2.3.15)
- Fire Water System (B.2.3.16)
- Fuel Oil Chemistry (B.2.3.17)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Internal Coatings/Linings of In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)
- One-Time Inspection (B.2.3.19)
- Selective Leaching (B.2.3.20)

3.3.2.1.8. Plant Ventilation Systems

Containment Ventilation Systems

Materials

The materials of construction for the components of the Containment Ventilation Systems are:

- Carbon steel
- Copper alloy
- Galvanized steel
- Stainless steel

Environments

The components of the Containment Ventilation Systems are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage

- Closed-cycle cooling water
- Condensation
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the Containment Ventilation Systems require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the Containment Ventilation Systems components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- One-Time Inspection (B.2.3.19)
- Water Chemistry (B.2.3.2)

<u>Control Room Area Ventilation System</u>

Materials

The materials of construction for the components of the Control Room Area Ventilation System are:

- Carbon steel
- Carbon steel with internal coating/lining
- Copper alloy
- Copper alloy > 15% Zn or >8% Al
- Elastomer
- Fiberglass
- Galvanized steel
- Stainless steel

Environments

The components of the Control Room Area Ventilation System are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor

- Closed-cycle cooling water
- Condensation
- Lubricating oil
- R-12 gas
- Raw water
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the Control Room Area Ventilation System require management:

- Blistering
- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the Control Room Area Ventilation System components:

- Bolting Integrity (B.2.3.9)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Water Chemistry (B.2.3.2)

<u>Miscellaneous Ventilation Systems</u>

Materials

The materials of construction for the components of the Miscellaneous Ventilation Systems are:

- Aluminum
- Carbon steel
- Carbon steel with internal coating/lining
- Copper alloy
- Copper alloy > 15% Zn
- Elastomer
- Fiberglass
- Galvanized steel
- Stainless steel

Environments

The components of the Miscellaneous Ventilation Systems are exposed to the following environments:

- Air – dry
- Air – indoor uncontrolled
- Air – outdoor
- Closed-cycle cooling water
- Condensation
- R-12 gas
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the Miscellaneous Ventilation Systems require management:

- Blistering
- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the Miscellaneous Ventilation Systems components:

- Bolting Integrity (B.2.3.9)
- Closed Treated Water Systems (B.2.3.12)
- Compressed Air Monitoring (B.2.3.14)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Selective Leaching (B.2.3.20)

Primary Plant Ventilation Systems

Materials

The materials of construction for the components of the Primary Plant Ventilation Systems are:

- Carbon steel
- Carbon steel with internal coating/lining
- Copper alloy
- Copper alloy > 15% Zn or >8% Al
- Elastomer

- Fiberglass
- Galvanized steel
- Stainless steel

Environments

The components of the Primary Plant Ventilation Systems are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Closed-cycle cooling water
- Condensation
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the Primary Plant Ventilation Systems require management:

- Blistering
- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the Primary Plant Ventilation Systems components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- One-Time Inspection (B.2.3.19)
- Selective Leaching (B.2.3.20)
- Water Chemistry (B.2.3.2)

3.3.2.1.9. Potable and Sanitary Water System

Chlorination System

Materials

The materials of construction for the CLS components are:

- PVC

Environments

The CLS components are exposed to the following environments:

- Air – indoor uncontrolled

Aging Effects Requiring Management

The following aging effects associated with the CLS require management:

- None

Aging Management Programs

The following AMPs manage the aging effects for the CLS components:

- None

Potable and Sanitary Water System

Materials

The materials of construction for the PWS components are:

- Copper alloy
- Copper alloy > 15% Zn or > 8% Al
- Stainless steel

Environments

The PWS components are exposed to the following environments:

- Air – indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the PWS require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the PWS components:

- Bolting Integrity (B.2.3.9)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Selective Leaching (B.2.3.20)

3.3.2.1.10. Process and Effluent Radiological Monitoring and Sampling System

Materials

The materials of construction for the Process and Effluent Radiological Monitoring and Sampling System components are:

- Carbon steel
- Stainless steel

Environments

The Process and Effluent Radiological Monitoring and Sampling System components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Concrete
- Gas
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Process and Effluent Radiological Monitoring and Sampling System require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the Process and Effluent Radiological Monitoring and Sampling System components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.3.2.1.11. Spent Fuel Pool Cooling and Cleanup System

Materials

The materials of construction for the SFS components are:

- Carbon steel
- Stainless steel

Environments

The SFS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Concrete
- Treated borated water
- Treated borated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the SFS require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the SFS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)

- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- One-Time Inspection (B.2.3.19)
- Water Chemistry (B.2.3.2)

3.3.2.1.12. Station Service Water System

Materials

The materials of construction for the SSW components are:

- Carbon steel
- Carbon steel with internal coating/lining
- Copper alloy > 15% Zn or > 8% Al
- Nickel alloy
- PVC
- Stainless steel

Environments

The SSW components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Condensation
- Lubricating Oil
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects associated with the SSW require management:

- Cracking
- Loss of coating or lining integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall-thinning

Aging Management Programs

The following AMPs manage the aging effects for the SSW components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Buried and Underground Piping and Tanks (B.2.3.27)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

- Internal Coatings/Lining for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Open-Cycle Cooling Water System (B.2.3.11)
- Selective Leaching (B.2.3.20)

3.3.2.1.13. Ventilation Chilled Water Systems

Materials

The materials of construction for the Ventilation Chilled Water Systems components are:

- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% Zn or >8% Al
- Glass
- Graphite
- Stainless steel

Environments

The Ventilation Chilled Water Systems components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Condensation
- Lubricating oil
- R-11 gas
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Ventilation Chilled Water Systems require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following AMPs manage the aging effects for the Ventilation Chilled Water Systems components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Selective Leaching (B.2.3.20)
- Water Chemistry (B.2.3.2)

3.3.2.1.14. Waste Processing Systems

Materials

The materials of construction for the WPS components are:

- Carbon steel
- Stainless steel

Environments

The WPS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water
- Condensation
- Steam
- Waste water
- Waste water >140°F

Aging Effects Requiring Management

The following aging effects associated with the WPS require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the WPS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- TLAA (Section 4.3)

3.3.2.2. AMR Results for Which Further Evaluation is Recommended by the GALL Report

The AMR summaries for the Auxiliary Systems provide the basis for Section 3.3.2.2 and are compiled from Section 3.3.2.1. NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the LRA. For the Auxiliary Systems, those programs are addressed in the following subsections.

Note - *Italicized* text is taken directly from NUREG-1800 as supplemented by LR-ISG-2011-05 and LR-ISG-2012-02.

3.3.2.2.1. Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," or Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-LR.

Cumulative fatigue damage affects piping or tubing component types as representative of other component types (e.g., heat exchanger tubes). Where cumulative fatigue damage is identified as an AERM, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). As summarized in item 3.3-1, 002, evaluation of fatigue for susceptible components in the CVCS and Process Sampling, and Liquid Waste Processing systems is addressed by the TLAA in Section 4.3.3, with the portions attached to the RCS (ASME Class 1) addressed in Section 4.3.2. In addition, as summarized in item 3.3-1, 001, cumulative fatigue damage, with regard to crane load cycle limits, is an aging effect assessed by the TLAA in Section 4.7.4.

3.3.2.2.2. Cracking due Stress Corrosion Cracking and Cyclic Loading

Cracking due to SCC and cyclic loading could occur in stainless steel PWR non-regenerative heat exchanger components exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system. The existing aging management program on monitoring and control of primary water chemistry in PWRs manages the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading. Therefore, the effectiveness of the water chemistry control *program should be verified to ensure that cracking is not occurring. The GALL Report recommends that a plant-specific aging management program be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are managed adequately. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.*

As summarized in item 3.3-1, 003, cracking due to SCC and cyclic loading in stainless steel PWR non-regenerative heat exchanger (letdown) components exposed to treated borated water greater than 140°F in the CVCS is an AERM. The Water Chemistry AMP manages cracking of stainless steel non-regenerative heat exchanger components exposed to treated borated water and treated borated water greater than 140°F. The AMP is augmented by the One-Time Inspection (B.2.3.19) AMP which will verify the absence of cracking through the use of appropriate visual, surface, or volumetric NDE techniques. Absence of cracking of the letdown heat exchanger tubes and tubesheet and channel head is also verified by monitoring radiation levels in the CCW system, through the Closed Treated Water Systems (B.2.3.12) AMP. Temperature monitoring is a less sensitive technique and is not used.

3.3.2.2.3. Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements applicable to the components.

Environmental conditions at CPNPP are described in Section 3.2.2.2.3 above. As indicated there and summarized in item 3.3-1, 004, the outdoor air does not contain sufficient halides. A review of CPNPP OE and evaluation of the location and surroundings of the plant have determined that the air at CPNPP does not contain sufficient halides nor are there events that would likely increase the halide content in the air to make cracking (due to stress corrosion cracking) an AERM for stainless steel exposed to air. As such, stainless steel components exposed to air environments in the auxiliary systems, as well as the in the structures and structural commodities are not susceptible to (halide-induced) cracking, which is not expected and does not require management. The RMWSTs are outdoor reinforced concrete tanks with stainless steel liners as described in Section 2.4.11.

3.3.2.2.4. Loss of Material due to Cladding Breach

Loss of material due to cladding breach could occur for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks," and recommends further evaluation of a plant-specific aging management program to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

This paragraph in NUREG-1800 pertains to steel charging pump casings with stainless steel cladding. Loss of material could occur for the steel casing material if exposed to treated borated water due to a cladding breach. As summarized in item 3.3-1, 005, the CPNPP charging pump casings are solid stainless steel and loss of material due to cladding breach is not applicable to the centrifugal or positive displacement charging pumps. Furthermore, there are no steel pump casings with stainless steel cladding in the Auxiliary systems.

3.3.2.2.5. Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within 1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI *requirements Quality Assurance for Aging Management of Nonsafety-Related Components.*

As described in Section 3.2.2.2.3, the outdoor air does not contain sufficient halides for corrosion of stainless steel in air. A review of CPNPP OE and evaluation of the location and surroundings of the plant have determined that the air at CPNPP does not contain sufficient halides nor are there events that would likely increase the halide content in the air to make loss of material (due to pitting and crevice corrosion) an AERM for stainless steel exposed to air except in select instances. As such, stainless steel components exposed to air environments in the auxiliary systems are not susceptible to (halide-induced) loss of material which does not require management. As summarized in item 3.3-1, 006; and 3.3-1, 012 there are select instances where corrosion of stainless steel in air is considered possible and managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP or Bolting Integrity (B.2.3.9) AMP. These include the RMWST tank liner (where contaminants could concentrate in the air-space that is vented to the outdoors, closure bolting (due to potential for local leakage) and insulation jacketing of components located outdoors (per LR-ISG-2012-02). Additionally, as summarized in item 3.3-1, 081 (per LR-ISG-2012-01), aluminum insulation jacketing is also susceptible to a loss of material and managed by the same AMP. Furthermore, as summarized in item 3.5-1, 093, stainless steel structural components located outdoors in above-grade areas prone to frequent or prolonged wetting are susceptible to corrosion that is managed by the Structures Monitoring (B.2.3.34) AMP.

3.3.2.2.6. <u>Quality Assurance for Aging Management of Nonsafety-Related Components</u>

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2, of this SRP-LR.)

QA provisions applicable to LR are discussed in Section B.1.3.

3.3.2.2.7. <u>Ongoing Review of Operating Experience (Per LR-ISG-2011-05)</u>

Acceptance criteria are described in Appendix A.4, “Operating Experience for Aging Management Programs.”

The OE process and acceptance criteria are described in Section B.1.4.

3.3.2.2.8. <u>Loss of Material due to Recurring Internal corrosion (Per LR-ISG-2012-02)</u>

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or more sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component *either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).*

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, and (e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.

The CPNPP CAP tracks and trends recurring issues, EOC, and includes recommendations to prevent recurrence, where appropriate. Corrosion in the SSW meets the criteria to be considered RIC based solely on number of instances. However, no minimum wall thickness criteria were exceeded. Reduction in wall thickness has been monitored at a frequency to sufficiently identify any issues. Based on the monitoring, the CPNPP SSW does not meet criteria for extent of degradation. Therefore, as summarized in item 3.3-1, 127, RIC is not an applicable aging effect for metals in CPNPP Auxiliary systems containing raw water, waste water or treated water. As such, credited CPNPP AMPs, such as the Fire Water System (B.2.3.16) AMP, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP, and the Open-Cycle Cooling Water System (B.2.3.11) AMP, do not require enhancements to address RIC in Auxiliary systems.

3.3.2.3. Time-Limited Aging Analysis

The TLAAs identified below are associated with the Auxiliary Systems:

- Section 4.3, “Metal Fatigue”
- Section 4.7.4, “Crane Load Cycle Limits”

3.3.3. Conclusion

The Auxiliary Systems piping, fittings, and components that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the Auxiliary System components are identified in the summaries in Section 3.3.2.1 above.

A description of these AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the PEO.

Therefore, based on the conclusions provided in Appendix B, the effects of aging associated with the Auxiliary System components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the PEO.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 001	Steel Cranes: structural girders exposed to Air – indoor, uncontrolled (External)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for structural girders of cranes that fall within the scope of 10 CFR 54 (see the SRP, Section 4.7, “Other Plant-Specific Time-Limited Aging Analyses,” for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1))	Yes, TLAA (See SRP subsection 3.3.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage (crane load cycle limits) is an aging effect evaluated by the TLAA in Section 4.7.4 for steel crane/hoist bridges, trolleys, girders, structural members, and bolting exposed to indoor air or to outdoor air. Structural components referencing this item are listed in Table 3.5.2-14. Further evaluation is documented in subsection 3.3.2.2.1.
3.3-1, 002	Stainless steel, Steel Heat exchanger components and tubes, Piping, piping components, and piping elements exposed to Treated borated water, Air - indoor, uncontrolled, Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA (See SRP subsection 3.3.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect evaluated by the fatigue TLAA in Section 4.3.3 for the CVCS, Process Sampling System, and (Liquid) Waste Processing System. In addition, cumulative fatigue damage of stainless steel portions of the Feedwater System is evaluated by the fatigue TLAA in Section 4.3.3. A plant-specific note is used. Further evaluation is documented in subsection 3.3.2.2.1.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 003	Stainless steel Heat exchanger components, non-regenerative exposed to Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M2, “Water Chemistry” The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant-specific (See SRP subsection 3.3.2.2.2)	Consistent with exception to NUREG-1801. Cracking of stainless steel letdown heat exchanger components exposed to treated borated water >60°C (>140°F) in the CVCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking and augments it relative to cyclic cracking. Further evaluation is documented in subsection 3.3.2.2.2.
3.3-1, 004	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See SRP subsection 3.3.2.2.3)	Not applicable. Air does not contain sufficient halides to make stress corrosion cracking a concern for stainless steel in air. Further evaluation is documented in subsection 3.3.2.2.3.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 005	Steel (with stainless steel or nickel-alloy cladding) Pump Casings exposed to Treated borated water	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC IN 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses clad cracking (See SRP subsection 3.3.2.2.4)	Not applicable. The CPNPP charging pumps have solid stainless steel casings, without cladding. Further evaluation is documented in subsection 3.3.2.2.4.
3.3-1, 006	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See SRP subsection 3.3.2.2.5)	Consistent with NUREG-1801 as supplemented by LR-ISG-2012-02. Environmental conditions at CPNPP are such that degradation of stainless steel exposed to outdoor air is not expected, except potentially in locations of water pooling or water inside insulation jacketing. Further evaluation is documented in Section 3.3.2.2.5. In addition, as listed in Table 3.5.2-13, stainless steel insulation jacketing that is located outdoors is conservatively managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Furthermore, stainless steel structural components located outdoors, where frequent or prolonged wetting is possible, are addressed in item 3.5-1, 093.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 007	Stainless steel High-pressure pump, casing exposed to Treated borated water	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-1801. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP will be used to manage cracking of high-pressure stainless steel charging pumps exposed to treated borated water >60°C (>140°F) in the CVCS.
3.3-1, 008	Stainless steel Heat exchanger components and tubes exposed to Treated borated water >60°C (>140°F)	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Not used. Stainless steel heat exchanger components and tubes exposed to treated borated water >60°C (>140°F) in the CVCS are included with item 3.3-1, 020.
3.3-1, 009	Steel, Aluminum, Copper alloy (>15% Zn or >8% Al) External surfaces, Piping, piping components, and piping elements, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion (BAC) of steel, including cast iron and galvanized steel and copper alloy (>15% Zn or >8% Al) external surfaces, including bolting, in the auxiliary systems is managed by the Boric Acid Corrosion (B.2.3.4) AMP. There are no aluminum components exposed to air with borated water leakage in the auxiliary systems. Aluminum components in the auxiliary systems are limited to the EDG and Auxiliary (Table 3.3.2-5) and Miscellaneous Ventilation Systems (Table 3.3.2-8c) which are not located in the vicinity of borated water systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 010	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, "Bolting Integrity"	No	Not applicable. There is no steel, high-strength closure bolting in the auxiliary systems.
3.3-1, 011	Steel, high-strength High-pressure pump, closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, "Bolting Integrity"	No	Not applicable. There are no steel, high-strength high-pressure pumps or closure bolting in the auxiliary systems.
3.3-1, 012	Steel; stainless steel Closure bolting, Bolting exposed to Condensation, Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material of steel and stainless steel bolting exposed to condensation, indoor air, or outdoor air in the auxiliary systems is managed by the Bolting Integrity (B.2.3.9) AMP. In addition, as listed in Table 3.3.2-12, bolting for SSW pump columns are the same material as the pump columns (copper alloy >15% Zn or >8% Al) and exposed to condensation above the waterline in the bay and loss of material is managed by the Bolting Integrity (B.2.3.9) AMP.
3.3-1, 013	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	Not used. Loss of material of steel closure bolting in the auxiliary systems is addressed in item 3.3-1, 012. As described in Table 3.0-1, it is recognized that the leakage at bolted joints may occur in indoor air, outdoor air, or condensation environments.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 014	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload of steel and stainless steel bolting exposed to soil in the SSW, EDG and Auxiliary (fuel oil), and Fire Protection Systems is managed by the Bolting Integrity (B.2.3.9) AMP.
3.3-1, 015	Steel; stainless steel, Copper alloy, Nickel alloy, Stainless steel Closure bolting, Bolting exposed to Air – indoor, uncontrolled (External), Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload of copper alloy (>15% Zn or >8% Al), steel, and stainless steel bolting exposed to air - indoor uncontrolled (external), air - outdoor (external), condensation, and raw water in the auxiliary systems is managed by the Bolting Integrity (B.2.3.9) AMP. There is no nickel alloy closure bolting or bolting in the auxiliary systems.
3.3-1, 016	Not applicable. This line item only applies to BWRs.				

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 017	Stainless steel Heat exchanger tubes exposed to Treated water, Treated borated water	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2011-01. Reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated borated water in the CVCS and SFS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage reduction of heat transfer. There are no stainless steel heat exchanger tubes with a heat transfer function exposed to treated water in the auxiliary systems. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to closed-cooling water is addressed in item 3.3-1, 050 below.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 018	Stainless steel High-pressure pump, casing, Piping, piping components, and piping elements exposed to Treated borated water >60°C (>140°F), Sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Cracking of stainless steel high-pressure charging pump casings, associated piping and piping components exposed to treated borated water >60°C (>140°F) in the CVCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes an exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. Cracking of other stainless steel pump casings, piping, and piping components exposed to treated borated water >60°C (>140°F) in the CVCS and SFS is addressed by items 3.3-1, 007 and 3.3-1, 124.
3.3-1, 019	Stainless steel Regenerative heat exchanger components exposed to Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not used. The regenerative heat exchanger in the CVCS is included with item 3.3-1, 020.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 020	Stainless steel, Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Treated borated water >60°C (>140°F), Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2011-01. Cracking of stainless steel heat exchanger components exposed to treated borated water >60°C (>140°F) or treated water >60°C (>140°F) in the CVCS is managed by the Water Chemistry (B.2.3.2) AMP, which takes an exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. There are no steel with stainless steel cladding heat exchanger components in the auxiliary systems.
3.3-1, 021	Not applicable. This line item only applies to BWRs.				
3.3-1, 022	Not applicable. This line item only applies to BWRs.				
3.3-1, 023	Aluminum Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. There are no aluminum piping or piping components exposed to treated water in the auxiliary systems.
3.3-1, 024	Not applicable. This line item only applies to BWRs.				
3.3-1, 025	Not applicable. This line item only applies to BWRs.				

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 026	Steel with stainless steel cladding Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion (only after cladding degradation)	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. There are no steel with stainless steel cladding piping and piping components exposed to treated water in the auxiliary systems.
3.3-1, 027	Not applicable. This line item only applies to BWRs.				
3.3-1, 028	Stainless steel Piping, piping components, and piping elements; tanks exposed to Treated borated water (Primary, oxygen levels controlled) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry"	No	Not used. Cracking of stainless steel piping and piping components exposed to treated borated water >60°C (>140°F) in the CVCS is included with item 3.3-1, 124 below.
3.3-1, 029	Steel (with stainless steel cladding); stainless steel Piping, piping components, and piping elements exposed to Treated borated water (Primary, oxygen levels controlled)	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry"	No	Not used. Loss of material for stainless steel piping and piping components exposed to treated borated water in the CVCS is included with item 3.3-1, 125 below.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 030	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Changes in material properties due to aggressive chemical attack	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There is no concrete or cementitious material piping and piping components exposed to raw water in the SSW System. However, cement-lined ductile iron piping is present in the FPS and is addressed by items 3.3-1, 064; and 3.3-1, 138.
3.3-1, 030.5	Fiberglass, HDPE Piping, piping components, and piping elements exposed to Raw water (internal)	Cracking, blistering, change in color due to water absorption	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no fiberglass, (High Density Polyethylene) HDPE piping, or piping components exposed to raw water (internal) in the GL 98-13 portion of the SSW System. PVC piping in the non-Generic Letter 89-13 portion of the SSW System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. A generic note G and plant-specific note is used.
3.3-1, 031	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Cracking due to settling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There is no concrete or cementitious material piping and piping components exposed to raw water in the SSW System. However, cement lined ductile iron piping is present in the FPS and is addressed by items 3.3-1, 064; and 3.3-1, 138.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 032	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Raw water	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. There are no reinforced concrete, asbestos cement piping, or piping components exposed to raw water in the SSW System.
3.3-1, 032.5	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. There are no elastomer seals and components exposed to raw water in the SSW System.
3.3-1, 033	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not applicable. There are no concrete or cementitious material piping and piping components exposed to raw water in the SSW System. However, cement-lined ductile iron piping is present in the FPS and is addressed by items 3.3-1, 064; and 3.3-1, 138.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 034	Nickel alloy, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Loss of material of nickel alloy piping and piping components exposed to raw water in the SSW is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Loss of material for copper alloy piping components exposed to raw water in the SSW System is addressed by item 3.3-1, 036. Loss of material for copper alloy piping components in other auxiliary piping systems is addressed by item 3.3-1, 064 for the FPS and 3.3-1, 093 for the Potable and Sanitary Water System.
3.3-1, 035	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not used. Loss of material for copper alloy piping components exposed to raw water in the SSW is addressed by item 3.3-1, 036. Loss of material for copper alloy piping components in other auxiliary piping systems is addressed by item 3.3-1, 064 for the FPS and 3.3-1, 093 for the Potable and Sanitary Water System.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 036	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. As listed in Table 3.3.2-12, loss of material and fouling of copper alloy pump casings and valve bodies exposed to raw water in the SSW System is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Copper alloy bolting for the columns exposed to raw water has loss of material managed by the Bolting Integrity (B.2.3.9) AMP. A generic note E and a plant-specific note are used. Similarly, as listed in Table 3.5.2-13, loss of material for copper alloy structural bolting exposed to a raw water environment in the bay is managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP, which takes an exception. A generic note E and a plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 037	Steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801 as supplemented by LR-ISG-2013-01. Loss of material and fouling of steel piping and piping components exposed to raw water in the SSW and EDG and Auxiliary Systems is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Loss of material for non-GL 89-13 steel piping and piping components exposed to raw water in the auxiliary systems is addressed by item 3.3-1, 064 and 3.3-1, 088.
3.3-1, 038	Copper alloy, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. Loss of material and fouling of copper alloy and steel heat exchanger components supplied with raw water from the SSW System are managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. These include – • SI pump lube oil coolers, • Centrifugal charging pump oil coolers, • Component cooling water heat exchangers, and • EDG jacket water coolers. In addition, loss of coating / lining integrity of the EDG jacket water cooler channel head is also addressed in item 3.3-1, 138.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 039	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not used. Loss of material of stainless steel piping and piping components exposed to raw water in the SSW is addressed in item 3.3-1, 040 below.
3.3-1, 040	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. Loss of material and fouling of stainless steel piping and piping components exposed to raw water in the SSW is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Loss of material and fouling of stainless steel CCP heat exchanger components exposed to raw water in the CVCS is also managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Loss of material and fouling of stainless steel non-GL 89-13 portions of the auxiliary systems exposed to raw water are addressed in item 3.3-1, 088, (per LR-ISG-2012-02) and 3.3-1, 066.
3.3-1, 041	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Not used. As listed in Table 3.3.2-5, there are no stainless steel piping or piping components exposed to raw water in the EDG and Auxiliary Systems. Loss of material of stainless steel piping, and piping components exposed to raw water in other auxiliary systems is addressed by item 3.3-1, 040.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 042	Copper alloy, Titanium, Stainless steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Reduction of heat transfer of copper alloy heat exchanger tubes exposed to raw water in the centrifugal charging pump oil cooler, CCW heat exchanger, and EDG jacket water heat exchanger, as well as in the stainless steel SSW pump motor bearing cooler is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. Reduction of heat transfer of copper alloy heat exchanger tubes exposed to raw water in the ESF SI pump oil cooler is also managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. There are no titanium heat exchanger tubes exposed to raw water in the auxiliary systems. Reduction of heat transfer for stainless steel ESF containment spray pump oil cooler tubes, supplied by the SSW, is addressed in item 3.2-1, 027.
3.3-1, 043	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Cracking of stainless steel piping and piping components exposed to closed-cycle cooling water >60°C (>140°F) in the CVCS and EDG and Auxiliary Systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 044	Stainless steel; steel with stainless steel cladding Heat Exchanger components exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Cracking of stainless steel heat exchanger components exposed to closed-cycle cooling water >60°C (>140°F) in the CVCS is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. There are no steel with stainless steel cladding heat exchanger components exposed to closed-cycle cooling water >60°C (>140°F) in the auxiliary systems.
3.3-1, 045	Steel Piping, piping components, and piping elements; tanks exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of steel, including cast iron, piping and piping components and tanks exposed to closed-cycle cooling water in the auxiliary systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 046	Steel, Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, “Closed Treated Water Systems”	No	Consistent with exception to NUREG-1801. Loss of material of steel and copper alloy heat exchanger components, cooling/fan coil unit components, piping, and piping components exposed to closed-cycle cooling water in the auxiliary systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801.
3.3-1, 047	Not applicable. This line item only applies to BWRs.				
3.3-1, 048	Aluminum Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, “Closed Treated Water Systems”	No	Not applicable. There are no aluminum piping or piping components exposed to closed-cycle cooling water in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 049	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel piping and piping components, as well as stainless steel heat exchanger components and tanks, exposed to closed-cycle cooling water in the auxiliary systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. As listed in Table 3.4.2-4f, loss of material for the stainless steel heat exchanger, piping, and piping components in the Turbine Plant Cooling Water System are also managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 050	Stainless steel, Copper Alloy, Steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with exception to NUREG-1801. Reduction of heat transfer of stainless steel and copper alloy heat exchanger tubes/coils exposed to closed-cycle cooling water in the auxiliary systems is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. Reduction of heat transfer for the cast iron turbocharger casing exposed to closed-cycle cooling water in the EDG and Auxiliary Systems is also managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. There are no other steel heat exchanger tubes or coil components with a heat transfer function in the auxiliary systems.
3.3-1, 051	Boraflex Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Chapter XI.M22, "Boraflex Monitoring"	No	Not applicable. There are no Boraflex neutron-absorbing sheets at CPNPP. BORAL neutron-absorbing sheets are used and are addressed in item 3.3-1, 102 below.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 052	Steel Cranes: rails and structural girders exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Consistent with NUREG-1801. Loss of material for steel crane bridges/trolleys/girders is managed by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP. As listed in Table 3.5.2-14, the majority of the crane components are exposed to air – indoor uncontrolled. Some are located outdoors, and a plant-specific note is used.
3.3-1, 053	Steel Cranes – rails exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Not used. Loss of material for crane rails is included in item 3.3-1, 052 above.
3.3-1, 054	Copper alloy Piping, piping components, and piping elements exposed to Condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M24, "Compressed Air Monitoring"	No	Not used. The Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the compressed air remains dry in item 3.3-1, 114 below. Generic note E and plant-specific note is used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 055	Steel Piping, piping components, and piping elements: compressed air system exposed to Condensation (Internal)	Loss of material due to general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No	Not used. As listed in Table 3.3.2-8c, the Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the compressed air remains dry in item 3.3-1, 121 below. Generic note E and a plant-specific note are used. In addition, as listed in Table 3.3.2-3, loss of material for steel piping and piping components in the Compressed Air and Plant Gas Systems (that are normally empty or upstream of air dryers and exposed to an air indoor – uncontrolled environment) are included in item 3.2-1, 044.
3.3-1, 056	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No	Not used. The Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the compressed air remains dry in item 3.3-1, 120 below. Generic note E and a plant-specific note are used.
3.3-1, 057	Elastomers Fire barrier penetration seals exposed to Air – indoor, uncontrolled, Air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	Chapter XI.M26, “Fire Protection”	No	Consistent with NUREG-1801. As listed in Table 3.5.2-15, hardening and loss of strength of elastomer fire barrier penetration seals is managed by the Fire Protection (B.2.3.15) AMP.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 058	Steel Halon/carbon dioxide fire suppression system piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M26, “Fire Protection”	No	Consistent with NUREG-1801. As listed in Table 3.3.2-7, loss of material of steel Halon fire suppression system piping, and piping components exposed to air – indoor, uncontrolled is managed by the Fire Protection (B.2.3.15) AMP.
3.3-1, 059	Steel Fire rated doors exposed to Air – indoor, uncontrolled, Air – outdoor	Loss of material due to wear	Chapter XI.M26, “Fire Protection”	No	Consistent with NUREG-1801. As listed in Table 3.5.2-15, loss of material for steel (and galvanized steel) fire barrier doors, as well as cable raceways, hatches, penetration sleeves, wall, floor, ceiling assemblies and hose stations is managed by the Fire Protection (B.2.3.15) AMP.
3.3-1, 060	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air – indoor, uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. As listed in Table 3.5.2-15, cracking of indoor concrete fire barrier hatches, walls, floors, and ceilings is managed by the Fire Protection (B.2.3.15) AMP and Structures Monitoring (B.2.3.34) AMP.
3.3-1, 061	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. As listed in Table 3.5.2-15, cracking, and loss of material of outdoor concrete fire barrier hatches, walls, floors, and ceilings are managed by the Fire Protection (B.2.3.15) AMP and Structures Monitoring (B.2.3.34) AMP. As described in Section 3.5.2.2.2.1, cracking, and loss of material due to freeze-thaw is not an AERM at CPNPP.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 062	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air – indoor, uncontrolled, Air – outdoor	Loss of material due to corrosion of embedded steel	Chapter XI.M26, "Fire Protection," and Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. As listed in Table 3.5.2-15, loss of material of indoor concrete fire barrier hatches, walls, floors, and ceilings is managed by the Fire Protection (B.2.3.15) AMP and Structures Monitoring (B.2.3.34) AMP.
3.3-1, 063	Steel Fire Hydrants exposed to Air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M27, "Fire Water System"	No	Consistent with exception to NUREG-1801. As listed in Table 3.3.2-7, loss of material of steel (cast iron) fire hydrants exposed to air – outdoor in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801.
3.3-1, 064	Steel, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2012-02. Loss of material, fouling, and flow blockage of steel and copper alloy piping and piping components exposed to raw water in the FPS are managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. This line item is also used for flow blockage of cement lined ductile iron exposed to raw water.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 065	Aluminum Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Not applicable. There are no aluminum piping or piping components exposed to raw water in the FPS.
3.3-1, 066	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2012-02. Loss of material, fouling, and flow blockage of stainless steel piping components exposed to raw water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801.
3.3-1, 067	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not used. Loss of material of the steel FWSTs exposed to air – outdoor (external) in the FPS is addressed by item 3.3-1, 136.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 068	Steel Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Loss of material of steel piping and piping components exposed to fuel oil in the FPS is managed by the Fuel Oil Chemistry (B.2.3.17) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Fuel Oil Chemistry (B.2.3.17) AMP to manage loss of material. Furthermore, loss of material for steel EDG and Auxiliary Systems piping and piping components, as well as tanks containing fuel oil in the EDG and Auxiliary and Fire Protection Systems is addressed in item 3.3-1, 070 below.
3.3-1, 069	Copper alloy Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. There are no copper alloy piping and piping components exposed to fuel oil in the EDG and Auxiliary Systems and Fire Protection System and no other auxiliary systems exposed to fuel oil.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 070	Steel Piping, piping components, and piping elements; tanks exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M30, “Fuel Oil Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801. Loss of material and fouling of steel piping, piping components, and tanks exposed to fuel oil in the EDG and Auxiliary and Fire Protection Systems is managed by the Fuel Oil Chemistry (B.2.3.17) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Fuel Oil Chemistry (B.2.3.17) AMP to manage loss of material and fouling.
3.3-1, 071	Stainless steel, Aluminum Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M30, “Fuel Oil Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel piping and tubing exposed to fuel oil in the EDG and Auxiliary and Fire Protection Systems is managed by the Fuel Oil Chemistry (B.2.3.17) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Fuel Oil Chemistry (B.2.3.17) AMP to manage loss of material. There are no aluminum piping or piping components exposed to fuel oil in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 072	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Treated water, Closed-cycle cooling water, Soil, Raw water, Waste water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Consistent with NUREG-1801 as supplemented by LR-ISG-2012-02. Selective leaching of gray cast iron, cement-lined ductile iron and copper alloy (>15% Zn or >8% Al) piping, piping components, and heat exchanger components exposed to treated water, closed-cycle cooling water, soil, raw water, and waste water in the auxiliary systems is managed by the Selective Leaching (B.2.3.20) AMP. Furthermore, as listed in Table 3.3.2-12 and Table 3.5.2-13, closure, and support bolting for the SSW pump columns are the same aluminum bronze material as the pumps and are submerged in the SWIS Bay, and susceptible to selective leaching that is managed by the Selective Leaching (B.2.3.20) AMP. A generic note F and a plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 073	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air – outdoor	Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no concrete or cementitious piping, and piping components exposed to air – outdoor in the SSW System or other auxiliary systems. As listed in Table 3.3.2-7, cement-lined ductile iron piping in the FPS is buried in the yard and is not exposed to outdoor air. In addition, the cement lining is internal to the piping and addressed with items 3.3-1, 064; 3.3-1, 072; 3.3-1, 106; 3.3-1, 138; 3.3-1, 139 and 3.3.1-140.
3.3-1, 074	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air – outdoor	Cracking due to settling	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. As described for item 3.3-1, 073, there are no concrete or cementitious piping or piping components exposed to air – outdoor in the auxiliary systems.
3.3-1, 075	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Air – outdoor	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no reinforced concrete or asbestos cement piping or piping components exposed to air – outdoor in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 076	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal/External)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Hardening and loss of strength of elastomers, elastomer seals and components exposed to air – indoor, uncontrolled (internal/external) in the Compressed Air and Gas, EDG and Auxiliary, Fire Protection, and {non-containment) Plant Ventilation Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. In addition, as listed in Table 3.1.2-3, hardening and loss of strength of the elastomer RCP oil lift pot/reservoir exposed to air – indoor, uncontrolled (external) is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Furthermore, the elastomer diaphragm for the Reactor Makeup Water Storage Tank (RMSWT) is not subject to hardening or loss of strength as the interior of the missile-protected concrete tank does not include lighting or direct sunlight. A generic note G and a plant-specific note are used.
3.3-1, 077	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air – outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. As described for item 3.3-1, 073 above, there are no concrete or cementitious piping or piping components exposed to air – outdoor in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 078	Steel Piping and components (External surfaces), Ducting and components (External surfaces), Ducting; closure bolting exposed to Air – indoor, uncontrolled (External), Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-1801. Loss of material of the external surfaces of steel (including galvanized steel and cast iron) piping and piping components, ducting, and ducting components, as well as tanks and heat exchanger components exposed to air – indoor, uncontrolled (external), air – outdoor (external), or condensation (external) in the auxiliary systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP.
3.3-1, 079	Copper alloy Piping, piping components, and piping elements exposed to Condensation (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-1801. Loss of material of the copper alloy piping, piping components, and cooling coil/unit components exposed to condensation (external) in the SSW, Ventilation Chilled Water, and Plant Ventilation Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Copper alloy cooling coil fins and cooling coils exposed to condensation (external) in the Containment Ventilation System is also managed under this item by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Generic note E and a plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 080	Steel Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-1801. Loss of material of steel heat exchanger components exposed to air – indoor, uncontrolled (external) in the auxiliary systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Steel intercooler heat exchanger tubesheets exposed to air – indoor uncontrolled (external) in the EDG and Auxiliary Systems is managed under this item by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Generic Note E and a plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 081	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Air – outdoor (External), Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. The External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP will manage loss of material for the aluminum insulation jacketing commodity on components located outdoors, as listed in Table 3.5.2-13. The copper alloy deluge spray nozzles exposed to outdoor air in the FPS are addressed in item 3.3-1, 131. There are no other copper alloy piping or piping components exposed to outdoor air in the auxiliary systems. Aluminum piping and ducting components exposed to indoor or outdoor air in the EDG and Auxiliary and Miscellaneous Ventilation Systems are addressed in item 3.3-1, 113. A generic note I and a plant-specific note are used for the outdoor air environment.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 082	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material of elastomers, elastomer seals and components exposed to air – indoor, uncontrolled (external) in the Compressed Air and Gas, EDG and Auxiliary, Fire Protection, and (non-Containment) Ventilation Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. In addition, as listed in Table 3.1.2-3, loss of material for the elastomer RCP oil lift pot/reservoir exposed to air – indoor, uncontrolled (external) is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. A generic note C and a plant-specific note are used.
3.3-1, 083	Stainless steel Diesel engine exhaust piping, piping components, and piping elements exposed to Diesel exhaust	Cracking due to stress corrosion cracking	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Cracking of stainless steel piping components (expansion joints) exposed to diesel exhaust in the EDG and Auxiliary and Fire Protection Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.3-1, 084	[There is no 3.3-1, 084 in NUREG-1800]				

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 085	Elastomers Elastomer seals and components exposed to Closed-cycle cooling water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Not applicable. There are no elastomer components exposed to closed-cycle cooling water in the auxiliary systems.
3.3-1, 086	Elastomers Elastomers, linings, Elastomer: seals and components exposed to Treated borated water, Treated water, Raw water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-1801. As listed in Table 3.3.2-4, hardening and loss of strength of elastomer components exposed to treated water in the DRMWS is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. There are no elastomers, elastomer linings or seals exposed to raw water or treated borated water in the auxiliary systems.
3.3-1, 087	[There is no 3.3-1, 087 in NUREG-1800]				

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 088	Steel; stainless steel Piping, piping components, and piping elements, Piping, piping components, and piping elements, diesel engine exhaust exposed to Raw water (potable), Diesel exhaust	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-1801. Loss of material of steel and stainless steel piping and piping components exposed to diesel engine exhaust in the EDG and Auxiliary and Fire Protection Systems or to raw water in the Control Room Ventilation System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Furthermore, reduction of heat transfer for the cast iron turbocharger casing exposed to diesel exhaust is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. A plant-specific note is used. Loss of material for stainless steel piping and piping components exposed to raw water in the Potable and Sanitary Water System is also managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. As listed in Table 3.3.2-9b, there are no steel piping or piping components in the Potable and Sanitary Water System.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 089	Steel, Copper alloy Piping, piping components, and piping elements exposed to Moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	For fire water system components: Chapter XI.M27, "Fire Water System," or for other components: Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 as supplemented by LR-ISG-2012-02. Loss of material of steel piping and piping components exposed to condensation (internal), which includes moist air as defined in Table 3.0-1, in the EDG starting air sub-system is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Copper alloy and steel piping and piping components exposed to condensation (internal) or to uncontrolled indoor air in the FPS is addressed by item 3.3-1, 131.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 090	Steel Ducting and components (Internal surfaces) exposed to Condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically-influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for steel and galvanized steel drip pans exposed to condensation (internal) in the Control Room, Miscellaneous, and Primary Plant Ventilation Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Furthermore, condensation entering drain lines (piping) is considered waste water and loss of material is addressed in item 3.3-1, 091. As listed in Tables 3.3.2-8a, and 3.3.2-8c, drip pans in the Containment Ventilation System and for the Uninterruptible Power Supply coolers in are stainless steel and, therefore, are addressed in item 3.3-1, 094.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 091	Steel Piping, piping components, and piping elements; tanks exposed to Waste Water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material of steel piping, piping components, and tanks exposed to waste water in the CVCS, EDG and Auxiliary Systems, FPS (RCS oil spillage), and Ventilation System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. As listed in Table 3.4.2-4c, loss of material of steel piping and piping components exposed to waste water in the CPS is also managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.3-1, 092	Aluminum Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. There are no aluminum piping or piping components exposed to condensation (internal) in the auxiliary systems. As listed in Table 3.3.2-5, the aluminum casing of the crankcase blower in the EDG and Auxiliary Systems is exposed to waste water and loss of material is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. A generic note G and plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 093	Copper alloy Piping, piping components, and piping elements exposed to Raw water (potable)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material of copper alloy piping (tubing) components exposed to raw water (potable) in the Potable and Sanitary Water System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.3-1, 094	Stainless steel Ducting and components exposed to Condensation	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for stainless steel cooling coil headers and drip pans in the Containment Ventilation Systems and stainless steel drip pan in the Miscellaneous Ventilation Systems exposed to condensation (internal) environment is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. In addition, loss of material for stainless steel piping and piping components in the EDG starting air subsystem is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 095	Copper alloy, Stainless steel, Nickel alloy, Steel Piping, piping components, and piping elements, Heat exchanger components, Piping, piping components, and piping elements; tanks exposed to Waste water, Condensation (Internal)	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material of stainless steel, and steel piping and piping components, heat exchanger components, and tanks exposed to waste water and condensation (internal) in the Equipment and Floor Drain and Waste Processing Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. There are no nickel alloy piping or piping components, heat exchanger components, or tanks exposed to waste water and condensation (internal) in the auxiliary systems. In addition, as listed in Table 3.4.2-3, loss of material for stainless steel piping, piping components and tanks in the Steam Generator blowdown portion of the Main Steam, Reheat and Steam Dump System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 096	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to wear	Chapter XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-1801. Loss of material of elastomer components exposed to air – indoor, uncontrolled (internal) in the EDG and Auxiliary and Plant Ventilation Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.3-1, 097	Steel Piping, piping components, and piping elements, Reactor coolant pump oil collection system: tanks, Reactor coolant pump oil collection system: piping, tubing, valve bodies exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, “Lubricating Oil Analysis,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of steel piping, piping components, and tanks exposed to lubricating oil in the CVCS, EDG and Auxiliary Systems (Lubricating Oil), and Control Room Ventilation System, as well as the RCP oil lift components (as listed in Table 3.1.2-3), is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material. As listed in Table 3.3.2-7, RCS oil spillage collection sub-system (RCS OSPS) components are considered to contain waste water. Accordingly, the steel RCS OSPS piping, piping components and tanks are included with item 3.3-1, 091.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 098	Steel Heat exchanger components exposed to Lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M39, “Lubricating Oil Analysis,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of steel heat exchanger components exposed to lubricating oil in the CVCS, Chilled Water System, and EDG and Auxiliary Systems is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material. In addition, as listed in Table 3.1.2-3, loss of material for the steel RCP bearing oil cooler shell is also managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 099	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material of copper alloy piping and piping components exposed to lubricating oil in the Control Room Ventilation System, as well as copper alloy heat exchanger tubes in the CVCS, and EDG and Auxiliary Systems, is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material. There are no aluminum piping or piping components exposed to lubricating oil in the auxiliary systems.
3.3-1, 100	Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material of stainless steel piping, piping components, and piping elements (sight glass frame), as well as stainless steel heat exchanger components, exposed to lubricating oil in the CVCS, EDG and Auxiliary Systems, SSW System, and Control Room Ventilation System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 101	Aluminum Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, “Lubricating Oil Analysis,” and Chapter XI.M32, “One-Time Inspection”	No	Not applicable. There are no aluminum heat exchanger tubes exposed to lubricating oil in the auxiliary systems.
3.3-1, 102	Boral®; boron steel, and other materials (excluding Boraflex) Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of“ SFP environment	Chapter XI.M40, “Monitoring of Neutron-Absorbing Materials other than Boraflex”	No	Consistent with NUREG-1801. As listed in Table 3.5.2-5, reduction of neutron-absorbing capacity, change in dimensions, and loss of material of Boral® spent fuel storage rack neutron-absorbing sheets exposed to treated borated water is managed by the Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26) AMP.
3.3-1, 103	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Soil or concrete	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive“ chemical attack	Chapter XI.M41, “Buried” and Underground Piping and Tanks”	No	Not applicable. There are no reinforced concrete or asbestos cement piping and piping components exposed to soil or concrete in the auxiliary systems.
3.3-1, 104	HDPE, Fiberglass Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, “Buried” and Underground Piping and Tanks”	No	Not applicable. There are no HDPE or fiberglass piping or piping components exposed to soil or concrete in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 105	Concrete cylinder piping, Asbestos cement pipe Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, spalling, corrosion of rebar due to "exposure of rebar	Chapter XI.M41, "Buried" and Underground Piping and Tanks"	No	Not applicable. There are no concrete cylinder piping, asbestos cement piping, or piping components exposed to soil or concrete in the auxiliary systems.
3.3-1, 106	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried" and Underground Piping and Tanks"	No	Consistent with exception to NUREG-1801. Loss of material of steel (with coating or wrapping) piping and piping components, as well as storage tanks, exposed to soil in the EDG and Auxiliary Systems (Fuel Oil), FPS, and SSW System is managed by the Buried and Underground Piping and Tanks (B.2.3.27) AMP, which takes exception to NUREG-1801. Steel piping exposed to concrete in the FPS is included in item 3.3-1, 120. Additionally, as listed in Tables 3.5.2-5 and 3.5.2-8, below grade piping penetrations for the FB and SWIS have coated steel plate collars exposed to soil that are managed by the Structures Monitoring (B.2.3.34) AMP, which includes inspection of inaccessible components when excavated for other reasons. A generic note E and plant-specific note are used."

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 107	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, “Buried” and Underground Piping and Tanks”	No	Not used. Stainless steel piping exposed to concrete in the DRMWS, Process and Effluent Radiation Monitoring and Sampling System, and SFS is addressed in item 3.3-1, 120, along with the stainless steel liner of the concrete RMWST. There are no nickel alloy piping or piping components exposed to soil or concrete in the auxiliary systems.
3.3-1, 108	Titanium, super austenitic, aluminum, copper alloy, stainless steel, nickel alloy piping, piping components, and piping elements, bolting exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, “Buried” and Underground Piping and Tanks”	No	Not used. Loss of material of stainless steel piping and piping components exposed to concrete in the DRMWS, Process and Effluent Radiation Monitoring and Sampling System, and SFS is addressed in item 3.3-1, 120, along with the stainless steel liner of the concrete RMWST. There is no titanium, super austenitic, aluminum, copper alloy, or nickel alloy piping or piping component bolting exposed to soil or concrete in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 109	Steel Bolting exposed to Soil or concrete	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried" and Underground Piping and Tanks"	No	Consistent with exception to NUREG-1801. Loss of material of steel bolting exposed to soil in the EDG and Auxiliary Systems (Fuel Oil), FPS, and SSW System is managed by the Buried and Underground Piping and Tanks (B.2.3.27) AMP, which takes exception to NUREG-1801. There is no steel bolting exposed to concrete in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 109.5	Underground aluminum, copper alloy, stainless steel, nickel alloy steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no underground aluminum, copper alloy, stainless steel, steel piping or piping components in the auxiliary systems, with the underground environment defined in Table 3.0-1. Also, as described in Section 2.4.11, the tunnel to the Seismic Category I RMWST is accessible and considered to be a separate room in the Safeguards Building and assigned an air – indoor uncontrolled environment. As described in Section 2.4.5, the same is true of the service water tunnel that passes through the shared FB. Furthermore, as listed in Table 3.3.2-5, piping, and piping components associated with the EDG fuel oil storage tanks are exposed to indoor or outdoor air and are not located in an underground vault.
3.3-1, 110	Not applicable. This line item only applies to BWRs.				
3.3-1, 111	Steel Structural steel exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Not used. The CPNPP new fuel storage racks are stainless steel and addressed with item 3.3-1, 120. Loss of material of structural steel exposed to indoor air is addressed with item 3.5-1, 077 below.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 112	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Consistent with NUREG-1801. As listed in Table 3.3.2-7, steel fire protection piping includes piping that is completely encased in concrete and protected from external aging effects. Also, as listed in Table 3.5.2-1, the steel guard pipes for Containment recirculation sump effluent (post-accident) are completely encased in concrete and protected from external aging effects. A plant-specific note is used. In addition - 1) As described in Section 3.5.2.2 Attributes of CPNPP concrete are consistent with ACI 318. 2) Degradation of concrete that would allow exposure of embedded piping to groundwater has not been identified.
3.3-1, 113	Aluminum Piping, piping components, and piping elements exposed to Air – dry (Internal/External), Air indoor, uncontrolled (Internal/External), Air indoor, controlled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Aluminum fan housings and crankcase vacuum blowers exposed to indoor air in the Miscellaneous Ventilation Systems and EDG and Auxiliary Systems, respectively, are not subject to aging effects. Fans housings are also exposed to outdoor air. A generic note I and plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 114	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Copper alloy components exposed to indoor air or gas in the auxiliary systems are not subject to aging effects. In addition, as listed in Table 3.3.2-3, the Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the air remains dry, such that copper alloy components exposed to the environment are not subject to aging. A generic note E and plant-specific note are used.
3.3-1, 115	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3-1, 116	Galvanized steel Piping, piping components, and piping elements exposed to Air - indoor, uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 117	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Closed-cycle cooling water, Air – outdoor, Fuel oil, Raw water, Treated water, Treated borated water, Air with borated water leakage, Condensation (Internal/External) Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3-1, 118	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3-1, 119	Nickel alloy, PVC, Glass Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal), Waste Water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 120	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Also includes stainless steel ducting components, heat exchanger components, and tanks, as well as stainless steel new fuel storage racks and doors in Section 3.5.2. Furthermore, as listed in Table 3.4.2-3, also includes stainless steel components exposed to air with borated water leakage in the Main Steam, Reheat and Steam Dump systems. In addition, as listed in Tables 3.3.2-3 and 3.4.2-1, the Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the air remains dry, such that stainless steel components exposed to the environment in the Compressed Air and Plant Gas and Auxiliary Feedwater Systems are not susceptible to aging degradation. A generic note E and plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 121	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. As listed in Table 3.2.2-5, also includes carbon steel components exposed to gas in the SIS. In addition, as listed in Tables 3.3.2-8c and 3.4.2-1, the Compressed Air Monitoring (B.2.3.14) AMP is credited with ensuring the air remains dry, such that carbon steel components exposed to a dry air environment in the Miscellaneous Ventilation Systems and AFWS, respectively, are not susceptible to aging degradation. A generic note E and plant-specific note are used.
3.3-1, 122	Titanium Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrol–ed or Air – outdoor	None	None	NA - No AEM or AMP	Not applicable. There are no titanium heat exchanger components, piping, or piping components exposed to air – indoor, uncontrolled or air – outdoor in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 123	Titanium (ASTM Grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) Heat exchanger components other than tubes, Piping, piping components, and piping elements exposed to raw water	None	None	NA - No AEM or AMP	Not applicable. There are no titanium (ASTM grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) heat exchanger components, piping, or piping components exposed to raw water in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 124	Stainless steel, Steel (with stainless steel or nickel-alloy cladding) Spent fuel storage racks (BWR), Spent fuel storage racks (PWR), Piping, piping components, and piping elements; exposed to Treated water >60°C (>140°F), Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2011-01. Cracking of stainless steel piping, piping components, as well as heat exchanger components and tanks exposed to treated borated water >60°C (>140°F) in the CVCS, Process and Effluent Radiation Monitoring and Sampling System, and SFS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. Cracking of stainless steel spent fuel storage racks, as listed in Table 3.5.2-5, is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. A plant-specific note is used. There are no spent fuel storage racks (BWR) at CPNPP. There are no steel (with stainless steel or nickel alloy cladding) spent fuel storage racks (PWR) at CPNPP.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 125	Steel (with stainless steel cladding); stainless steel Spent fuel storage racks (BWR), Spent fuel storage racks (PWR), Piping, piping components, and piping elements exposed to Treated Water, Treated borated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2011-01. Loss of material of stainless steel piping, and piping components, as well as heat exchanger components and tank exposed to treated borated water in the CVCS, Process and Effluent Radiation Monitoring and Sampling System, and SFS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of stainless steel spent fuel storage racks, as listed in Table 3.5.2-5, is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. There are no spent fuel storage racks (BWR), or Steel (with stainless steel cladding) spent fuel storage racks (PWR), piping, or piping components exposed to treated water or treated borated water in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 126	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated), raw water	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2012-01. Wall thinning (due to erosion) of carbon steel, cast iron, copper alloy, and stainless steel piping exposed to closed-cycle cooling water, raw water, treated water, or treated borated water in the CVCS, CCW System, Demineralized and Reactor Water Makeup System, and Process Effluent Radiation Monitoring and Sampling System, as well as in the NNS portions of the SSW System is managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801. As listed in Table 3.2.2-5, for heat exchanger components exposed to raw water in the SIS, wall thinning (due to erosion) is also managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801. As listed in Table 3.3.2-12, wall thinning (loss of material) of steel and stainless steel piping exposed to raw water in the nuclear safety related portions of the SSW System is managed by the Open-Cycle Cooling Water System (B.2.3.11) AMP. A Generic Note E and a plant-specific note are used.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3-1, 127	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific (See SRP Subsection 3.3.2.2.8)	Not applicable. Loss of material due to recurring internal corrosion has not been identified in metallic piping, piping components, and tanks exposed to raw water or waste water in the auxiliary systems. Further evaluation is documented in subsection 3.3.2.2.8.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 128	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, or crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not used. Other than the RMWSTs, FOSTs, and FWSTs, metallic tanks in the auxiliary systems are located indoors and not exposed to soil or concrete. Also, tank capacities are less than 100,000 gallons. As described in Section 2.4.11, the RMWST in the Demineralized and Reactor Water Makeup System is a reinforced concrete tank. Aging management review of the concrete is listed in Table 3.5.2-11. As described in Section 2.3.3.5, the carbon steel FOST is buried in soil. Loss of material for the surface exposed to soil is addressed in item 3.3-1, 106. As described in Section 2.3.3.7, the carbon steel FWST in the FPS is located outdoors. Loss of material for the steel exposed to outdoor air is addressed in item 3.3-1, 136 below. In addition, the Fire Water System (B.2.3.16) AMP includes enhancement to address the steel/concrete interface. Therefore, there are no CPNPP tanks in the auxiliary systems that fit the scope of NUREG-1801, AMP XI.M29, Aboveground Metallic Tanks, as supplemented by LR-ISG-2012-02.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 129	Steel tanks exposed to soil or concrete; air-indoor uncontrolled, raw water, treated water, waste water, condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Not applicable. As discussed for item 3.3-1, 128, there are no CPNPP Tanks in the scope of NUREG-1801, AMP XI.M29, Aboveground Metallic Tanks, as supplemented by LR-ISG-2012-02.
3.3-1, 130	Metallic sprinklers exposed to air-indoor controlled, air-indoor uncontrolled, air-outdoor, moist air, condensation, raw water, treated water	Loss of material due to general (where applicable), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, “Fire Water System”	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2012-02. Loss of material, fouling, and flow blockage of metallic sprinklers exposed to air-indoor uncontrolled and treated water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801.
3.3-1, 131	Steel, stainless steel, copper alloy, or aluminum fire water system piping, piping components and piping elements exposed to air-indoor uncontrolled (internal), air-outdoor (internal), or condensation (internal)	Loss of material due to general (steel, and copper alloy only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, “Fire Water System”	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2012-02. Loss of material, fouling, and flow blockage of carbon steel (including cast iron), copper alloy and stainless steel Fire Water System (B.2.3.16) piping, and piping components exposed to air-indoor, air-outdoor, or condensation in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. There are no aluminum piping or piping components in the FPS.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 132	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion; cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy“ (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, “Aboveground Metallic Tanks” (for tanks only)	No	Consistent with NUREG-1801, as supplemented by LR-ISG-2012-02. Cracking and loss of material of insulated copper alloy >15% Zn or >8% Al and stainless steel piping and piping components exposed to condensation in the CCW, Ventilation Chilled Water and SSW Systems or components supplied by them is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Loss of material of insulated steel piping and piping components and heat exchanger component (letdown chiller shell) exposed to condensation or outdoor air in the CVCS, CCW System, FPS, and SSW System or components supplied by them is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP.
3.3-1, 133	Underground HDPE piping, piping components, and piping elements in an air-indoor uncontrolled or condensation (external) environment	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, “Buried and Underground Piping and Tanks”	No	Not applicable. There are no underground HDPE piping or piping components exposed to an air-indoor uncontrolled or condensation (external) environment in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 134	Steel, stainless steel, or copper alloy piping, piping components, and piping elements, and heat exchanger components exposed to a raw water environment (for nonsafety-related components not covered by NRC GL 89-13)	Loss of material due to general (steel and copper alloy only), pitting, crevice, and microbiologically influenced (MIC) corrosion, fouling that leads to corrosion	Chapter XI.MI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	No	Consistent with NUREG-1801. Loss of material for carbon steel, and stainless steel; as well as copper alloy; piping and piping components exposed to a raw water environment, in the SSW System, outside of the GL 89-13 scope, is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.3-1, 135	Steel or stainless steel pump casings submerged in a waste water (internal and external) environment	Loss of material due to general (steel only), pitting, crevice, and microbiologically influenced corrosion	Chapter XI.MI.M36, “External Surfaces Monitoring of Mechanical Components”	No	Not applicable. There are no steel or stainless steel pump casings submerged in a waste water environment in the auxiliary systems.
3.3-1, 136	Steel, stainless steel or aluminum fire water storage tanks exposed to air-indoor uncontrolled, air-outdoor, condensation, moist air, raw water, treated water	Loss of material due to general (steel only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M27, "Fire Water System"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2012-02. Loss of material and fouling of steel FWSTs exposed to air-outdoor and treated water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. Loss of material, cracking, and fouling of stainless steel piping and piping components exposed to treated water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. There are no aluminum tanks in the FPS or other auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 137	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water, treated borated water	Loss of material due to general (steel only) pitting and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not used. As discussed for item 3.3-1, 128 above, there are no CPNPP Tanks in the scope of NUREG-1801, AMP XI.M29, Aboveground Metallic Tanks, as supplemented by LR-ISG-2012-02. The FWST for each unit is exposed to treated water and addressed in item 3.3-1, 136 above. Loss of material for stainless steel tanks exposed to treated borated water in the CVCS and SFS is included with item 3.3-1, 125 above. As listed in Tables 3.3.2-1 and 3.3.2-4, respectively, loss of material for carbon steel and stainless steel tanks, including tank liners, exposed to treated water in the CVCS and Demineralized and Reactor Water Makeup System is included with Steam and Power Conversion tanks in item 3.4-1, 012 below .

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 138	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, or fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2013-01. Loss of coating or lining integrity of metallic piping, piping components, heat exchanger with internal coatings / linings exposed to raw water or treated water in the CCW System, EDG and Auxiliary Systems, SSW System, and FPS is managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP, which takes exception to NUREG-1801. As listed in Table 3.3.2-7, loss of coating or lining integrity of FWSTs with internal coatings / linings exposed to treated water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. A generic note E and a plant-specific note are used. There are no metallic piping, piping components, heat exchangers, or tanks with internal coatings/linings exposed to closed-cycle cooling water, treated borated water, lubricating oil, or fuel oil in the auxiliary systems.

Table 3.3-1 Summary of Aging Management Programs for Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3-1, 139	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2013-01. Loss of material for metallic piping, piping components, and heat exchanger components with internal coatings / linings exposed to raw water or treated water in the CCW System, EDG and Auxiliary Systems, SSW System, and FPS is managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP, which takes exception to NUREG-1801.
3.3-1, 140	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with exception to NUREG-1801, as supplemented by LR-ISG-2013-01. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP is credited to manage loss of material/selective leaching for cement-lined ductile iron exposed to raw water or treated water in the FPS. There are no other cast iron components with internal coatings

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blender housing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Blender housing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Blender housing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Ejector (Recycle holdup tank)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Ejector (Recycle holdup tank)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Ejector (Recycle holdup tank)	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Filter element	Filter	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Filter element	Filter	Stainless steel	Treated borated water >140°F (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Filter housing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Filter housing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Filter housing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Filter housing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Flexible hose	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible hose	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flexible hose	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Flow element	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Flow element	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flow element	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Flow element	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Throttle	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Flow element	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flow element	Throttle	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Heat exchanger (CCP oil cooler) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (CCP oil cooler) channel head	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	C
Heat exchanger (CCP oil cooler) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (CCP oil cooler) shell	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-138	3.3-1, 100	C
Heat exchanger (CCP oil cooler) tubes	Heat transfer	Copper alloy	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-78	3.2-1, 051	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (CCP oil cooler) tubes	Heat transfer	Copper alloy	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-72	3.3-1, 042	A
Heat exchanger (CCP oil cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-133	3.3-1, 099	C
Heat exchanger (CCP oil cooler) tubes	Pressure boundary	Copper alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-179	3.3-1, 038	A
Heat exchanger (CCP oil cooler) tubesheet	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-138	3.3-1, 100	C
Heat exchanger (CCP oil cooler) tubesheet	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	C
Heat exchanger (chiller unit condenser) channel head	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (chiller unit condenser) channel head	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (chiller unit condenser) channel head	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (chiller unit condenser) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (chiller unit condenser) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (chiller unit condenser) shell	Leakage boundary (spatial)	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Heat exchanger (chiller unit evaporator) channel head	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (chiller unit evaporator) channel head	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (chiller unit evaporator) channel head	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (chiller unit evaporator) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (chiller unit evaporator) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (chiller unit evaporator) shell	Leakage boundary (spatial)	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Heat exchanger (evaporator) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (evaporator) channel head	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	D C
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (excess letdown) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (excess letdown) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (excess letdown) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (excess letdown) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (excess letdown) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (excess letdown) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (excess letdown) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-188	3.3-1, 050	B
Heat exchanger (excess letdown) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (excess letdown) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (excess letdown) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (excess letdown) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (excess letdown) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (excess letdown) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (excess letdown) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (excess letdown) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (excess letdown) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (feed preheater) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (feed preheater) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (feed preheater) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	D C
Heat exchanger (letdown chiller) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (letdown chiller) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (letdown chiller) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (letdown chiller) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (letdown chiller) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (letdown chiller) shell (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.E1.A-405	3.3-1, 132	A
Heat exchanger (letdown chiller) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-188	3.3-1, 050	B
Heat exchanger (letdown chiller) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (letdown chiller) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (letdown chiller) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown chiller) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (letdown chiller) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (letdown reheat) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (letdown reheat) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (letdown reheat) shell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) shell	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (letdown reheat) tubes	Heat transfer	Stainless steel	Treated borated water (external)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (letdown reheat) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (letdown reheat) tubes	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (letdown reheat) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (letdown reheat) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown reheat) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (letdown reheat) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (letdown) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-69	3.3-1, 003	E, 2
Heat exchanger (letdown) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (letdown) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (letdown) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (letdown) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (letdown) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-188	3.3-1, 050	B
Heat exchanger (letdown) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (letdown) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (letdown) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (letdown) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-69	3.3-1, 003	E, 2
Heat exchanger (letdown) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (letdown) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (letdown) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (letdown) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-69	3.3-1, 003	E, 2
Heat exchanger (moderating) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (moderating) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (moderating) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (moderating) shell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (moderating) shell	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (moderating) tubes	Heat transfer	Stainless steel	Treated borated water (external)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (moderating) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (moderating) tubes	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (moderating) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (moderating) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (moderating) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (moderating) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (moderating) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (positive displacement charging pump oil cooler) channel head	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (positive displacement charging pump oil cooler) channel head	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (positive displacement charging pump oil cooler) channel head	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (positive displacement charging pump oil cooler) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (positive displacement charging pump oil cooler) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (positive displacement charging pump oil cooler) shell	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	C
Heat exchanger (positive displacement charging pump oil cooler) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger (positive displacement charging pump oil cooler) tubes	Heat transfer	Copper alloy	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.D1.EP-78	3.2-1, 051	A
Heat exchanger (positive displacement charging pump oil cooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (positive displacement charging pump oil cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-133	3.3-1, 099	C
Heat exchanger (positive displacement charging pump oil cooler) tubesheet	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (positive displacement charging pump oil cooler) tubesheet	Pressure boundary	Copper alloy	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-133	3.3-1, 099	C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (positive displacement charging pump oil cooler) tubesheet	Pressure boundary	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.E1.AP-43	3.3-1, 072	C
Heat exchanger (recycle distillate cooler) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle distillate cooler) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle distillate cooler) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle distillate cooler) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle distillate cooler) shell	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle distillate cooler) shell	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle distillate cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle distillate cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (recycle distillate cooler) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle distillate cooler) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle distillate cooler) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle distillate cooler) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (external)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle distillate cooler) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle distillate cooler) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle evaporator grab sample cooler) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle evaporator grab sample cooler) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle evaporator grab sample cooler) channel head	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (recycle evaporator grab sample cooler) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle evaporator grab sample cooler) shell	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	D C
Heat exchanger (recycle evaporator grab sample cooler) shell	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E3.AP-112	3.3-1, 020	B A
Heat exchanger (recycle evaporator vent condenser) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle evaporator vent condenser) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle evaporator vent condenser) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle evaporator vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle evaporator vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Heat exchanger (recycle evaporator vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (recycle evaporator vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle evaporator vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle evaporator vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle evaporator vent condenser) tubes	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle evaporator vent condenser) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle evaporator vent condenser) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle evaporator vent condenser) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle evaporator vent condenser) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (recycle evaporator vent condenser) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle vent condenser) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle vent condenser) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle vent condenser) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (recycle vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Heat exchanger (recycle vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (recycle vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle vent condenser) tubes	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle vent condenser) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (recycle vent condenser) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (recycle vent condenser) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.E3.AP-192	3.3-1, 044	B
Heat exchanger (recycle vent condenser) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (recycle vent condenser) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (regenerative) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (regenerative) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (regenerative) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (regenerative) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (regenerative) shell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (regenerative) shell	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (regenerative) tubes	Heat transfer	Stainless steel	Treated borated water (internal)/(external)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (regenerative) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)/(external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (regenerative) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)/(external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (regenerative) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)/(external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (regenerative) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)/(external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (seal water) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (seal water) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (seal water) channel head	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (seal water) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (seal water) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Heat exchanger (seal water) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (seal water) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-188	3.3-1, 050	B
Heat exchanger (seal water) tubes	Heat transfer	Stainless steel	Treated borated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (seal water) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (seal water) tubes	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (seal water) tubes	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (seal water) tubesheet	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (seal water) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-118	3.3-1, 020	B A
Heat exchanger (seal water) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Moment restraint	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A, 4
Moment restraint	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B, 4 A
Moment restraint	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B, 4 A
Orifice	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Orifice	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Throttle	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-34	3.3-1, 002	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B, 1
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Piping	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-186	3.3-1, 043	B
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 3
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 3
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B, 1

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-34	3.3-1, 002	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B, 1
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 3
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 3
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B, 1
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.E1.A-405	3.3-1, 132	A
Piping element	Leakage boundary (spatial)	Glass	Air – indoor uncontrolled (external/internal)	None	None	VII.J.AP-48	3.3-1, 117	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping element	Leakage boundary (spatial)	Glass	Air with borated water leakage (external)	None	None	VII.J.AP-96	3.3-1, 117	A
Piping element	Leakage boundary (spatial)	Glass	Treated borated water (internal)	None	None	VII.J.AP-52	3.3-1, 117	A
Pump casing (boric acid transfer pump)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (boric acid transfer pump)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (boric acid transfer pump)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Pump casing (CCP auxiliary lube oil)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (CCP auxiliary lube oil)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Pump casing (CCP auxiliary lube oil)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A
Pump casing (CCP main lube oil)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-180 1 Item	Table 1 Item	Notes
Pump casing (CCP main lube oil)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Pump casing (CCP main lube oil)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-127	3.3-1, 097	A
Pump casing (CCP)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (CCP)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (CCP)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	VII.E1.AP-115	3.3-1, 007	A
Pump casing (CCP)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-114	3.3-1, 018	B A
Pump casing (chiller pump)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (chiller pump)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Pump casing (chiller pump)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	D

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (concentrate canned pump)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (concentrate canned pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (concentrate canned pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Pump casing (distillate canned pump)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (distillate canned pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (distillate canned pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Pump casing (positive displacement charging pump)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (positive displacement charging pump)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (positive displacement charging pump)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)	VII.E1.AP-115	3.3-1, 007	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (positive displacement charging pump)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-114	3.3-1, 018	B A
Pump casing (recycle evaporator feed pump)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Pump casing (recycle evaporator feed pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (recycle evaporator feed pump)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Spray nozzle	Spray	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Spray nozzle	Spray	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Spray nozzle	Spray	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (absorption tower)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (absorption tower)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (absorption tower)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (boric acid batching)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (boric acid batching)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (boric acid batching)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (boric acid)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (boric acid)	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tank (boric acid)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (boric acid)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (cation bed demineralizer)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (cation bed demineralizer)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank (cation bed demineralizer)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (chemical mixing)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (chemical mixing)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (chemical mixing)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (chiller surge)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (chiller surge)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Tank (chiller surge)	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-75	3.4-1, 012	D C
Tank (discharge dampener)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (discharge dampener)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (discharge dampener)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (mixed bed demineralizer)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (mixed bed demineralizer)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (mixed bed demineralizer)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (recycle evaporator condensate demineralizer)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (recycle evaporator condensate demineralizer)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (recycle evaporator condensate demineralizer)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (recycle evaporator feed demineralizer)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (recycle evaporator feed demineralizer)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank (recycle evaporator feed demineralizer)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (recycle evaporator reagent)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (recycle evaporator reagent)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (recycle evaporator reagent)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (stripping column)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (stripping column)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (stripping column)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (stuffing box coolant PDCP)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (stuffing box coolant PDCP)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (stuffing box coolant PDCP)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (suction stabilizer)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (suction stabilizer)	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tank (suction stabilizer)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (suction stabilizer)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (thermal regeneration demineralizer)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (thermal regeneration demineralizer)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (thermal regeneration demineralizer)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tank (volume control)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (volume control)	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank (volume control)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Tank (volume control)	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Thermowell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Thermowell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Thermowell	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Thermowell	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A
Thermowell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Thermowell	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Thermowell	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Thermowell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Thermowell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Thermowell	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A
Thermowell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Thermowell	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Trap	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Trap	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Trap	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-186	3.3-1, 043	B
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-186	3.3-1, 043	B
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Valve body	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-186	3.3-1, 043	B
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.E1.A-79	3.3-1, 009	A
Valve body	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A

Table 3.3.2-1: Chemical and Volume Control System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	B A
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 for material, environment, and aging effect but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Wall thinning due to erosion is applicable to Carbon steel and Stainless steel components exposed to non-borated treated water within the CVCS.
2. NUREG-1801 specifies a plant-specific program to verify the effectiveness of the Water Chemistry (B.2.3.2) program in preventing cracking of the non-regenerative heat exchanger components. The One-Time Inspection (B.2.3.19) program will utilize volumetric inspections to verify the absence of cracking. The Closed Treated Water Systems (B.2.3.12) program includes activities to monitor the radioactivity of the shell side water. Temperature monitoring of shell side is a less sensitive technique and is not used. (Reference Further Evaluation 3.3.2.2.2)
3. Piping associated with the following components have an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4: normal and alternate charging and letdown branch line; normal letdown and excess letdown branch line; pressurizer auxiliary spray line.
4. Structural support functions of moment restraints are managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP and evaluated in Table 3.5.2-13.

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Carbon steel	Condensation (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.D.AP-121	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Condensation (external)	Loss of preload	Bolting Integrity (B.2.3.9)	None	None	H, 1
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Condensation (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.D.AP-121	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Condensation (external)	Loss of preload	Bolting Integrity (B.2.3.9)	None	None	H, 1
Filter housing (Cartridge filter)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Filter housing (Cartridge filter)	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Flexible hose	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible hose	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Flexible hose	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Flexible hose	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Flexible hose	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Flexible hose	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Flexible hose	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Flow element	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Flow element	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Throttle	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (CCW) channel head	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (CCW) channel head	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C
Heat exchanger (CCW) channel head	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.C1.A-416	3.3-1, 138	B
Heat exchanger (CCW) channel head	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.C1.A-414	3.3-1, 139	B
Heat exchanger (CCW) channel head (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	C
Heat exchanger (CCW) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (CCW) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (CCW) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (CCW) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger (CCW) tubes	Heat transfer	Copper alloy	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-72	3.3-1, 042	A
Heat exchanger (CCW) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (CCW) tubes	Pressure boundary	Copper alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-179	3.3-1, 038	A
Heat exchanger (CCW) tubesheet	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (CCW) tubesheet	Pressure boundary	Carbon steel	Raw water (external)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-183	3.3-1, 038	A
Heat exchanger (Instrument air compressor CCW trim cooler) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (Instrument air compressor CCW trim cooler) channel head	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (Instrument air compressor CCW trim cooler) channel head (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	C

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (Instrument air compressor CCW trim cooler) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Heat exchanger (Instrument air compressor CCW trim cooler) shell	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Orifice	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Orifice	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Orifice	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Orifice	Throttle	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Piping element	Leakage boundary (spatial)	Glass	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 117	A
Piping element	Leakage boundary (spatial)	Glass	Closed-cycle cooling water (internal)	None	None	VII.J.AP-166	3.3-1, 117	A

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (CCW drain pump)	Leakage boundary (spatial)	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (CCW drain pump)	Leakage boundary (spatial)	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C
Pump casing (CCW drain pump)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	D
Pump casing (CCW drain pump)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.A-50	3.3-1, 072	C
Pump casing (CCW pumps)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (CCW pumps)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C
Pump casing (CCW pumps)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	D
Pump casing (Demineralizer metering pump)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Pump casing (Demineralizer metering pump)	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Strainer (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Strainer (Containment CCW drain tank)	Leakage boundary (spatial)	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer (Containment CCW drain tank)	Leakage boundary (spatial)	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Strainer (Containment CCW drain tank)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Strainer (Containment CCW drain tank)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.A-50	3.3-1, 072	C
Tank (CCW chemical addition tank)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (CCW chemical addition tank)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (CCW chemical addition tank)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F2.AP-202	3.3-1, 045	B
Tank (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C
Tank (CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F2.AP-202	3.3-1, 045	B
Tank (CCW surge tank)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (CCW surge tank)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C
Tank (CCW surge tank)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F2.AP-202	3.3-1, 045	B
Tank (Containment CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (Containment CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	C

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tank (Containment CCW drain tank)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F2.AP-202	3.3-1, 045	B
Tank (Demineralizer vessel and hydrazine addition tank)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C
Tank (Demineralizer vessel and hydrazine addition tank)	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Thermowell	Leakage boundary (spatial)	Nickel alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-16	3.3-1, 118	A
Thermowell	Leakage boundary (spatial)	Nickel alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	None	None	G, 2
Thermowell	Pressure boundary	Nickel alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-16	3.3-1, 118	A
Thermowell	Pressure boundary	Nickel alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	None	None	G, 2
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A

Table 3.3.2-2: Component Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

G. Environment not in NUREG-1801 for this component and material

H. Aging effect not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. The Bolting Integrity (B.2.3.9) program will be used to manage this material/environment/aging effect combination.

2. A closed-cycle cooling water environment is not in NUREG-1801 for nickel alloy components. OE from NUREG-2191 (VII.C2.A-471) indicates that nickel alloy components exposed to closed-cycle cooling water experience loss of material and are appropriately managed by the Closed Treated Water Systems (B.2.3.12) AMP.

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Filter housing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Filter housing	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Flexible hose	Pressure boundary	Elastomer	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	None	None	G, 1
Flexible hose	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible hose	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Piping	Structural integrity (attached)	Copper alloy	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-8	3.3-1, 114	E, 1

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Structural integrity (attached)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Piping	Structural integrity (attached)	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Piping	Structural integrity (attached)	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tubing	Pressure boundary	Copper alloy	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-8	3.3-1, 114	E, 1
Tubing	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Pressure boundary	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Tubing	Pressure boundary	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Structural integrity (attached)	Copper alloy	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-8	3.3-1, 114	E, 1
Tubing	Structural integrity (attached)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Structural integrity (attached)	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Tubing	Structural integrity (attached)	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Tubing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Pressure boundary	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A

Table 3.3.2-3: Compressed Air and Gas Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Valve body	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-8	3.3-1, 114	E, 1
Valve body	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.AP-66	3.3-1, 009	A
Valve body	Structural integrity (attached)	Stainless steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 1
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identified a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. The Compressed Air Monitoring (B.2.3.14) AMP is applied to assure dry-air conditions are maintained during the PEO.

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Flexible connection	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flexible connection	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Orifice	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Orifice	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Orifice	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Orifice	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Orifice	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Orifice	Throttle	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Orifice	Throttle	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	A, 5, 6
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	A, 5, 6
Piping	Pressure boundary	Stainless steel	Concrete (external)	None	None	VII.J.AP-19	3.3-1, 120	C, 4
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.E1.A-407	3.3-1, 126	B
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A, 5
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pulsation dampener	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Pulsation dampener	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Pump casing (RMWP)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Pump casing (RMWP)	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Respirator washer	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Respirator washer	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-75	3.4-1, 012	B A
Tank (fuel transfer system hydraulic power unit reservoir)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (fuel transfer system hydraulic power unit reservoir)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-75	3.4-1, 012	B A
Tank (Hot water)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tank (Hot water)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-75	3.4-1, 012	B A
Tank (RMWST) diaphragm	Diaphragm integrity	Elastomer	Air – outdoor (internal)	None	None	VII.F1.AP-102	3.3-1, 076	G, 3
Tank (RMWST) diaphragm	Diaphragm integrity	Elastomer	Gas (Internal)	None	None	VII.F1.AP-102	3.3-1, 076	G, 3
Tank (RMWST) diaphragm	Diaphragm integrity	Elastomer	Treated water (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.A3.AP-100	3.3-1, 086	C, 3
Tank liner (RMWST)	Pressure boundary	Stainless steel	Air – outdoor (internal)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.AP-221	3.3-1, 006	A, 7
Tank liner (RMWST)	Pressure boundary	Stainless steel	Concrete (external)	None	None	VII.J.AP-19	3.3-1, 120	C, 1, 2, 4
Tank liner (RMWST)	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A, 1

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank liner (RMWST)	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-75	3.4-1, 012	B A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	A, 5, 6
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Tubing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	A, 5, 6
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	A, 5, 6
Valve body	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A

Table 3.3.2-4: Demineralized and Reactor Makeup Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. The internal stainless steel liner associated with the RMWST is evaluated in this AMR as a stainless steel tank component type.

2. The external concrete portion of the RMWST is evaluated with the Yard structures in Table 3.5.2-11.

3. The RMWST diaphragm separates the water and air spaces inside the RMWST. RMWST diaphragm membranes are rubber-type material with fiber-reinforcement (i.e. elastomer). Only the loss of material aging effect in the treated water environment requires management since the diaphragm is not exposed directly to UV or heat inside the tank and so is not susceptible to hardening or loss of strength.

4. This item does not require an AMP provided that certain concrete conditions are met. RMWST concrete and associate building wall AMR results are contained in Table 3.5.2-11.

5. Internal and external environment are the same for vent and drain components that are empty downstream of closed valves, such that the condition of external surface is representative of the internal surface condition.

6. Aging effects not applicable, for more information see Sections 3.3.2.2.3 and 3.3.2.2.5.

7. The RMWST is vented to the outdoor air and contaminants/moisture may conservatively collect in the air space above the liner and connected diaphragm.

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Air receiver (starting air)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Air receiver (starting air)	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.A-23	3.3-1, 089	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.I.AP-241	3.3-1, 109	B
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-242	3.3-1, 014	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Expansion joint	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Expansion joint	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A
Expansion joint	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-102	3.3-1, 076	A
Expansion joint	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F4.AP-103	3.3-1, 096	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-128	3.3-1, 083	A
Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Filter housing	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Filter housing	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Filter housing	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Flame arrestor	Leakage boundary (spatial)	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A
Flame arrestor	Leakage boundary (spatial)	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Heat exchanger (Governor cooler) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Governor cooler) shell	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	A
Heat exchanger (Governor cooler) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (Governor cooler) tubes	Heat transfer	Copper alloy	Lubricating oil (internal)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-78	3.2-1, 051	C
Heat exchanger (Governor cooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (Governor cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-133	3.3-1, 099	C
Heat exchanger (Lube oil cooler) channel head	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Lube oil cooler) channel head	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (Lube oil cooler) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Lube oil cooler) shell	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	A
Heat exchanger (Lube oil cooler) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger (Lube oil cooler) tubes	Heat transfer	Copper alloy	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	V.A.EP-78	3.2-1, 051	C

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (Lube oil cooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (Lube oil cooler) tubes	Pressure boundary	Copper alloy	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-133	3.3-1, 099	C
Heat exchanger (Lube oil cooler) tubesheet	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (Lube oil cooler) tubesheet	Pressure boundary	Carbon steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	A
Heat exchanger (Intercooler) channel head	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Intercooler) channel head	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (Intercooler) fins	Heat transfer	Aluminum	Air – indoor uncontrolled (external)	Reduction of heat transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 3
Heat exchanger (Intercooler) shell	Pressure boundary	Carbon steel with internal coating/lining	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Intercooler) shell	Pressure boundary	Carbon steel with internal coating/lining	Air – indoor uncontrolled (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	None	None	H, 2

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (Intercooler) shell	Pressure boundary	Carbon steel with internal coating/lining	Air – indoor uncontrolled (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	None	None	H, 2
Heat exchanger (Intercooler) tubes	Heat transfer	Copper alloy	Air – indoor uncontrolled (external)	Reduction of heat transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 3
Heat exchanger (Intercooler) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger (Intercooler) tubes	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	C
Heat exchanger (Intercooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (Intercooler) tubesheet	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-41	3.3-1, 080	E, 1
Heat exchanger (Intercooler) tubesheet	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (Jacket water cooler) channel head	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (Jacket water cooler) channel head	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.H2.A-416	3.3-1, 138	B
Heat exchanger (Jacket water cooler) channel head	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.H2.A-414	3.3-1, 139	B
Heat exchanger (Jacket water cooler) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (Jacket water cooler) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (Jacket water cooler) tubes	Heat transfer	Copper alloy	Closed-cycle cooling water (external)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger (Jacket water cooler) tubes	Heat transfer	Copper alloy	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-72	3.3-1, 042	A
Heat exchanger (Jacket water cooler) tubes	Pressure boundary	Copper alloy	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (Jacket water cooler) tubes	Pressure boundary	Copper alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-179	3.3-1, 038	A
Heat exchanger (Jacket water cooler) tubesheet	Pressure boundary	Copper alloy	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.E1.AP-203	3.3-1, 046	B
Heat exchanger (Jacket water cooler) tubesheet	Pressure boundary	Copper alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-179	3.3-1, 038	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heater casing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Heater casing	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Heater casing	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Piping	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Piping	Leakage boundary (spatial)	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.H1.AP-198	3.3-1, 106	B
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-87	3.4-1, 016	B A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Piping	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Piping	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.A-23	3.3-1, 089	A
Piping	Pressure boundary	Carbon steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Piping	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Piping	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.H2.AP-194	3.3-1, 037	A, 4
Piping	Pressure boundary	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.H1.AP-198	3.3-1, 106	B
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Pressure boundary	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Piping	Pressure boundary	Stainless steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H2.AP-136	3.3-1, 071	B A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.D2.E-29	3.2-1, 044	C
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.D2.E-29	3.2-1, 044	C
Piping	Structural integrity (attached)	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A
Piping element (sight glass)	Pressure boundary	Glass	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 114	A
Piping element (sight glass)	Pressure boundary	Glass	Lubricating oil (internal)	None	None	VII.J.AP-15	3.3-1, 117	A
Piping element (sight glass)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping element (sight glass)	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (Auxiliary jacket water pump)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Pump casing (Crankcase vacuum blower)	Pressure boundary	Aluminum	Air – indoor uncontrolled (external)	None	None	VII.J.AP-135	3.3-1, 113	A
Pump casing (Crankcase vacuum blower)	Pressure boundary	Aluminum	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 1
Pump casing (Engine jacket water pump)	Pressure boundary	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (Engine jacket water pump)	Pressure boundary	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Pump casing (Engine jacket water pump)	Pressure boundary	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.A-50	3.3-1, 072	A
Pump casing (Fuel oil transfer, drip waste return, booster, fuel oil)	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Pump casing (Keep warm)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Pump casing (Prelube, engine lube oil, auxiliary lube oil)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (Various)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Silencer (Air inlet)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Silencer (Air inlet)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.D2.E-29	3.2-1, 044	C
Strainer	Filter	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer	Filter	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Strainer	Filter	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Strainer	Filter	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Strainer	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Strainer	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Strainer	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Tank (Fuel oil day, drip waste)	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Tank (Fuel oil day, drip waste, lube oil sump)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Tank (Fuel oil storage)	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Tank (Fuel oil storage)	Pressure boundary	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.H1.AP-198	3.3-1, 106	B
Tank (Lube oil sump)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	C

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Thermowell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Thermowell	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Tubing	Pressure boundary	Stainless steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H2.AP-136	3.3-1, 071	B A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A
Turbocharger casing	Heat transfer	Cast iron	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F4.AP-204	3.3-1, 050	D
Turbocharger casing	Heat transfer	Cast iron	Diesel exhaust (internal)	Reduction of heat transfer	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A, 5
Turbocharger casing	Pressure boundary	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Turbocharger casing	Pressure boundary	Cast iron	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.D2.E-29	3.2-1, 044	C
Turbocharger casing	Pressure boundary	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Turbocharger casing	Pressure boundary	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.A-50	3.3-1, 072	C
Turbocharger casing	Pressure boundary	Cast iron	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Turbocharger casing	Pressure boundary	Cast iron	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.A-23	3.3-1, 089	A
Valve body	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Valve body	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Valve body	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.H2.AP-202	3.3-1, 045	B
Valve body	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.A-23	3.3-1, 089	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H1.AP-105	3.3-1, 070	B A
Valve body	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-127	3.3-1, 097	A
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.3.2-5: Emergency Diesel Generator and Auxiliary Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Closed-cycle cooling water >140°F (internal)	Cracking	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-186	3.3-1, 043	B
Valve body	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	C
Valve body	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Structural integrity (attached)	Carbon steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) program is used to manage the aging effects for this component, material, and environment combination.
2. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) program is used to manage loss of coating integrity for this component, material, and environment combination.
3. Aging effect is consistent with SLR OE presented in NUREG-2191 item VII.I.A-816, further clarified by SLR-ISG-2021-02-MECHANICAL Table 3.3-1 ID 151. Reduction of heat transfer is an applicable aging effect for components with a heat transfer function exposed to an air environment. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) program is used to manage the aging effects as this component is internal to the shell of the heat exchanger.
4. Piping is service water supply and return piping to the jacket water cooler.
5. Reduction of heat transfer is an applicable aging effect for the turbocharger which has a heat transfer function exposed to an air environment (diesel exhaust). The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) program is used to manage the aging effects as the portion of the component exposed to diesel exhaust is internal to the turbocharger.

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Waste Water (External)	Loss of material	Bolting Integrity (B.2.3.9)	None	None	H, 1
Bolting	Mechanical closure	Stainless steel	Waste Water (External)	Loss of preload	Bolting Integrity (B.2.3.9)	None	None	H, 1
Flexible hose	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Flexible hose	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	C
Flexible hose	Leakage boundary (spatial)	Carbon steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	C
Flexible hose	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	C

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible hose	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	C
Flow element	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Orifice	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Orifice	Leakage boundary (spatial)	Stainless steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Cast iron	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Cast iron	Waste water (Internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.A3.AP-31	3.3-1, 072	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Pressure boundary	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.AP-31	3.3-1, 009	A
Piping	Pressure boundary	Cast iron	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Pressure boundary	Cast iron	Waste water (Internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.A3.AP-31	3.3-1, 072	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Waste water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Pump casing (SGB sump)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Pump casing (sumps)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Pump casing (SGB sump)	Pressure boundary	Stainless steel	Waste Water (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.E5.AP-278	3.3-1, 095	E, 2
Pump casing (SGB sump)	Pressure boundary	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Pump casing (sumps)	Leakage boundary (spatial)	Stainless steel	Waste Water (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.E5.AP-278	3.3-1, 095	E, 2

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (sumps)	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Strainer	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Strainer	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Tank (Containment cooling unit condensate measuring)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Tank (Containment cooling unit condensate measuring)	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C

Table 3.3.2-6: Equipment and Floor Drainage System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Carbon steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Valve body	Pressure boundary	Carbon steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Waste Water (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. Stainless steel bolting components exposed to waste water are not covered in NUREG-1801. Review of NUREG-2191 shows that these components are addressed (VII.I.AP-124, VII.I.A-426, VII.I.A-423).

2. External surfaces of stainless steel sump pump casings.

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Carbon steel	Raw water (external)	Loss of material	Bolting Integrity (B.2.3.9)	None	None	H, 6
Bolting	Mechanical closure	Carbon steel	Raw water (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-264	3.3-1, 015	A, 7
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.I.AP-241	3.3-1, 109	B
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-242	3.3-1, 014	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Drip pan (RCS oil spillage collection)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Drip pan (RCS oil spillage collection)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Drip pan (RCS oil spillage collection)	Pressure boundary	Carbon steel	Waste water (internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-128	3.3-1, 083	A
Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A
Fire hydrant	Pressure boundary	Cast iron	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.AP-149	3.3-1, 063	B
Fire hydrant	Pressure boundary	Cast iron	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.G.AP-198	3.3-1, 106	B
Fire hydrant	Pressure boundary	Cast iron	Soil (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.A-02	3.3-1, 072	C
Fire hydrant	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Fire hydrant	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.AP-31	3.3-1, 072	C
Flame arrestor	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Flame arrestor	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Flame arrestor	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Flexible hose	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Flexible hose	Pressure boundary	Copper alloy	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-144	3.3-1, 114	A
Flexible hose	Pressure boundary	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Flexible hose	Pressure boundary	Copper alloy	Gas (Internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Flexible hose	Pressure boundary	Copper alloy	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.A.SP-101	3.4-1, 016	E, 2
Flexible hose	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible hose	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A
Flexible hose	Pressure boundary	Elastomer	Waste water (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Flexible hose	Pressure boundary	Elastomer	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Flow element	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	I, 5
Flow element	Pressure boundary	Stainless steel	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-55	3.3-1, 066	B, 7
Flow element	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-55	3.3-1, 066	B, 7
Flow element	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Gas bottle	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Gas bottle (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Hose station	Structural support	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Orifice	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Orifice	Pressure boundary	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	I, 5
Orifice	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Orifice	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Orifice	Throttle	Stainless steel	Air – outdoor (external)	None	None	VII.J.AP-123	3.3-1, 120	I, 5
Orifice	Throttle	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Concrete (external)	None	None	VII.J.AP-282	3.3-1, 112	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Condensation (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Piping	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Piping	Pressure boundary	Carbon steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A
Piping	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.G.AP-234	3.3-1, 068	B A
Piping	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Piping	Pressure boundary	Carbon steel	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Piping	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2
Piping	Pressure boundary	Carbon steel	Waste water (internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Cement-lined ductile iron	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7, 8
Piping	Pressure boundary	Cement-lined ductile iron	Raw water (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-416	3.3-1, 138	B, 7
Piping	Pressure boundary	Cement-lined ductile iron	Raw water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-414	3.3-1, 139	B, 7
Piping	Pressure boundary	Cement-lined ductile iron	Raw water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-415	3.3-1, 140	B, 7
Piping	Pressure boundary	Cement-lined ductile iron	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.G.AP-198	3.3-1, 106	B
Piping	Pressure boundary	Cement-lined ductile iron	Soil (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.A-02	3.3-1, 072	A
Piping	Pressure boundary	Cement-lined ductile iron	Treated water (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-416	3.3-1, 138	B

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Cement-lined ductile iron	Treated water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-414	3.3-1, 139	B
Piping	Pressure boundary	Cement-lined ductile iron	Treated water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.G.A-415	3.3-1, 140	B
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Piping (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Piping (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Piping (insulated)	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.G.A-405	3.3-1, 132	A
Piping element	Pressure boundary	Glass	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 117	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping element	Pressure boundary	Glass	Treated water (internal)	None	None	VII.J.AP-51	3.3-1, 117	A
Pump casing (Main diesel-driven, main motor-driven, chemical recirculation, jockey)	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2
Pump casing (Main diesel-driven, main motor-driven, chemical recirculation, jockey)	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.AP-31	3.3-1, 072	C
Pump casing (Main diesel-driven, main motor-driven, jockey, chemical recirculation, vertical centrifugal)	Pressure boundary	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (Vertical centrifugal)	Pressure boundary	Cast iron	Raw water (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Pump casing (Vertical centrifugal)	Pressure boundary	Cast iron	Raw water (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.A-51	3.3-1, 072	C, 7

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (Vertical centrifugal)	Pressure boundary	Cast iron	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Pump casing (Vertical centrifugal)	Pressure boundary	Cast iron	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Pump casing (Vertical centrifugal)	Pressure boundary	Cast iron	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.A-51	3.3-1, 072	C, 7
Silencer (Exhaust)	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Silencer (Exhaust)	Pressure boundary	Carbon steel	Diesel exhaust (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.H2.AP-104	3.3-1, 088	A
Spray nozzle (Charcoal filter)	Spray	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 1
Spray nozzle (Charcoal filter)	Spray	Stainless steel	Condensation (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Charcoal filter)	Spray	Stainless steel	Condensation (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Air with borated water leakage (external)	Loss of Material	Boric Acid Corrosion (B.2.3.4)	VII.I.AP-66	3.3-1, 009	A
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Condensation (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Deluge)	Spray	Copper alloy >15% Zn or >8% Al	Condensation (internal)	Loss of Material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Spray nozzle (Halon suppression)	Spray	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Spray nozzle(Halon suppression)	Spray	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Sprinkler head	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	Loss of Material	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B
Sprinkler head	Pressure boundary	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Sprinkler head	Pressure boundary	Copper alloy	Gas (Internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Sprinkler head	Pressure boundary	Copper alloy	Treated water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Sprinkler head	Pressure boundary	Copper alloy	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B
Sprinkler head	Spray	Copper alloy	Air – indoor uncontrolled (external)	Loss of Material	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B
Sprinkler head	Spray	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Sprinkler head	Spray	Copper alloy	Gas (Internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Sprinkler head	Spray	Copper alloy	Treated water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B
Sprinkler head	Spray	Copper alloy	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-403	3.3-1, 130	B
Strainer	Filter	Stainless steel	Gas (external)	None	None	VII.J.AP-22	3.3-1, 120	A
Strainer	Filter	Stainless steel	Raw water (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G A-55	3.3-1, 066	B, 7
Strainer	Filter	Stainless steel	Treated water (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Strainer	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Strainer	Pressure boundary	Carbon steel	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Strainer	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Strainer	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Strainer (Electric motor driven pump suction)	Filter	Copper alloy	Raw water (external)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.AP-197	3.3-1, 064	B, 7
Strainer (Electric motor driven pump suction)	Filter	Copper alloy	Raw water (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.AP-197	3.3-1, 064	B, 7
Strainer (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Tank (Fire Water Storage)	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	B
Tank (Fire Water Storage)	Pressure boundary	Carbon steel with internal coating/lining	Treated water (internal)	Loss of coating/lining integrity	Fire Water System (B.2.3.16)	VII.G.A-416	3.3-1, 138	E, 4
Tank (Fire Water Storage)	Pressure boundary	Carbon steel with internal coating/lining	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	B
Tank (Fuel oil storage)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Tank (Fuel oil storage)	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.H2.AP-105	3.3-1, 070	B A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (RCS Oil Spillage Tank)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Tank (RCS Oil Spillage Tank)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Tank (RCS Oil Spillage Tank)	Pressure boundary	Carbon steel	Waste water (internal)	Loss of Material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Tank (Retard chamber)	Pressure boundary	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (Retard chamber)	Pressure boundary	Cast iron	Air – indoor uncontrolled (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	D
Tank (Retard chamber)	Pressure boundary	Cast iron	Air – indoor uncontrolled (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	D
Tank (Retard chamber)	Pressure boundary	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	C
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.G.AP-136	3.3-1, 071	B A
Tubing	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-55	3.3-1, 066	D, 7
Tubing	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-55	3.3-1, 066	D, 7
Tubing	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-404	3.3-1, 131	B
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (internal)	Loss of material	Fuel Oil Chemistry (B.2.3.17) One-Time Inspection (B.2.3.19)	VII.G.AP-234	3.3-1, 068	B A
Valve body	Pressure boundary	Carbon steel	Gas (Internal)	None	None	VII.J.AP-6	3.3-1, 121	A

Table 3.3.2-7: Fire Protection – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Raw water (internal)	Flow blockage	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Valve body	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-33	3.3-1, 064	B, 7
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2
Valve body	Pressure boundary	Cast iron	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.G.AP-198	3.3-1, 106	B
Valve body	Pressure boundary	Cast iron	Soil (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.A-02	3.3-1, 072	A
Valve body	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VIII.E.SP-73	3.4-1, 014	E, 2
Valve body	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.G.AP-31	3.3-1, 072	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Fire Water System (B.2.3.16)	VII.G.A-412	3.3-1, 136	D
Valve body (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A
Valve body (Halon suppression)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Fire Protection (B.2.3.15)	VII.G.AP-150	3.3-1, 058	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identified a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant-Specific Notes

1. The component is located within HVAC housings, and the external surfaces are subject to the HVAC environment of condensation during normal operation.
2. The Fire Water System (B.2.3.16) AMP is substituted for the Water Chemistry (B.2.3.2) AMP and One-Time Inspection (B.2.3.19) AMP.
3. The (Flexible hose – rubber) components for FPS made of Elastomer material subjected to waste water environment is not found in NUREG-1801. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP will be used to manage these components.
4. The Fire Water System (B.2.3.16) AMP is substituted for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP.
5. Stainless steel components in an Air – outdoor (external) environment do not experience aging effects as addressed in LRA Further Evaluation Section 3.3.2.2.6.
6. The submerged bolting components for the FPS made of carbon steel subjected to a raw water environment with a loss of material aging effect is not found in NUREG-1801. OE found in NUREG-2191 (V.E.E-418) indicates that the Bolting Integrity (B.2.3.9) AMP is used to manage loss of material.
7. An emergency fill line is provided from the SWIS to refill the FWSTs with water from the SSI Dam and this portion of the system is exposed to raw water. The remainder of the system is supplied with treated water via the Potable Water System which provides fill and normal makeup to the FWSTs.
8. Consistent with LR-ISG-2012-02, flow blockage due to fouling is an aging effect for cement-lined ductile iron fire protection piping in a raw water environment. The Fire Water System (B.2.3.16) AMP manages this aging effect.

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Cooling coil (containment recirculation)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (containment recirculation)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil (CRDM air handling unit)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (CRDM air handling unit)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil (neutron detector well)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Cooling coil (neutron detector well)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil fins (containment recirculation)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil fins (CRDM air handling unit)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil fins (neutron detector well)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-109	3.3-1, 079	E, 1
Cooling coil header (containment recirculation)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-189	3.3-1, 046	B
Cooling coil header (containment recirculation)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-105	3.3-1, 078	A
Cooling coil header (CRDM air handling unit)	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Cooling coil header (CRDM air handling unit)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	A
Cooling coil header (neutron detector well)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-189	3.3-1, 046	B

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooling coil header (neutron detector well)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-105	3.3-1, 078	A
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Damper housing (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Drip pan	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Drip pan	Leakage boundary (spatial)	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F3.AP-99	3.3-1, 094	A
Ductwork (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Ductwork (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Ductwork (reactor coolant pipe penetration)	Direct flow	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Fan housing (reactor coolant pipe penetration)	Direct flow	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Fan housing (reactor coolant pipe penetration)	Direct flow	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Fan housing (reactor coolant pipe penetration)	Direct flow	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Filter housing (containment preaccess)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	C
Filter housing (containment preaccess)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Orifice	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Orifice	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Orifice	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Screen	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	C
Screen	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A

Table 3.3.2-8a: Containment Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Coils and fins are located inside of air handling and cooling units such that Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) is the credited AMP, in lieu of External Surfaces Monitoring of Mechanical Components (B.2.3.22).

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Condenser shell (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Condenser shell (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Condenser shell (control room A/C) (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	B, 8

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Condenser tube sheet (control room A/C)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Condenser tube sheet (control room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser tubes (control room A/C)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Condenser tubes (control room A/C)	Heat transfer	Copper alloy	R-12 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser tubes (control room A/C)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Condenser tubes (control room A/C)	Pressure boundary	Copper alloy	R-12 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser water box (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Condenser water box (control room A/C)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-189	3.3-1, 046	B
Cooling coil (control room A/C)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 1
Cooling coil (control room A/C)	Heat transfer	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooling coil (control room A/C)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (control room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Cooling coil fins (control room A/C)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil header (control room A/C)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Cooling coil header (control room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A, 6
Damper housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C, 6
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A, 6

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C, 6
Drip pan (control room A/C)	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	C, 7
Drip pan (control room A/C)	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.FI.A-08	3.3-1, 090	A, 7
Ductwork	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A, 6
Ductwork	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C, 6
Ductwork	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C, 6

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fan housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Fan housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Fan housing	Pressure boundary	Galvanized steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Filter housing (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Filter housing (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Filter housing (control room A/C)	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Filter housing (emergency filtration/pressurization)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Filter housing (emergency filtration/pressurization)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Filter housing (emergency filtration/pressurization)	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Filter housing (emergency filtration/pressurization)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-103	3.3-1, 096	A
Flexible connection	Pressure boundary	Elastomer	Air – outdoor (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Flexible connection	Pressure boundary	Elastomer	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 4
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	G, 5
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 2

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	G, 5
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 2
Flexible connection	Pressure boundary	Fiberglass	Air – outdoor (internal)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	G, 5
Flexible connection	Pressure boundary	Fiberglass	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 2
Flexible connection (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Flexible connection (control room A/C)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.F1.AP-127	3.3-1, 097	A
Flexible connection (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Oil separator (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Oil separator (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 8
Strainer (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Strainer (control room A/C) (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 8
Trap (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Trap (control room A/C)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.F1.AP-127	3.3-1, 097	C
Trap (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Tubing (control room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing (control room A/C)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.F1.AP-127	3.3-1, 097	A
Tubing (control room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	A
Tubing (control room A/C)	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing (control room A/C)	Pressure boundary	Copper alloy	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-133	3.3-1, 099	A
Tubing (control room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Tubing (control room A/C)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing (control room A/C)	Pressure boundary	Stainless steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-138	3.3-1, 100	A
Tubing (control room A/C)	Pressure boundary	Stainless steel	R-12 gas (internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tubing (control room A/C)	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Tubing (control room A/C)	Structural integrity (attached)	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	A

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing (control room A/C)	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing (control room A/C)	Structural integrity (attached)	Stainless steel	R-12 gas (internal)	None	None	VII.J.AP-22	3.3-1, 120	A
Tubing (control room A/C) (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 9
Valve body	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-202	3.3-1, 045	B

Table 3.3.2-8b: Control Room Area Ventilation System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-133	3.3-1, 099	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Valve body (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 8

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. Consistent with the latest industry guidance, based on industry OE updates incorporated into NUREG-2191 (Item VII.I.A-716, Table 3.3-1, 151).

2. Consistent with the latest industry guidance, based on industry OE updates incorporated into NUREG-2191 (Item VII.F1.A-495, Table 3.3-1, 159).

3. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.A-504, Table 3.3-1, 085).

4. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.AP-103, Table 3.3-1, 096).

5. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-720, Table 3.3-1, 150).

6. Galvanized steel components which have the potential to be impacted by adjacent components are treated as carbon steel, due to the possibility of localized corrosion sites.

7. Aging of control room A/C drip pan internal coating/linings is not explicitly managed, only the carbon steel body is integral in maintaining the leakage boundary.

8. Insulated components associated with the control room A/C units operate below the dew point; therefore, these components have the potential to accumulate condensation which may trap particulates underneath insulation.

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator (CCW return pressure control valve actuator)	Pressure boundary	Carbon steel	Air – dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-4	3.3-1, 121	E, 10
Accumulator (CCW return pressure control valve actuator)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Condenser shell (UPS room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	C

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Condenser shell (UPS room A/C)	Pressure boundary	Carbon steel	R-12 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Condenser shell (UPS room A/C) (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	B, 11
Condenser tube sheet (UPS room A/C)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Condenser tube sheet (UPS room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser tubes (UPS room A/C)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Condenser tubes (UPS room A/C)	Heat transfer	Copper alloy	R-12 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser tubes (UPS room A/C)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Condenser tubes (UPS room A/C)	Pressure boundary	Copper alloy	R-12 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Condenser water box (UPS room A/C)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Condenser water box (UPS room A/C)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-189	3.3-1, 046	B

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Cooling coil (electrical area supply)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (electrical area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (main steam feedwater area supply)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (main steam feedwater area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (office and service area A/C)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (office and service area A/C)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (uncontrolled access area supply)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (uncontrolled access area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (UPS room A/C)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 8

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooling coil (UPS room A/C)	Heat transfer	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Cooling coil (UPS room A/C)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (UPS room A/C)	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Cooling coil fins (electrical area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (main steam feedwater area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (office and service area A/C)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (uncontrolled access area supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (UPS room A/C)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil header (electrical area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Cooling coil header (electrical area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Cooling coil header (main steam feedwater area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Cooling coil header (main steam feedwater area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A
Cooling coil header (office and service area A/C)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil header (office and service area A/C)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil header (uncontrolled access area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Cooling coil header (uncontrolled access area supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A
Cooling coil header (UPS room A/C)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil header (UPS room A/C)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A
Damper housing	Pressure boundary	Galvanized steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Drip pan	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	C, 3
Drip pan	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F4.A-08	3.3-1, 090	A, 3
Drip pan	Leakage boundary (spatial)	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	C
Drip pan	Leakage boundary (spatial)	Galvanized steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F4.A-08	3.3-1, 090	A
Drip pan	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C, 12

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Drip pan	Leakage boundary (spatial)	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-99	3.3-1, 094	A, 12
Ductwork	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A, 4
Ductwork	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C, 4
Ductwork	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A, 4
Ductwork	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C, 4
Fan coil unit (electrical area)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Fan coil unit (electrical area)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 8
Fan coil unit (electrical area)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (electrical area)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fan coil unit (UPS room)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Fan coil unit (UPS room)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 8
Fan coil unit (UPS room)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (UPS room)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Fan housing	Pressure boundary	Aluminum	Air – indoor uncontrolled (external)	None	None	VII.J.AP-135	3.3-1, 113	C
Fan housing	Pressure boundary	Aluminum	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-135	3.3-1, 113	C
Fan housing	Pressure boundary	Aluminum	Air – outdoor (external)	None	None	VII.J.AP-135	3.3-1, 113	I, 9
Fan housing	Pressure boundary	Aluminum	Air – outdoor (internal)	None	None	VII.J.AP-135	3.3-1, 113	I, 9
Fan housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Fan housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Fan housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Filter housing (UPS room A/C)	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Filter housing (UPS room A/C)	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-103	3.3-1, 096	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible connection	Pressure boundary	Elastomer	Air – outdoor (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 5
Flexible connection	Pressure boundary	Elastomer	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 6
Flexible connection	Pressure boundary	Elastomer	R-12 gas (internal)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 2
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 7
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 1
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 7
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 1
Flexible connection	Pressure boundary	Fiberglass	Air – outdoor (internal)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 7

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible connection	Pressure boundary	Fiberglass	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 1
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Pressure boundary	Carbon steel	Air – dry (internal)	None	None	VII.J.AP-4	3.3-1, 121	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Piping	Structural integrity (attached)	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Piping (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 11
Tubing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Tubing	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Pressure boundary	Copper alloy	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	R-12 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A

Table 3.3.2-8c: Miscellaneous Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-405	3.3-1, 132	A, 11

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant-Specific Notes

1. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.A-495, Table 3.3-1, 159).

2. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.D.A-729, Table 3.3-1, 085).

3. Aging of UPS and distribution room A/C drip pan internal coating/linings is not explicitly managed, only the carbon steel body is integral in maintaining the leakage boundary.

4. Galvanized steel components which have the potential to be impacted by adjacent components are treated as carbon steel, due to the possibility of localized corrosion sites.

5. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.A-504, Table 3.3-1, 085).

6. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.AP-103, Table 3.3-1, 096).

7. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-720, Table 3.3-1, 150).

8. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-716, Table 3.3-1, 151).

9. Aging effects not applicable, for more information see item Table 3.3-1, item 081.

10. The Compressed Air Monitoring (B.2.3.14) AMP is applied to assure dry-air conditions are maintained during the PEO.

11. Insulated components associated with the UPS room A/C units operate below the dew point; therefore, these components have the potential to accumulate condensation which may trap particulates underneath insulation.

12. Stainless steel drip pans in the Miscellaneous Ventilation Systems are for the UPS room coolers.

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-126	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-263	3.3-1, 015	A
Cooling coil (auxiliary building equipment room supply)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (auxiliary building equipment room supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooling coil (positive displacement charging pump)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (positive displacement charging pump)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil (primary plant supply)	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Cooling coil (primary plant supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (auxiliary building equipment room supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (positive displacement charging pump)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil fins (primary plant supply)	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	A
Cooling coil header (auxiliary building equipment room supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooling coil header (auxiliary building equipment room supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A
Cooling coil header (positive displacement charging pump)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Cooling coil header (positive displacement charging pump)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A
Cooling coil header (primary plant supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Cooling coil header (primary plant supply)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F4.AP-109	3.3-1, 079	A
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A
Damper housing	Pressure boundary	Galvanized steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-78	3.3-1, 078	A
Damper housing	Pressure boundary	Galvanized steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Damper housing	Pressure boundary	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Damper housing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	C
Drip pan	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	C, 3
Drip pan	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A, 3
Drip pan	Leakage boundary (spatial)	Carbon steel with internal coating/lining	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F2.A-08	3.3-1, 090	A, 3
Drip pan	Leakage boundary (spatial)	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	C
Drip pan	Leakage boundary (spatial)	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A, 2
Drip pan	Leakage boundary (spatial)	Galvanized steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F2.A-08	3.3-1, 090	A
Ductwork	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-13	3.3-1, 116	A
Ductwork	Pressure boundary	Galvanized steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-13	3.3-1, 116	A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Ductwork	Pressure boundary	Galvanized steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Ductwork	Pressure boundary	Galvanized steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Fan coil unit (AFW and ESF pump rooms)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Fan coil unit (AFW and ESF pump rooms)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 4
Fan coil unit (AFW and ESF pump rooms)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (AFW and ESF pump rooms)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Fan coil unit (CCW pump room)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (CCW pump room)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Fan coil unit (CCW pump room)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 4
Fan coil unit (CCW pump room)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Fan coil unit (CVCS pump rooms)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Fan coil unit (CVCS pump rooms)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 4
Fan coil unit (CVCS pump rooms)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (CVCS pump rooms)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Fan coil unit (SFP heat exchanger and pump rooms)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-205	3.3-1, 050	B
Fan coil unit (SFP heat exchanger and pump rooms)	Heat transfer	Copper alloy	Condensation (external)	Reduction of heat transfer	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 4
Fan coil unit (SFP heat exchanger and pump rooms)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Fan coil unit (SFP heat exchanger and pump rooms)	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Fan housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	C
Fan housing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.A-10	3.3-1, 078	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Filter housing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-113	3.3-1, 082	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-102	3.3-1, 076	A
Flexible connection	Pressure boundary	Elastomer	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.F1.AP-103	3.3-1, 096	A
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 5

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 1
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Cracking, blistering, loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	H, 5
Flexible connection	Pressure boundary	Fiberglass	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	H, 1
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Tubing	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Tubing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Tubing	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Pressure boundary	Copper alloy	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-8d: Primary Plant Ventilation Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.AP-66	3.3-1, 009	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.F4.AP-43	3.3-1, 072	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.F1.A-495, Table 3.3-1, 159).

2. Drip pans may include boric acid buildup from beneath the cooling coils.

3. Aging of emergency room cooler drip pan internal coating/linings is not explicitly managed, only the carbon steel body is integral in maintaining the leakage boundary.

4. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-716, Table 3.3-1, 151).

5. Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-720, Table 3.3-1, 150).

Table 3.3.2-9a: Chlorination System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	PVC	Air – indoor uncontrolled (external)	None	None	VII.J.AP-268	3.3-1, 119	A, 1
Piping	Leakage boundary (spatial)	PVC	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-268	3.3-1, 119	A, 1

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. Chlorination PVC piping surrounds process tubing and prevents leakage or spray onto nuclear safety related components, should the internal process tubing rupture. For this reason, it has a leakage boundary intended function. However, during normal operation the process tubing is not expected to be ruptured, and therefore the PVC piping is exposed to an internal air – indoor (uncontrolled) environment.

Table 3.3.2-9b: Potable and Sanitary Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	C
Tubing	Leakage boundary (spatial)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Leakage boundary (spatial)	Copper alloy	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-271	3.3-1, 093	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	C
Valve body	Leakage boundary (spatial)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Leakage boundary (spatial)	Copper alloy	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-271	3.3-1, 093	A

Table 3.3.2-9b: Potable and Sanitary Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C3.A-47	3.3-1, 072	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-270	3.3-1, 088	C

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

None.

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Heat exchanger (sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	C
Heat exchanger (sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	B
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Concrete (external)	None	None	VII.J.AP-19	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Piping	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Gas (Internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Tubing	Pressure boundary	Stainless steel	Treated borated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A- 409	3.3-1, 126	B
Tubing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Tubing	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 1
Tubing	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A

Table 3.3.2-10: Process and Effluent Radiation Monitoring and Sampling System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.A3.AP-79	3.3-1, 125	B A
Valve body	Pressure boundary	Stainless steel	Treated borated water >140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-17	3.3-1, 120	A

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1800 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

Plant-Specific Notes

1. Piping and tubing associated with the following components have an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4: process sampling – hot leg isolation, process sampling – pressurizer liquid sample isolation.

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Treated borated water (external)	Loss of material	Bolting Integrity (B.2.3.9)	None	None	H, 1
Bolting	Mechanical closure	Stainless steel	Treated borated water (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-265	3.3-1, 015	A
Filter housing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Filter housing	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Filter housing	Leakage boundary (spatial)	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flow element	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Flow element	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Throttle	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Heat exchanger (spent fuel pool) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Heat exchanger (spent fuel pool) channel head	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (spent fuel pool) channel head	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Heat exchanger (spent fuel pool) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (spent fuel pool) shell	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A
Heat exchanger (spent fuel pool) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.A3.AP-189	3.3-1, 046	B
Heat exchanger (spent fuel pool) tubes	Heat transfer	Stainless steel	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-188	3.3-1, 050	B
Heat exchanger (spent fuel pool) tubes	Heat transfer	Stainless steel	Treated borated water (external)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-101	3.3-1, 017	B A
Heat exchanger (spent fuel pool) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (spent fuel pool) tubes	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (spent fuel pool) tubes	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Heat exchanger (spent fuel pool) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (spent fuel pool) tubesheet	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Heat exchanger (spent fuel pool) tubesheet	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Orifice	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Orifice	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Leakage boundary (spatial)	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Orifice	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Orifice	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Orifice	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Orifice	Throttle	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Orifice	Throttle	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Concrete (external)	None	None	VII.J.AP-19	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Piping	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Piping	Pressure boundary	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Piping	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Pump casing (refueling water purification, cask pit and transfer canal drain, refuel cavity skimmer, and spent fuel pool skimmer)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Pump casing (refueling water purification, cask pit and transfer canal drain, refuel cavity skimmer, and spent fuel pool skimmer)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (refueling water purification, cask pit and transfer canal drain, refuel cavity skimmer, and spent fuel pool skimmer)	Leakage boundary (spatial)	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (spent fuel pool cooling water)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	C
Pump casing (spent fuel pool cooling water)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Pump casing (spent fuel pool cooling water)	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Resin trap	Filter	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Resin trap	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Resin trap	Pressure boundary	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Rotation vane	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Rotation vane	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Rotation vane	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Screen	Filter	Stainless steel	Treated borated water (external)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Screen	Filter	Stainless steel	Treated borated water >140ºF (external)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Strainer (skimmer)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Strainer (skimmer)	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Tank (Spent fuel pool demineralizer)	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank (Spent fuel pool demineralizer)	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	D C
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A
Valve body	Pressure boundary	Stainless steel	Treated borated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.AP-79	3.3-1, 125	B A

Table 3.3.2-11: Spent Fuel Pool Cooling and Cleanup System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated borated water >140ºF (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VII.E1.A-103	3.3-1, 124	D C
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. The submerged bolting components for the SFS made of stainless steel subjected to a treated borated water environment with a loss of material aging effect is not found in NUREG-1801. OE found in NUREG-2191 (V.E.E-418) indicates that the Bolting Integrity (B.2.3.9) AMP is used to manage loss of material.

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A, 1
Bolting	Mechanical closure	Carbon steel	Condensation (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.D.AP-121	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Condensation (external)	Loss of preload	Bolting Integrity (B.2.3.9)	None	None	H, 2
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.I.AP-241	3.3-1, 109	B
Bolting	Mechanical closure	Carbon steel	Soil (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-242	3.3-1, 014	A
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-261	3.3-1, 015	A
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.D.AP-121	3.3-1, 012	C
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-261	3.3-1, 015	A
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Raw water (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.C1.AP-196	3.3-1, 036	E, 4
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Raw water (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Copper alloy >15% Zn or >8% Al	Raw water (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-261	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Stainless steel	Condensation (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.D.AP-121	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Condensation (external)	Loss of preload	Bolting Integrity (B.2.3.9)	None	None	H, 2
Flow element	Pressure boundary	Nickel alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-206	3.3-1, 034	A
Flow element	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Flow element	Throttle	Nickel alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-206	3.3-1, 034	A
Flow element	Throttle	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Flow element (insulated)	Pressure boundary	Nickel alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Flow element (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Flow element (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Flow element (insulated)	Throttle	Nickel alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element (insulated)	Throttle	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Flow element (insulated)	Throttle	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Heat exchanger (service water pump motor bearing cooler) tubes	Heat transfer	Stainless steel	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-138	3.2-1, 051	A
Heat exchanger (service water pump motor bearing cooler) tubes	Heat transfer	Stainless steel	Raw water (internal)	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-187	3.3-1, 042	A
Heat exchanger (service water pump motor bearing cooler) tubes	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.E1.AP-138	3.3-1, 100	C
Heat exchanger (service water pump motor bearing cooler) tubes	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	C
Orifice	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Orifice	Throttle	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Orifice (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Orifice (insulated)	Throttle	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Orifice (insulated)	Throttle	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Piping	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-408	3.3-1, 134	A
Piping	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	A
Piping	Leakage boundary (spatial)	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B
Piping	Leakage boundary (spatial)	PVC	Air – indoor uncontrolled (external)	None	None	VII.J.AP-268	3.3-1, 119	A
Piping	Leakage boundary (spatial)	PVC	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	PVC	Raw water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	A
Piping	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-409	3.3-1, 134	A
Piping	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VII.C1.A-409	3.3-1, 126	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Piping	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-194	3.3-1, 037	A
Piping	Pressure boundary	Carbon steel	Raw water (internal)	Wall thinning	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-409	3.3-1, 126	E, 5
Piping	Pressure boundary	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B
Piping	Pressure boundary	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of coating/lining integrity	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.C1.A-416	3.3-1, 138	B
Piping	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Loss of material	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)	VII.C1.A-414	3.3-1, 139	B
Piping	Pressure boundary	Carbon steel with internal coating/lining	Raw water (internal)	Wall thinning	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-409	3.3-1, 126	E, 5
Piping	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Piping	Pressure boundary	Stainless steel	Raw water (internal)	Wall thinning	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-409	3.3-1, 126	E, 5
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Piping	Structural integrity (attached)	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping (insulated)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Structural integrity (attached)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Structural integrity (attached)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Piping (insulated)	Structural integrity (attached)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Pump casing (Service water screen wash)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Pump casing (Service water screen wash)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-408	3.3-1, 134	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (Service water screen wash)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C
Pump casing (Station service water)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-109	3.3-1, 079	C
Pump casing (Station service water)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (external)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-196	3.3-1, 036	A
Pump casing (Station service water)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (external)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C
Pump casing (Station service water)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-196	3.3-1, 036	A
Pump casing (Station service water)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C
Strainer	Filter	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Strainer	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Strainer (insulated)	Filter	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Strainer (insulated)	Filter	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Strainer (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Strainer (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Nickel alloy	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-206	3.3-1, 034	A
Thermowell (insulated)	Pressure boundary	Nickel alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Tubing	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-409	3.3-1, 134	A
Tubing	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Tubing (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Tubing (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Tubing (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Tubing (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	C
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Valve body	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-408	3.3-1, 134	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F2.AP-109	3.3-1, 079	A
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-408	3.3-1, 134	A
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C
Valve body	Leakage boundary (spatial)	Stainless steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.C1.A-409	3.3-1, 134	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Valve body	Pressure boundary	Carbon steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-194	3.3-1, 037	A
Valve body	Pressure boundary	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F2.AP-109	3.3-1, 079	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.AP-196	3.3-1, 036	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Raw water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	C
Valve body	Pressure boundary	Stainless steel	Raw water (internal)	Loss of material	Open-Cycle Cooling Water System (B.2.3.11)	VII.C1.A-54	3.3-1, 040	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.D.A-80	3.3-1, 078	A
Valve body	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.A3.A-79	3.3-1, 009	A, 1
Valve body	Structural integrity (attached)	Carbon steel	Soil (external)	Loss of material	Buried and Underground Piping and Tanks (B.2.3.27)	VII.C1.AP-198	3.3-1, 106	B
Valve body	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	V.F.EP-82	3.2-1, 063	A
Valve body (insulated)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A

Table 3.3.2-12: Station Service Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Structural integrity (attached)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Structural integrity (attached)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Structural integrity (attached)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A
Valve body (insulated)	Structural integrity (attached)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C1.A-405	3.3-1, 132	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. This aging effect is only applicable to components NOT located in the SWIS/Pump house.

2. Closure bolting experiencing loss of preload in a condensation (external) environment is not present in NUREG-1801. OE within NUREG-2191 (VII.I.AP-124) indicates that bolting within any environment can experience loss of preload.

3. Raw water is not in NUREG-1801 for PVC piping. OE within NUREG-2191 (VII.C1.A-787c) indicates that PVC piping (not covered by NRC GL 89-13) within a raw water environment can experience loss of material, which can be properly managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.

4. The Bolting Integrity (B.2.3.9) AMP is credited to manage loss of material of copper alloy closure bolting in a raw water environment.

5. The Open-Cycle Cooling Water AMP is used to manage wall thinning due to erosion for piping covered by NRC GL 89-13.

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Flexible connection	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flexible connection	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Flexible connection	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flexible connection	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Flow element	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Flow element	Throttle	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Flow element	Throttle	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Heat exchanger channel head (oil cooler)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (oil cooler)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger channel head (oil cooler)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger channel head (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger channel head (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger channel head (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger channel head (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger channel head (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger channel head (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger channel head (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	C

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger channel head (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger channel head (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger channel head (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger channel head (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger channel head (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger channel head (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	C

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger shell (oil cooler)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger shell (oil cooler)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger shell (oil cooler)	Leakage boundary (spatial)	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VII.H2.AP-131	3.3-1, 098	C
Heat exchanger shell (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger shell (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger shell (purge condenser, ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger shell (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger shell (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger shell (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger shell (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger shell (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger shell (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	C
Heat exchanger shell (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger shell (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger shell (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger shell (ventilation chilled water chiller – condenser)	Leakage boundary (spatial)	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger shell (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger shell (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger shell (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	C
Heat exchanger shell (ventilation chilled water chiller – evaporator)	Leakage boundary (spatial)	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger tubes (safety chilled water chiller – condenser)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger tubes (safety chilled water chiller – condenser)	Heat transfer	Copper alloy	R-11 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Heat exchanger tubes (safety chilled water chiller – condenser)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B
Heat exchanger tubes (safety chilled water chiller – condenser)	Pressure boundary	Copper alloy	R-11 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Heat exchanger tubes (safety chilled water chiller – evaporator)	Heat transfer	Copper alloy	Closed-cycle cooling water (internal)	Reduction of heat transfer	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-205	3.3-1, 050	B
Heat exchanger tubes (safety chilled water chiller – evaporator)	Heat transfer	Copper alloy	R-11 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Heat exchanger tubes (safety chilled water chiller – evaporator)	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-203	3.3-1, 046	B

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger tubes (safety chilled water chiller – evaporator)	Pressure boundary	Copper alloy	R-11 gas (external)	None	None	VII.J.AP-9	3.3-1, 114	A
Heat exchanger tubesheet (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger tubesheet (safety chilled water chiller – condenser)	Pressure boundary	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Heat exchanger tubesheet (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger tubesheet (safety chilled water chiller – evaporator)	Pressure boundary	Carbon steel	R-11 gas (internal)	None	None	VII.J.AP-6	3.3-1, 121	C
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Leakage boundary (spatial)	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Pressure boundary	Carbon steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-81	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Structural integrity (attached)	Carbon steel	Air – indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	A
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping	Structural integrity (attached)	Stainless steel	Air – indoor uncontrolled (internal)	None	None	VII.J.AP-123	3.3-1, 120	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Piping (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Piping (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Piping element	Leakage boundary (spatial)	Glass	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 117	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping element	Leakage boundary (spatial)	Glass	Closed-cycle cooling water (internal)	None	None	VII.J.AP-166	3.3-1, 117	A
Pump casing (safety chilled water recirc pumps)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (safety chilled water recirc pumps)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Pump casing (safety chilled water recirc pumps)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	D
Pump casing (ventilation chilled water recirc pumps)	Leakage boundary (spatial)	Cast iron	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (ventilation chilled water recirc pumps)	Leakage boundary (spatial)	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Pump casing (ventilation chilled water recirc pumps)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	D
Pump casing (ventilation chilled water recirc pumps)	Leakage boundary (spatial)	Cast iron	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.A-50	3.3-1, 072	C
Rupture disc	Leakage boundary (spatial)	Graphite	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 117	F, 1
Rupture disc	Leakage boundary (spatial)	Graphite	R-11 gas (internal)	None	None	VII.J.AP-98	3.3-1, 117	F, 1

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Rupture disc	Pressure boundary	Graphite	Air – indoor uncontrolled (external)	None	None	VII.J.AP-14	3.3-1, 117	F, 1
Rupture disc	Pressure boundary	Graphite	R-11 gas (internal)	None	None	VII.J.AP-98	3.3-1, 117	F, 1
Strainer	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Strainer	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Tank (chemical addition)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (chemical addition)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Tank (chemical addition)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Tank (chilled water surge tank – non-safety)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (chilled water surge tank – non-safety)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (chilled water surge tank – non-safety)	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-202	3.3-1, 045	B
Tank (chilled water surge tank – safety)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (chilled water surge tank – safety)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Tank (chilled water surge tank – safety)	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.F1.AP-202	3.3-1, 045	B
Thermowell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Thermowell	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Thermowell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Thermowell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Tubing	Leakage boundary (spatial)	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Leakage boundary (spatial)	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Leakage boundary (spatial)	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-199	3.3-1, 046	B
Tubing	Leakage boundary (spatial)	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F2.AP-109	3.3-1, 079	A
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Pressure boundary	Copper alloy	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Tubing	Pressure boundary	Copper alloy	Air with borated water leakage (external)	None	None	VII.J.AP-11	3.3-1, 115	A
Tubing	Pressure boundary	Copper alloy	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-199	3.3-1, 046	B
Tubing	Pressure boundary	Copper alloy	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F2.AP-109	3.3-1, 079	A
Tubing	Pressure boundary	Copper alloy	R-11 gas (internal)	None	None	VII.J.AP-9	3.3-1, 114	A
Tubing	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Tubing	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Tubing (insulated)	Leakage boundary (spatial)	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Tubing (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Tubing (insulated)	Pressure boundary	Stainless steel	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.AP-66	3.3-1, 009	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-199	3.3-1, 046	B
Valve body	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.AP-43	3.3-1, 072	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air – indoor uncontrolled (external)	None	None	VII.J.AP-144	3.3-1, 114	A
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.AP-66	3.3-1, 009	A

Table 3.3.2-13: Ventilation Chilled Water Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-199	3.3-1, 046	B
Valve body	Pressure boundary	Copper alloy >15% Zn or >8% Al	Closed-cycle cooling water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VII.C2.AP-43	3.3-1, 072	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-123	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Valve body (insulated)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Valve body (insulated)	Leakage boundary (spatial)	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Valve body (insulated)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Condensation (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A
Valve body (insulated)	Pressure boundary	Copper alloy >15% Zn or >8% Al	Condensation (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.C2.A-405	3.3-1, 132	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Material not in NUREG-1801 for this component.

Plant-Specific Notes

1. The aging effects for glass components are applied for graphite rupture discs in applicable environments.

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Carbon steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-102	3.3-1, 009	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VII.I.AP-125	3.3-1, 012	A
Bolting	Mechanical closure	Stainless steel	Air – indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VII.I.AP-124	3.3-1, 015	A
Demineralizer (Waste monitor tank, waste evaporator condensate)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Demineralizer (Waste monitor tank, waste evaporator condensate)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Eductor	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Eductor	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Filter housing	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Flow element	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Flow element	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Heat exchanger (feed preheater) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (feed preheater) channel head	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (feed preheater) shell	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (catalytic recombiner condenser) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (catalytic recombiner condenser) channel head	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (catalytic recombiner condenser) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (catalytic recombiner condenser) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (catalytic recombiner condenser) shell	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (distillate cooler) Channel Head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (distillate cooler) channel head	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (distillate cooler) shell	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (distillate cooler) shell	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (distillate cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (distillate cooler) tubes	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (distillate cooler) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (distillate cooler) tubesheet	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (evaporator condenser and vent condenser) channel head	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (evaporator condenser and vent condenser) channel head	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (evaporator condenser and vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (evaporator condenser and vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (evaporator condenser and vent condenser) shell	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (evaporator condenser and vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (evaporator condenser and vent condenser) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (evaporator condenser and vent condenser) tubes	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (evaporator condenser and vent condenser) tubes	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (evaporator condenser and vent condenser) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (evaporator condenser and vent condenser) tubesheet	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (evaporator condenser and vent condenser) tubesheet	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (evaporator) shell	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (feed precooler) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (feed precooler) channel head	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (feed precooler) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (feed precooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (feed precooler) shell	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Heat exchanger (reactor coolant drain tank) channel head	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (reactor coolant drain tank) channel head	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (reactor coolant drain tank) channel head	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (reactor coolant drain tank) shell	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.H2.AP-41	3.3-1, 080	A
Heat exchanger (reactor coolant drain tank) shell	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (reactor coolant drain tank) shell	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (reactor coolant drain tank) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (reactor coolant drain tank) tubes	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (reactor coolant drain tank) tubes	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (reactor coolant drain tank) tubesheet	Pressure boundary	Stainless steel	Closed-cycle cooling water (external)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (reactor coolant drain tank) tubesheet	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Heat exchanger (reactor coolant drain tank) tubesheet	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Heat exchanger (sample cooler) shell	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Heat exchanger (sample cooler) shell	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (waste gas compressor seal cooler) channel head	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (waste gas compressor seal cooler) channel head	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (waste gas compressor seal cooler) channel head	Pressure boundary	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-189	3.3-1, 046	B
Heat exchanger (waste gas compressor seal cooler) shell	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.F1.AP-41	3.3-1, 080	A
Heat exchanger (waste gas compressor seal cooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Heat exchanger (waste gas compressor seal cooler) shell	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (waste gas compressor seal cooler) tubes	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Heat exchanger (waste gas compressor seal cooler) tubes	Pressure boundary	Stainless steel	Waste water (external)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-275	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Leakage boundary (spatial)	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-273	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Stainless steel	Steam	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-98	3.4-1, 011	E, 2
Piping	Leakage boundary (spatial)	Stainless steel	Steam	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-155	3.4-1, 016	E, 2
Piping	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Piping	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 4
Piping	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Piping	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Piping	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Piping	Pressure boundary	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Piping	Pressure boundary	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-273	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Piping	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Piping	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Piping	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 4
Pump casing (powdex transfer)	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Pump casing (powdex transfer)	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	D

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (Reactor coolant drain tank)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Pump casing (Reactor coolant drain tank)	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Pump casing (Reactor Coolant Drain Tank) (Waste Evaporator Feed) (Waste Evaporator Condensate Tank) (Distillate Canned) (Concentrate Canned (Floor Drain Tank) (Waste Monitor Tank) (Plant Effluent Holdup and Monitor Tank) (Laundry Holdup and Monitor Tank) (Laundry and Hot Shower Tank) (Gas Decay Tank Drain) (Waste Feeder) (Emergency Waste Return) (Chemical Drain Tank)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (Waste Evaporator Feed) (Waste Evaporator Condensate Tank) (Distillate Canned) (Concentrate Canned) (Floor Drain Tank) (Waste Monitor Tank) (Plant Effluent Holdup and Monitor Tank) (Laundry Holdup and Monitor Tank) (Laundry and Hot Shower Tank) (Gas Decay Tank Drain) (Waste Feeder) (Emergency Waste Return) (Chemical Drain Tank)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Rupture disc	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Rupture disc	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Steam trap	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steam trap	Leakage boundary (spatial)	Stainless steel	Steam	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-98	3.4-1, 011	E, 2
Steam trap	Leakage boundary (spatial)	Stainless steel	Steam	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-155	3.4-1, 016	E, 2
Strainer	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Strainer	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Strainer	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Strainer	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Strainer	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Stripping column	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Stripping column	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Stripping column	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Tank (absorption tower) (chemical addition) (chemical drain) (evaporator reagent) (feeder acid flush system) (floor drain) (laundry and hot shower) (laundry holdup and monitor) (laundry water head) (spent resin storage) (waste conditioning) (waste evaporator condensate) (waste evaporator reagent) (waste monitor)	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (absorption tower) (chemical addition) (chemical drain) (evaporator reagent) (feeder acid flush system) (floor drain) (laundry and hot shower) (laundry holdup and monitor) (laundry water head) (spent resin storage) (waste conditioning) (waste evaporator condensate) (waste evaporator reagent) (waste monitor)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Tank (Gas decay)	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	C
Tank (Gas decay)	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Tank (Gas decay)	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (Reactor coolant drain)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Tank (Reactor coolant drain)	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Tubing	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Tubing	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Tubing	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Leakage boundary (spatial)	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A
Valve body	Leakage boundary (spatial)	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-273	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Stainless steel	Steam	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-98	3.4-1, 011	E, 2

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Stainless steel	Steam	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-155	3.4-1, 016	E, 2
Valve body	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A
Valve body	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Valve body	Leakage boundary (spatial)	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3
Valve body	Pressure boundary	Carbon steel	Air – indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.A-77	3.3-1, 078	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	VII.I.A-79	3.3-1, 009	A

Table 3.3.2-14: Waste Processing Systems – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Condensation (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-280	3.3-1, 095	A
Valve body	Pressure boundary	Stainless steel	Air – indoor uncontrolled (external)	None	None	VII.J.AP-17	3.3-1, 120	A
Valve body	Pressure boundary	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-278	3.3-1, 095	A, 1
Valve body	Pressure boundary	Stainless steel	Waste water >140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	None	None	G, 3

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. Component downstream of Reactor Coolant Drain Tank Heat Exchanger periodically subjected to temperatures > 140 °F.

2. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP will be used to manage WPS components exposed to steam.

3. NUREG-2191 has been used as guidance to identify the appropriate AMP to manage this material/environment/aging effect combination.

4. Liquid Waste Processing System piping has an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4.

3.4. AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1. Introduction

This section provides the results of the AMR for those components identified in Section 2.3.4, "Steam and Power Conversion Systems", as being subject to AMR. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Auxiliary Feedwater System (2.3.4.1)
- Condensate and Feedwater System (2.3.4.2)
- Main Steam, Reheat, and Steam Dump System (2.3.4.3)
- Main Turbine and Auxiliaries System (2.3.4.4)

3.4.2. Results

The following tables summarize the results of the AMR for S&PC Systems.

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation

Table 3.4.2-4b: Chemical Feed and Hydrazine Injection – Summary of Aging Management Evaluation

Table 3.4.2-4c: Condensate Polishing System – Summary of Aging Management Evaluation

Table 3.4.2-4d: Condenser Vacuum System – Summary of Aging Management Evaluation

Table 3.4.2-4e: Heater Drain System – Summary of Aging Management Evaluation

Table 3.4.2-4f: Turbine Plant Cooling Water System – Summary of Aging Management Evaluation

3.4.2.1. Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.4.2.1.1. Auxiliary Feedwater System

Materials

The materials of construction for the AFWS components are:

- Carbon steel
- Cast iron
- Stainless steel

Environments

The AFWS components are exposed to the following environments:

- Air – dry
- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Concrete
- Gas
- Lubricating oil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the AFWS require management:

- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Reduction in heat transfer
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the AFWS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Compressed Air Monitoring (B.2.3.14)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

- Lubricating Oil Analysis (B.2.3.25)
- One-Time Inspection (B.2.3.19)
- Selective Leaching (B.2.3.20)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.4.2.1.2. Condensate and Feedwater Systems

Materials

The materials of construction for the Condensate and Feedwater Systems components are:

- Carbon steel
- CASS
- Stainless steel

Environments

The Condensate and Feedwater Systems components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Gas
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the Condensate and Feedwater Systems require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the Condensate and Feedwater Systems components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)

- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.4.2.1.3. Main Steam, Reheat, and Steam Dump System

Materials

The materials of construction for the MSS components are:

- Carbon steel
- CASS
- Stainless steel

Environments

The MSS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Gas
- Steam
- Treated water
- Treated water > 140°F
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the MSS require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the MSS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- One-Time Inspection (B.2.3.19)

- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

3.4.2.1.4. Main Turbine and Auxiliaries Systems

Auxiliary Steam System

Materials

The materials of construction for the SAS components are:

- Carbon steel
- Cast iron
- Stainless steel

Environments

The SAS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Steam
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the SAS require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall-thinning

Aging Management Programs

The following AMPs manage the aging effects for the SAS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- Selective Leaching (B.2.3.20)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

Chemical Feed and Hydrazine Injection

Materials

The materials of construction for the CFS and HIS components are:

- Stainless steel

Environments

The CFS and HIS components are exposed to the following environments:

- Air – indoor uncontrolled
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the CFS and HIS require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the CFS and HIS components:

- Bolting Integrity (B.2.3.9)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

Condensate Polishing System

Materials

The materials of construction for the CPS components are:

- Carbon steel
- Stainless steel

Environments

The CPS components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the CPS require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the CPS components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
- One-Time Inspection (B.2.3.19)
- Water Chemistry (B.2.3.2)

Condenser Vacuum System

Materials

The materials of construction for the CVS components are:

- Carbon steel

Environments

The CVS components are exposed to the following environments:

- Air – indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the CVS require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the CVS components:

- Bolting Integrity (B.2.3.9)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)

Heater Drains System

Materials

The materials of construction for the HDS components are:

- Carbon steel

Environments

The HDS components are exposed to the following environments:

- Air – indoor uncontrolled
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the HDS require management:

- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following AMPs manage the aging effects for the HDS components:

- Bolting Integrity (B.2.3.9)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Flow-Accelerated Corrosion (B.2.3.8)
- One-Time Inspection (B.2.3.19)
- TLAA (Section 4.3)
- Water Chemistry (B.2.3.2)

Turbine Plant Cooling Water System

Materials

The materials of construction for the TPCW components are:

- Carbon steel
- Stainless steel

Environments

The TPCW components are exposed to the following environments:

- Air – indoor uncontrolled
- Air with borated water leakage
- Closed-cycle cooling water

Aging Effects Requiring Management

The following aging effects associated with the TPCW require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the TPCW components:

- Bolting Integrity (B.2.3.9)
- Boric Acid Corrosion (B.2.3.4)
- Closed Treated Water Systems (B.2.3.12)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)

3.4.2.2. AMR Results for Which Further Evaluation is Recommended by the GALL Report

The AMR summaries for the S&PC Systems provide the basis for Section 3.4.2.2 and are compiled from Section 3.3.2.1. NUREG-1801 provides the basis for identifying those programs that warrant FE by the reviewer in the LRA. For the S&PC Systems, those programs are addressed in the following sections.

Note – Italicized text is taken directly from NUREG-1800 as supplemented by LR-ISG-2011-05 and LR-ISG-2012-02.

3.4.2.2.1. Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21I. This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of this SRP-LR. The related GALL Report items invoked by the subsection are VIII.D1.S-11, VIII.D2.S-11, VIII.G.S-11, VIII.B1.S-08, VIII.B2.S-08.

Where identified as an AERM, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. As summarized in item 3.4-1, 001, TLAAs are evaluated in accordance with 10 CFR 54.21(c). Steam and Power Conversion (S&PC) Systems susceptible to cumulative fatigue damage are MS, Feedwater, Auxiliary Feedwater, Auxiliary Steam, and Heater Drains. Evaluation of this TLAA is addressed in Section 4.3.3.

3.4.2.2.2. Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of cracking also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Cracking is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible.

Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those with½1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above. GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external chloride stress corrosion cracking is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements applicable to the components.

The outdoor environment at CPNPP is described in Section 3.2.2.2.3, item 2 above. As described there, the outdoor air does not contain sufficient halides for degradation of stainless steel components in air. A review of CPNPP OE and evaluation of the location and surroundings of the plant have determined that the air at CPNPP does not contain sufficient halides nor are there events that would likely increase the halide content in the air to make stress corrosion cracking an AERM. As such, as summarized in item 3.4-1, 002, stainless steel components exposed to air environments in the S&PC Systems are not susceptible to SCC and do not require management for SCC except as noted. The CSTs are outdoor reinforced concrete tanks with stainless steel liners as described in Section 2.4.11. As summarized in item 3.4-1, 063 (per LR-ISG-2012-02), SCC of insulated Feedwater System piping located outdoors is considered susceptible to cracking (water through or under insulation) and is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. The CSTs are outdoor reinforced concrete tanks with stainless steel liners as described in Section 2.4.11.

3.4.2.2.3. Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those with½1/2 mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.

GALL AMP XI.M36, "External Surfaces Monitoring," is an acceptable method to manage the aging effect. The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an adequate aging management program is used to manage this aging effect based on the environmental conditions applicable to the plant and ASME Code Section XI requirements Quality Assurance for Aging Management of Nonsafety-Related Components.

The outdoor environment at CPNPP is described in Section 3.2.2.2.3, item 2 above. As described there, the outdoor air does not contain sufficient halides for degradation of stainless steel components in air. A review of CPNPP OE and evaluation of the location and surroundings of the plant have determined that the air at CPNPP does not contain sufficient halides nor are there events that would likely increase the halide content in the air to make loss of material due to pitting and crevice corrosion an AERM. As such, stainless steel components exposed to air environments in the S&PC Systems are not susceptible to SCC or loss of material and do not require management for SCC or loss of material except as noted. As summarized in items 3.4-1, 003; 3.4-1, 008; and 3.4-1, 063, there are select instances where corrosion of stainless steel in air is considered possible and managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP or Bolting Integrity (B.2.3.9) AMP. These instances include: liner inside the CST (where contaminants could concentrate in the air space that is vented to the outdoors), closure bolting (due to the potential for local leakage), and through or under insulation (per LR-ISG-2012-02).

3.4.2.2.4. Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2, of this SRP-LR).

QA provisions applicable to LR are discussed in Section B.1.3.

3.4.2.2.5. Ongoing Review of Operating Experience (per LR-ISG-2011-05)

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

The OE process and acceptance criteria are described in Section B.1.4.

3.4.2.2.6. Loss of Material due to Recurring Internal Corrosion (per LR-ISG-2012-02)

Recurring internal corrosion can result in the need to augment AMPs beyond the recommendations in the GALL Report. During the search of plant-specific OE conducted during the LRA development, recurring internal corrosion can be identified by the number of occurrences of aging effects and the extent of degradation at each localized corrosion site. This further evaluation item is applicable if the search of plant-specific OE reveals repetitive occurrences (e.g., one per refueling outage cycle that has occurred over: (a) three or more sequential or nonsequential cycles for a 10-year OE search, or (b) two or more *sequential or nonsequential cycles for a 5-year OE search) of aging effects with the same aging mechanism in which the aging effect resulted in the component either not meeting plant-specific acceptance criteria or experiencing a reduction in wall thickness greater than 50 percent (regardless of the minimum wall thickness).*

The GALL Report recommends that a plant-specific AMP, or a new or existing AMP, be evaluated for inclusion of augmented requirements to ensure the adequate management of any recurring aging effect(s). Potential augmented requirements include: alternative examination methods (e.g., volumetric versus external visual), augmented inspections (e.g., a greater number of locations, additional locations based on risk insights based on susceptibility to aging effect and consequences of failure, a greater frequency of inspections), and additional trending parameters and decision points where increased inspections would be implemented. Acceptance criteria are described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RSLB-1)."

The applicant states: (a) why the program's examination methods will be sufficient to detect the recurring aging effect before affecting the ability of a component to perform its intended function, (b) the basis for the adequacy of augmented or lack of augmented inspections, (c) what parameters will be trended as well as the decision points where increased inspections would be implemented (e.g., the extent of degradation at individual corrosion sites, the rate of degradation change), (d) how inspections of components that are not easily accessed (i.e., buried, underground) will be conducted, aI(e) how leaks in any involved buried or underground components will be identified.

Each plant-specific operating experience example should be evaluated to determine if the chosen AMP should be augmented even if the thresholds for significance of aging effect or frequency of occurrence of aging effect have not been exceeded. For example, during a 10-year search of plant specific operating experience, two instances of 360 degree 30 percent wall loss occurred at copper alloy to steel joints. Neither the significance of the aging effect nor the frequency of occurrence of aging effect threshold has been exceeded. Nevertheless, the operating experience should be evaluated to determine if the AMP that is proposed to manage the aging effect is sufficient (e.g., method of inspection, frequency of inspection, number of inspections) to provide reasonable assurance that the CLB intended functions of the component will be met throughout the period of extended operation. Likewise, the GALL Report AMR items associated with the new FE items only cite raw water and waste water environments because OE indicates that these are the predominant environments associated with recurring internal corrosion; however, if the search of plant-specific OE reveals recurring internal corrosion in other water environments (e.g., treated water), the aging effect should be addressed in a similar manner.

The CPNPP CAP tracks and trends recurring issues, EOC, and includes recommendations to prevent recurrence, where appropriate. Through wall leaks in the Turbine Plant Cooling Water (TPCW) System due to undersized welds are prevalent throughout recent OE. Even though degradation in the TPCW stems from an original installation issue, these through wall leaks at weld locations qualify as RIC, given that degradation in the TPCW can be observed throughout the current operating life of the plant. Due to the low stress conditions within the TPCW, many of these undersized welds will last the life of the plant, while others may need multiple repairs. RIC has not been observed in any of the other in-scope S&PC Systems at CPNPP.

There are currently no mitigative strategies in place for the TPCW, other than corrosion inhibiting water chemistry control of the closed system; therefore, to address RIC in the TPCW the Closed Treated Water Systems (B.2.3.12) AMP will be enhanced to perform representative sample inspections of in-scope TPCW welds during the PEO.

3.4.2.3. Time-Limited Aging Analysis

Systems susceptible to cumulative fatigue damage are MS, Feedwater, Auxiliary Feedwater, Auxiliary Steam, and Heater Drains. Evaluation of this TLAA is addressed in the TLAA identified below:

- Section 4.3.3, “ASME Section III, Class 2 and 3 Allowable Stress Analyses”

3.4.3. Conclusion

The S&PC Systems piping, fittings, and components that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the S&PC Systems components are identified in the summaries in Section 3.4.2.1 above.

A description of these AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the PEO.

Therefore, based on the conclusions provided in Appendix B, the effects of aging associated with the S&PC System components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the PEO.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 001	Steel Piping, piping components, and piping elements exposed to Steam or Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA (See subsection 3.4.2.2.1)	Consistent with NUREG-1801. Cumulative fatigue damage is an aging effect addressed by a fatigue TLAA (Section 4.3). Further evaluation is documented in subsection 3.4.2.2.1.
3.4-1, 002	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See subsection 3.4.2.2.2)	Not applicable. Air does not contain sufficient halides to make SCC a concern. Further evaluation is documented in subsection 3.4.2.2.2.
3.4-1, 003	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated (See subsection 3.4.2.2.3)	Consistent with NUREG-1801, as clarified. Air does not contain sufficient halides to make loss of material due to pitting and crevice corrosion a concern. A generic note I and plant-specific note are used for vent piping and components inside the concrete CST as listed in Table 3.4.2-1. Loss of material for the top portion of the liner in the concrete CST above the water-line and exposed to outdoor air through vents is manage by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. Further evaluation is documented in subsection 3.4.2.2.3.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 004	Steel External surfaces, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-1801. Loss of material of steel external surfaces and bolting exposed to air with borated water leakage in the S&PC Systems is managed by the Boric Acid Corrosion (B.2.3.4) AMP.
3.4-1, 005	Steel Piping, piping components, and piping elements exposed to Steam, Treated water	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with exception to NUREG-1801. Wall thinning of steel piping and piping components exposed to treated water, including steam, in the S&PC Systems is managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801.
3.4-1, 006	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Chapter XI.M18, "Bolting Integrity "	No	Not applicable. There are no steel or stainless steel bolting exposed to soil in the S&PC Systems.
3.4-1, 007	High-strength steel Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity "	No	Not applicable. There are no high strength steel closure bolting exposed to air with steam or water leakage in the S&PC Systems.
3.4-1, 008	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity "	No	Consistent with NUREG-1801. Loss of material of steel and stainless steel bolting exposed to air – indoor, uncontrolled (external) in the S&PC Systems is managed by the Bolting Integrity (B.2.3.9) AMP. Loss of material of steel bolting exposed to air – indoor, uncontrolled (external) in SGs secondary side is also managed by the Bolting Integrity (B.2.3.9) AMP.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 009	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity "	No	Not used. Steel closure bolting exposed to air with steam or water leakage in the S&PC Systems is addressed by item 3.4-1, 008. As defined in Table 3.0-1, potential for leakage is considered in the air – indoor uncontrolled environment.
3.4-1, 010	Copper alloy, Nickel alloy, Steel; stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity "	No	Consistent with NUREG-1801. Loss of preload of steel and stainless steel bolting, and closure bolting exposed to any environment, air – outdoor (external), air – indoor, uncontrolled (external) in the S&PC Systems is managed by the Bolting Integrity (B.2.3.9) AMP. Loss of preload of steel bolting exposed to air – indoor, uncontrolled (external) in the steam generators secondary side is managed by the Bolting Integrity (B.2.3.9) AMP. There are no copper alloy or nickel alloy bolting or closure bolting exposed to any environment, air – outdoor (external), or air – indoor, uncontrolled (external) in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 011	Stainless steel Piping, piping components, and piping elements, Tanks, Heat exchanger components exposed to Steam, Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Cracking of stainless steel piping and piping components exposed treated water >60°C (>140°F) , including steam, in the S&PC Systems (with the exception of the Chemical Feed System) is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. Cracking of stainless steel piping and piping components exposed to treated water >60°C (>140°F) in the auxiliary Waste Processing Systems and in the S&PC Chemical Feed System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP. Cracking of stainless steel tanks exposed to treated water >60°C (>140°F) in the Main Steam System is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking. There are no stainless steel heat exchanger components exposed to steam or treated water >60°C (>140°F) in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 012	Steel; stainless steel Tanks exposed to Treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel tanks exposed to treated water in the Main Steam System, as well as in the DRMWS, is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of stainless steel tank liners exposed to treated water in the AFWS, as well as the DRMWS, is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of steel tanks exposed to treated water in the Auxiliary Steam System and CVCS is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 013	Steel Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Loss of material of steel piping and piping components exposed to treated water in the S&PC Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of steel piping, piping components, and heat exchanger components exposed to treated water in the CVCS is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 014	Steel Piping, piping components, and piping elements, PWR heat exchanger components exposed to Steam, Treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Loss of material of steel piping and piping components exposed to steam and treated water in the MS System, Auxiliary Steam System, and CPS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of steel piping and piping components exposed to steam and treated water in the Containment Ventilation Systems, Primary Plant Ventilation Systems, DRMWS, EDG and Auxiliary Systems, and Chilled Water Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of steel and cast iron piping and piping components exposed to treated water in the FPS is managed by the Fire Water System (B.2.3.16) AMP, which takes exception to NUREG-1801. A generic note E and plant-specific note are used. Loss of material of steel and cast iron heat exchanger components exposed to treated water in the S&PC Systems is addressed in item 3.4-1, 015.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 015	Steel Heat exchanger components exposed to Treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with exception to NUREG-1801. Loss of material of steel heat exchanger components exposed to treated water in the Main Steam and Auxiliary Steam Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of cast iron heat exchanger components exposed to treated water in the AFWS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 016	Copper alloy, Stainless steel, Nickel alloy, Aluminum Piping, piping components, and piping elements, Heat exchanger components and tubes, PWR heat exchanger components exposed to Treated water, Steam	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Loss of material of stainless steel piping, piping components, heat exchanger components and tubes exposed to treated water, including steam, in the S&PC Systems is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. Loss of material of stainless steel piping and piping components exposed to treated water, including steam, in the Chemical Feed System (specifically the pump casings and tanks) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. A generic note E and plant-specific note are used. Loss of material of stainless steel and nickel alloy steam generator (secondary side) components; stainless steel piping, piping components, and heat exchanger components exposed to treated water in the Control Room Ventilation System, CVCS, DRMWS, EDG and Auxiliary Systems, and Process and Effluent Radiation Monitoring and Sampling System is also managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material. There are no copper alloy, nickel alloy, or aluminum piping, piping components, or heat exchanger components exposed to treated water or steam in the S&PC Systems. Furthermore, loss of material for copper alloy piping components in the FPS is managed by the Fire Water System (B.2.3.16) AMP. A generic note E and a plant-specific mote are used.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 017	Copper alloy Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Not applicable. There are no copper alloy heat exchanger tubes exposed to treated water in the S&PC Systems.
3.4-1, 018	Copper alloy, Stainless steel Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with exception to NUREG-1801. Reduction of heat transfer of stainless steel heat exchanger tubes exposed to treated water in the AFWS is managed by the Water Chemistry (B.2.3.2) AMP, which takes exception to NUREG-1801. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage fouling. There are no copper alloy heat exchanger tubes exposed to treated water in the S&PC Systems.
3.4-1, 019	Stainless steel, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no stainless steel or steel heat exchanger components exposed to raw water in the S&PC Systems.
3.4-1, 020	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no copper alloy or stainless steel piping and piping components exposed to raw water in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 021	Stainless steel Heat exchanger components exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no stainless steel heat exchanger components exposed to raw water in the S&PC Systems.
3.4-1, 022	Stainless steel, Copper alloy, Steel Heat exchanger tubes, Heat exchanger components exposed to Raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Not applicable. There are no stainless steel, copper alloy, or steel heat exchanger tubes or heat exchanger components exposed to raw water in the S&PC Systems.
3.4-1, 023	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no stainless steel piping and piping components exposed to closed-cycle cooling water >60°C (>140°F) in the S&PC Systems.
3.4-1, 024	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no steel heat exchanger components exposed to closed-cycle cooling water in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 025	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no steel heat exchanger components exposed to closed-cycle cooling water in the S&PC Systems.
3.4-1, 026	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not used. Loss of material for stainless steel heat exchanger components (channel head and shell), piping and piping components exposed to treated water in the Turbine Plant Cooling Water System are included with item 3.3-1, 049. There are no other stainless steel heat exchanger components, piping, and piping components exposed to closed-cycle cooling water in the S&PC Systems.
3.4-1, 027	Copper alloy Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no copper alloy piping and piping components exposed to closed-cycle cooling water in the S&PC Systems.
3.4-1, 028	Steel, Stainless steel, Copper alloy Heat exchanger components and tubes, Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Not applicable. There are no steel, stainless steel, or copper alloy heat exchanger tubes exposed to closed-cycle cooling water in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 029	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no steel tanks exposed to air – outdoor (external) in the S&PC Systems.
3.4-1, 030	Steel, Stainless Steel, Aluminum Tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to Soil or Concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, and crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil, air-indoor uncontrolled, moist air, or condensation external environments in the S&PC Systems. The stainless steel liner of the concrete CST is exposed to outdoor air, above the waterline from tank vents, and to concrete and addressed in items 3.4-1, 003 and 3.4-1, 058, respectively.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 031	Stainless steel, Aluminum Tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to Soil or Concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to pitting, and crevice corrosion; cracking due to stress corrosion cracking	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Not applicable. There are no stainless steel or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or to air-outdoor, air-indoor uncontrolled, moist air, or condensation environments in the S&PC Systems, as clarified for item 3.4-1, 030.
3.4-1, 032	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Not applicable. There are no gray cast iron piping and piping components exposed to soil in the S&PC Systems.
3.4-1, 033	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements exposed to Treated water, Raw water, Closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Consistent with NUREG-1801. Selective leaching of cast iron piping components exposed to treated water in the AFWS and Auxiliary Steam System is managed by the Selective Leaching (B.2.3.20) AMP. There are no copper alloy (>15% Zn or >8% Al) piping and piping components exposed to treated water, raw water, or closed-cycle cooling water in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 034	Steel External surfaces exposed to Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material of steel external surfaces exposed to air – indoor, uncontrolled (external) or air – outdoor (external) in the S&PC Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP.
3.4-1, 035	Aluminum Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no aluminum piping and piping components exposed to air (outdoor) in the S&PC Systems.
3.4-1, 036	Steel Piping, piping components, and piping elements exposed to Air – outdoor (Internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material of steel piping and piping components exposed to air – outdoor (internal) in the Main Steam System, as well as the Control Room Ventilation, Miscellaneous Ventilation, and EDG and Auxiliary Systems is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.4-1, 037	Steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. There are no steel piping and piping components exposed to condensation (internal) in the S&PC System.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 038	Steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material and fouling of steel piping and piping components exposed to raw water in the Condenser Vacuum System is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP.
3.4-1, 039	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Not applicable. There are no stainless steel piping and piping components exposed to condensation (internal) in the S&PC Systems.
3.4-1, 040	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of steel piping and piping components exposed to lubricating oil in the Turbine-Driven Auxiliary Feedwater Pump Lubricating Oil System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.
3.4-1, 041	Steel Heat exchanger components exposed to Lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of steel heat exchanger components exposed to lubricating oil in the Turbine-Driven Auxiliary Feedwater Pump Lubricating Oil System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 042	Aluminum Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Not applicable. There are no aluminum piping and piping components exposed to lubricating oil in the S&PC Systems.
3.4-1, 043	Copper alloy Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Not applicable. There are no copper alloy piping and piping components exposed to lubricating oil in the S&PC Systems.
3.4-1, 044	Stainless steel Piping, piping components, and piping elements, Heat exchanger components exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of stainless steel heat exchanger components exposed to lubricating oil in the Turbine-Driven Auxiliary Feedwater Pump Lubricating Oil System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage loss of material. There are no stainless steel piping and piping components exposed to lubricating oil in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 045	Aluminum Heat exchanger components and tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Not applicable. There are no aluminum heat exchanger components and tubes exposed to lubricating oil in the S&PC Systems.
3.4-1, 046	Stainless steel, Steel, Copper alloy Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Reduction of heat transfer of stainless steel heat exchanger tubes exposed to lubricating oil in the Turbine-Driven Auxiliary Feedwater Pump Lubricating Oil System is managed by the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection (B.2.3.19) AMP will verify the effectiveness of the Lubricating Oil Analysis (B.2.3.25) AMP to manage fouling. There are no steel or copper alloy heat exchanger tubes exposed to lubricating oil in the S&PC Systems.
3.4-1, 047	Steel (with coating or wrapping), stainless steel, nickel-alloy piping, piping components, and piping elements; tanks exposed to Soil or Concrete	Loss of material due to general (steel only), pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no buried or underground steel (with coating or wrapping), stainless steel, nickel-alloy piping, piping components, or tanks exposed to soil or concrete in the S&PC Systems.
3.4-1, 048	Stainless steel, nickel alloy bolting exposed to soil	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no stainless steel or nickel alloy bolting exposed to soil in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 049	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no stainless steel or nickel alloy piping and piping components exposed to soil or concrete in the S&PC Systems.
3.4-1, 050	Steel Bolting exposed to Soil	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There is no steel bolting exposed to soil in the S&PC Systems.
3.4-1, 050.5	Underground stainless steel, nickel alloy, steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Not applicable. There are no underground stainless steel, nickel alloy, or steel piping and piping components in the S&PC Systems. Some of the piping and piping components to/from the stainless steel-lined concrete CST in the AFWS are located below-grade in the tunnel that is considered an extension of (room in) the SGBs and, therefore, exposed to indoor air and included with items 3.4-1, 034 and 3.4-1, 058 for steel and stainless steel, respectively.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 051	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. There are no steel piping and piping components exposed to concrete in the S&PC Systems.
3.4-1, 052	Aluminum Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (Internal/External)	None	None	NA - No AEM or AMP	Not applicable. There are no aluminum piping and piping components exposed to gas or air – indoor, uncontrolled (internal/external) in the S&PC Systems.
3.4-1, 053	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not applicable. There are no copper alloy (≤15% Zn and ≤8% Al) piping and piping components exposed to air with borated water leakage in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 054	Copper alloy Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. There are no copper alloy piping and piping components exposed to gas or air – indoor, uncontrolled (external) in the S&PC Systems.
3.4-1, 055	Glass Piping elements exposed to Lubricating oil, Air – outdoor, Condensation (Internal/External), Raw water, Treated water, Air with borated water leakage, Gas, Closed-cycle cooling water, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. There are no glass piping elements exposed to lubricating oil, air – outdoor, condensation (internal/external), raw water, treated water, air with borated water leakage, gas, closed-cycle cooling water, or air – indoor, uncontrolled (external) in the S&PC Systems.
3.4-1, 056	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. There are no nickel alloy piping and piping components exposed to air – indoor, uncontrolled (external) in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 057	Nickel alloy, PVC Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal)	None	None	NA - No AEM or AMP	Not applicable. There are no nickel alloy, PVC piping, or piping components exposed to air with borated water leakage, air – indoor, uncontrolled, condensation (internal) in the S&PC Systems.
3.4-1, 058	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4-1, 059	Steel Piping, piping components, and piping elements exposed to Air – indoor controlled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 060	Any material, piping, piping components, and piping elements exposed to treated water	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with exception to NUREG-1801 as supplemented by LR-ISG-2012-01. Wall thinning of susceptible carbon steel and stainless steel piping and piping components exposed to treated water in the S&PC Systems is managed by the Flow-Accelerated Corrosion (B.2.3.8) AMP, which takes exception to NUREG-1801.
3.4-1, 061	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific (See subsection 3.4.2.2.6)	Not applicable. S&PC components containing raw water or waste water have not evidenced recurring internal corrosion. However, LR-ISG-2012-02 Appendix H clarifies the applicability of recurring internal corrosion to water environments other than raw water or waste water, if revealed by plant-specific OE. As such, loss of material due to recurring internal corrosion in carbon steel TPCW piping exposed to closed-cycle cooling water is managed by the Closed Treated Water Systems (B.2.3.12) AMP, which takes exception to NUREG-1801. A generic note H and a plant-specific note are used in Table 3.4.2-4f. Further evaluation is documented in subsection 3.4.2.2.6.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems					
Item	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4-1, 062	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Not applicable. There are no steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water in the S&PC Systems. Loss of material for the stainless steel liner of the concrete CST exposed to treated water, in the AFWS, is addressed in item 3.4-1, 012. Other than the stainless steel-lined concrete CST, tanks in the S&PC Systems are located indoors with volumes less than 100,000 gallons and do not meet the scope of XI.M29 as supplemented by LR-ISG-2012-02.
3.4-1, 063	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy), pitting, or crevice corrosion, and cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks" (for tanks only)	No	Consistent with NUREG-1801 as supplemented by LR-ISG-2012-02. Loss of material of steel and stainless steel piping, and piping components exposed to outdoor air in the Feedwater and Main Steam Systems is managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP. There are no insulated copper alloy, aluminum, or copper alloy (> 15% Zn) piping, and piping components in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 064	Jacketed calcium silicate or fiberglass insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not used. The only credited insulation function associated with S&PC Systems is the insulation integral to the “hot pipe” Containment penetrations, addressed in Table 3.5.2-1. The External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP will be used to manage aging effect of reduced thermal insulation resistance (IR) for jacketed calcium silicate or fiberglass insulation in ESF areas of the Safeguards Buildings and AB, as listed in Table 3.5.2-13.
3.4-1, 065	Jacketed foamglas ® (glass dust) insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Not applicable. There are no jacketed Foamglas ® (glass dust) insulation in an air-indoor uncontrolled or air-outdoor environment in the S&PC Systems.
3.4-1, 066	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Not applicable. There are no metallic heat exchangers, or tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in the S&PC Systems.

Table 3.4-1: Summary of Aging Management Programs for Steam and Power Conversion Systems

Item	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4-1, 067	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. As described in item 3.4-1, 066, there are no metallic heat exchangers, or tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil in the S&PC Systems.
3.4-1, 068	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks"	No	Not applicable. There are no cast iron components with internal linings/coatings in the S&PC Systems.

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Accumulator (air)	Pressure boundary	Carbon steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-4	3.3-1, 121	E, 4
Accumulator (air)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Filter housing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Filter housing	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-91	3.4-1, 040	A
Flow element	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Flow element	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Flow element	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Flow element	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Flow element	Throttle	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Heat exchanger channel head (TDAFW pump lubricating oil cooler)	Pressure boundary	Cast iron	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger channel head (TDAFW pump lubricating oil cooler)	Pressure boundary	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Heat exchanger channel head (TDAFW pump lubricating oil cooler)	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VIII.G.SP-27	3.4-1, 033	C
Heat exchanger channel head (TDAFW pump lubricating oil cooler)	Pressure boundary	Cast iron	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Heat exchanger shell (TDAFW pump lubricating oil cooler)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger shell (TDAFW pump lubricating oil cooler)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Heat exchanger shell (TDAFW pump lubricating oil cooler)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-76	3.4-1, 041	A
Heat exchanger tubes (TDAFW pump lubricating oil cooler)	Heat transfer	Stainless steel	Lubricating oil (external)	Reduction of heat transfer	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-102	3.4-1, 046	A
Heat exchanger tubes (TDAFW pump lubricating oil cooler)	Heat transfer	Stainless steel	Treated water (internal)	Reduction of heat transfer	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-100	3.4-1, 018	B A
Heat exchanger tubes (TDAFW pump lubricating oil cooler)	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-79	3.4-1, 044	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Heat exchanger tubes (TDAFW pump lubricating oil cooler)	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-80	3.4-1, 016	B A
Heat exchanger tubesheet (TDAFW pump lubricating oil cooler)	Pressure boundary	Stainless steel	Lubricating oil (external)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-79	3.4-1, 044	A
Heat exchanger tubesheet (TDAFW pump lubricating oil cooler)	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-80	3.4-1, 016	B A
Moment restraint	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A, 3
Moment restraint	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A, 3
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	B, 3 A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Orifice	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice	Throttle	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	B A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.G.S-408	3.4-1, 060	B
Piping	Pressure boundary	Carbon steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-4	3.3-1, 121	E, 4
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Piping	Pressure boundary	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-41	3.4-1, 034	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-91	3.4-1, 040	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	B A
Piping	Pressure boundary	Stainless steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 4
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A
Piping	Pressure boundary	Stainless steel	Air - outdoor (external)	None	None	VIII.G.SP-127	3.4-1, 003	I, 2

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.G.S-408	3.4-1, 060	B
Piping	Structural integrity (attached)	Carbon steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-4	3.3-1, 121	E, 4
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Piping	Structural integrity (attached)	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-41	3.4-1, 034	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Structural integrity (attached)	Stainless steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 4
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A
Piping	Structural integrity (attached)	Stainless steel	Air - outdoor (external)	None	None	VIII.G.SP-127	3.4-1, 003	I, 2
Pump casing (condensate transfer)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	C
Pump casing (condensate transfer)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	D C
Pump casing (MDAFW)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Pump casing (MDAFW)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Pump casing (MDAFW)	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	D C
Pump casing (TDAFW)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Pump casing (TDAFW)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Pump casing (TDAFW)	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	D C
Tank (TDAFW lube oil cooler reservoir)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Tank (TDAFW lube oil cooler reservoir)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Tank (TDAFW lube oil cooler reservoir)	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-91	3.4-1, 040	A
Tank liner (CST)	Pressure boundary	Stainless steel	Air - outdoor (internal)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.G.SP-127	3.4-1, 003	A, 5
Tank liner (CST)	Pressure boundary	Stainless steel	Concrete (external)	None	None	VIII.I.SP-13	3.4-1, 058	C, 1
Tank liner (CST)	Pressure boundary	Stainless steel	Gas (Internal)	None	None	VIII.I.SP-15	3.4-1, 058	C
Tank liner (CST)	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-75	3.4-1, 012	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Tubing	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Tubing	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Tubing	Pressure boundary	Carbon steel	Lubricating oil (internal)	Loss of material	Lubricating Oil Analysis (B.2.3.25) One-Time Inspection (B.2.3.19)	VIII.G.SP-91	3.4-1, 040	A
Tubing	Pressure boundary	Stainless steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 4
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tubing	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Tubing	Structural integrity (attached)	Stainless steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 4
Tubing	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Turbine casing (AFW)	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Turbine casing (AFW)	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	C
Turbine casing (AFW)	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.G.S-11	3.4-1, 001	C
Turbine casing (AFW)	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	D C
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	B A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Valve body	Pressure boundary	Carbon steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-4	3.3-1, 121	E, 4
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Pressure boundary	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-41	3.4-1, 034	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-74	3.4-1, 013	B A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table Item	Notes
Valve body	Pressure boundary	Stainless steel	Air - dry (internal)	None	Compressed Air Monitoring (B.2.3.14)	VII.J.AP-20	3.3-1, 120	E, 4
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A
Valve body	Pressure boundary	Stainless steel	Air - outdoor (external)	None	None	VIII.G.SP-127	3.4-1, 003	I, 2
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-87	3.4-1, 016	B A
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	V.A.E-29	3.2-1, 044	C
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-1: Auxiliary Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table Item**	**Notes**
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant-Specific Notes

1. The external concrete portion of the CST is evaluated with the Yard structures in Table 3.5.2-10.

2. Aging effects not applicable, for more information see Sections 3.4.2.2.2 and 3.4.2.2.3.

3. Structural support functions of moment restraints are managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP and evaluated in Table 3.5.2-13.

4. Compressed (dry) air is supplied to the air accumulators and attached components from the Instrument Air System for air-operated AFW control valves.

5. Conservatively, the liner and makeup/vent lines inside the CST are exposed to outdoor air above the waterline where contaminants could concentrate.

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Flow element	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B, 3 A
Flow element	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B, 3
Flow element	Leakage boundary (spatial)	Carbon steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2, 3

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element (insulated)	Leakage boundary (spatial)	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A, 3
Moment restraint	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A, 1
Moment restraint	Pressure boundary	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-41	3.4-1, 034	A, 1
Moment restraint	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A, 1
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B, 1 A
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B, 1
Moment restraint	Pressure boundary	Carbon steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	C
Orifice	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Orifice	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	C
Orifice	Throttle	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Orifice	Throttle	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-408	3.4-1, 060	B

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Leakage boundary (spatial)	Carbon steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2, 5
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-408	3.4-1, 060	B
Piping	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B A
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-408	3.4-1, 060	B
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2, 5
Piping	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	VIII.I.SP-4	3.4-1, 059	A
Piping (insulated)	Leakage boundary (spatial)	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Air - outdoor (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Piping (insulated)	Leakage boundary (spatial)	Stainless steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Thermowell	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Thermowell	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Thermowell	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Thermowell	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	CASS	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	CASS	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Valve body	Leakage boundary (spatial)	CASS	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 2, 4
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B A
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2
Valve body	Pressure boundary	CASS	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Pressure boundary	CASS	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Valve body	Pressure boundary	CASS	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A
Valve body	Pressure boundary	CASS	Treated water > 140°F (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VII.E1.A-57	3.3-1, 002	A, 2, 4
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-87	3.4-1, 016	B A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-88	3.4-1, 011	B A

Table 3.4.2-2: Condensate and Feedwater System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Structural integrity (attached)	Carbon steel	Gas (Internal)	None	None	VIII.I.SP-4	3.4-1, 059	A
Valve body (insulated)	Leakage boundary (spatial)	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Valve body (insulated)	Leakage boundary (spatial)	Stainless steel	Air - outdoor (external)	Cracking	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Valve body (insulated)	Leakage boundary (spatial)	Stainless steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 for material, environment, aging effect, and AMP. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1) Structural support functions of moment restraints are managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP and evaluated in Table 3.5.2-13.

2) Only components within the Feedwater System are subject to cumulative fatigue damage; components within the Condensate System are not exposed to high temperatures.

3) The CASS flow elements are housed entirely inside a carbon steel spool piece, which provides the leakage boundary for the component.

4) Consistent with OE contained in NUREG-2191, Item VII.E1.A-57, Table 3.3-1, 002 is used to manage cumulative fatigue damage of stainless steel piping components exposed to any environment.

5) Feedwater piping has an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4.

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-82	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - outdoor (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-151	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A
Drain pot	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Drain pot	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Drain pot	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	A
Filter housing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Filter housing	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A
Flexible hose	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Flexible hose	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Flexible hose	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Flow element	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Flow element	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-155	3.4-1, 016	B
Flow element	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Flow element	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Heat exchanger channel head (SG blowdown)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger channel head (SG blowdown)	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B, 1
Heat exchanger shell (SG blowdown)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger shell (SG blowdown)	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B, 1

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Knock out pot	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Knock out pot	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Knock out pot	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Moment restraint	Pressure boundary	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-41	3.4-1, 034	A, 2
Moment restraint	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A, 2
Moment restraint	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A, 2
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.D1.S-11	3.4-1, 001	A, 2
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.D1.SP-74	3.4-1, 013	B, 2
Moment restraint	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B, 2

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Orifice	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Orifice	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Orifice	Throttle	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice	Throttle	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Orifice	Throttle	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A
Piping	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-71	3.4-1, 014	B
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	A
Piping	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Piping	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-15 5	3.4-1, 016	B
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Piping	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A
Piping (insulated)	Leakage boundary (spatial)	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Piping (insulated)	Pressure boundary	Carbon steel	Air - outdoor (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.D1.S-402	3.4-1, 063	A
Piping	Pressure boundary	Carbon steel	Air - outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	A
Piping	Pressure boundary	Carbon steel	Air - outdoor (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-59	3.4-1, 036	A
Piping	Pressure boundary	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A
Piping	Pressure boundary	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-71	3.4-1, 014	B
Piping	Pressure boundary	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.B1.S-15	3.4-1, 005	B
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Piping	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B
Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Pressure boundary	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Piping	Pressure boundary	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-15 5	3.4-1, 016	B
Piping	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Structural integrity (attached)	Carbon steel	Gas (internal)	None	None	VIII.I.SP-4	3.4-1, 059	A
Pump casing (SG blowdown spent resin sluice pump)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	A
Pump casing (SG blowdown spent resin sluice pump)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A
Tank (auxiliary feedwater turbine drain flash tank)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	C
Tank (auxiliary feedwater turbine drain flash tank)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-75	3.4-1, 012	B
Tank (auxiliary feedwater turbine drain flash tank)	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-97	3.4-1, 011	B
Tank (SG blowdown spent resin storage tank)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	C

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank (SG blowdown spent resin storage tank)	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A
Trap	Leakage boundary (spatial)	CASS	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	A
Trap	Leakage boundary (spatial)	CASS	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A
Trap	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Trap	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Trap	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tubing	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-155	3.4-1, 016	B
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tubing	Pressure boundary	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Tubing	Pressure boundary	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-155	3.4-1, 016	B
Tubing	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage (external)	None	None	VII.J.AP-18	3.3-1, 120	A
Valve body	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Valve body	Leakage boundary (spatial)	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-15 5	3.4-1, 016	B
Valve body	Leakage boundary (spatial)	Stainless steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-27 8	3.3-1, 095	A

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Pressure boundary	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A
Valve body	Pressure boundary	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-71	3.4-1, 014	B
Valve body	Pressure boundary	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.B1.S-15	3.4-1, 005	B
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-74	3.4-1, 013	B
Valve body	Pressure boundary	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.D1.S-16	3.4-1, 005	B
Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Pressure boundary	Stainless steel	Steam (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-98	3.4-1, 011	B
Valve body	Pressure boundary	Stainless steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-15 5	3.4-1, 016	B
Valve body	Pressure boundary	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B

Table 3.4.2-3: Main Steam, Reheat, and Steam Dump System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B
Valve body	Structural integrity (attached)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Structural integrity (attached)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Structural integrity (attached)	Carbon steel	Gas (internal)	None	None	VIII.I.SP-4	3.4-1, 059	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. The SG blowdown heat exchanger contains the same treated condensate water, at different temperatures, on both the shell and tube sides (i.e., incoming blowdown on the tube side and returning blowdown on the shell side); as such, the internal environment for both the heat exchanger shell and channel head is listed as treated water.

2. Structural support functions of moment restraints are managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP and evaluated in Table 3.5.2-13.

3. Piping associated with the following components have an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4: MS line – piping upstream of MSIVs, main steam line – piping downstream of MSIVs, MS line – admitted for operation of the turbine drive auxiliary feedwater pump, steam generator blowdown and heater drains.

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A
Drip pot	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Drip pot	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Drip pot	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-73	3.4-1, 014	B A
Heat exchanger (Auxiliary steam condensate cooler) channel head	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger (Auxiliary steam condensate cooler) channel head	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (Auxiliary steam condensate cooler) channel head	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B A
Heat exchanger (Auxiliary steam condensate cooler) shell	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger (Auxiliary steam condensate cooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Heat exchanger (Auxiliary steam condensate cooler) shell	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B A
Heat exchanger (Auxiliary steam condensate sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Heat exchanger (Auxiliary steam condensate sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Heat exchanger (Auxiliary steam condensate sample cooler) shell	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-77	3.4-1, 015	B A

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice (restricting)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Orifice (restricting)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-73	3.4-1, 014	B A
Orifice (restricting)	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-88	3.4-1, 011	B A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A, 1
Piping	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-71	3.4-1, 014	B A
Piping	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.C.S-15	3.4-1, 005	B
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-73	3.4-1, 014	B A

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (Auxiliary steam drain)	Leakage boundary (spatial)	Cast iron	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Pump casing (Auxiliary steam drain)	Leakage boundary (spatial)	Cast iron	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Pump casing (Auxiliary steam drain)	Leakage boundary (spatial)	Cast iron	Treated water (internal)	Loss of material	Selective Leaching (B.2.3.20)	VIII.E.SP-27	3.4-1, 033	A
Pump casing (Auxiliary steam drain)	Leakage boundary (spatial)	Cast iron	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-73	3.4-1, 014	B A
Steam trap	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Steam trap	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Steam trap	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A, 1
Steam trap	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-71	3.4-1, 014	B A
Steam trap	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.C.S-15	3.4-1, 005	B

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Strainer	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Strainer	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A, 1
Strainer	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-71	3.4-1, 014	B A
Strainer	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.C.S-15	3.4-1, 005	B
Tank (Auxiliary steam drain)	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Tank (Auxiliary steam drain)	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Tank (Auxiliary steam drain)	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.G.SP-75	3.4-1, 012	D C
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-4a: Auxiliary Steam System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.B1.SP-87	3.4-1, 016	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A, 1
Valve body	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-71	3.4-1, 014	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Steam (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.C.S-15	3.4-1, 005	B
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.C.SP-73	3.4-1, 014	B A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant-Specific Notes

1. Auxiliary Steam piping has an existing fatigue analysis as described in Section 4.3.3 and Table 4.3.1-4.

Table 3.4.2-4b: Chemical Feed and Hydrazine Injection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Flexible hose	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Flexible hose	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Flexible hose	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-88	3.4-1, 011	E, 1
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Piping	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-88	3.4-1, 011	E, 1
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A

Table 3.4.2-4b: Chemical Feed and Hydrazine Injection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing (Chemical feed recirculation)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Pump casing (Chemical feed recirculation)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Pump casing (Feedwater amine, feedwater hydrazine)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Pump casing (Feedwater amine, feedwater hydrazine)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Strainer	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Strainer	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Tank (Feedwater amine, feedwater hydrazine, reagent head)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Tank (Feedwater amine, feedwater hydrazine, reagent head)	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A

Table 3.4.2-4b: Chemical Feed and Hydrazine Injection – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-87	3.4-1, 016	E, 1
Valve body	Leakage boundary (spatial)	Stainless steel	Treated water > 140°F (internal)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.B1.SP-88	3.4-1, 011	E, 1
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-12	3.4-1, 058	A
Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled (internal)	None	None	VIII.I.SP-86	3.4-1, 058	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP is used to manage the aging effects for this component, material, and environment combination.

Table 3.4.2-4c: Condensate Polishing System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Piping	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A

Table 3.4.2-4c: Condensate Polishing System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Leakage boundary (spatial)	Stainless steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-87	3.4-1, 016	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.E.SP-73	3.4-1, 014	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Waste water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VII.E5.AP-281	3.3-1, 091	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant-Specific Notes

None

Table 3.4.2-4d: Condenser Vacuum System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.G.SP-136	3.4-1, 038	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Raw water (internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)	VIII.G.SP-136	3.4-1, 038	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

None

Table 3.4.2-4e: Heater Drain System – Summary of Aging Management Evaluation								
Component Type	**Intended Function (IF)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A, 1
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.F.SP-74	3.4-1, 013	B A
Piping	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.F.S-16	3.4-1, 005	B
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Cumulative fatigue damage	TLAA (Section 4.3)	VIII.B1.S-08	3.4-1, 001	A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Loss of material	Water Chemistry (B.2.3.2) One-Time Inspection (B.2.3.19)	VIII.F.SP-74	3.4-1, 013	B A
Valve body	Leakage boundary (spatial)	Carbon steel	Treated water (internal)	Wall thinning	Flow-Accelerated Corrosion (B.2.3.8)	VIII.F.S-16	3.4-1, 005	B

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant-Specific Notes

1. Heater Drain piping has an existing fatigue analysis and described in Section 4.3.3 and Table 4.3.1-4.

Table 3.4.2-4f: Turbine Plant Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Carbon steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Bolting	Mechanical closure	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-40	3.4-1, 004	A, 1
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of material	Bolting Integrity (B.2.3.9)	VIII.H.SP-84	3.4-1, 008	A
Bolting	Mechanical closure	Stainless steel	Air - indoor uncontrolled (external)	Loss of preload	Bolting Integrity (B.2.3.9)	VIII.H.SP-83	3.4-1, 010	A
Filter housing	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Filter housing	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Heat exchanger (instrument air compressor TPCW trim cooler) channel head	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A
Heat exchanger (instrument air compressor TPCW trim cooler) channel head	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D

Table 3.4.2-4f: Turbine Plant Cooling Water System – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (instrument air compressor TPCW trim cooler) shell	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A
Heat exchanger (instrument air compressor TPCW trim cooler) shell	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	D
Piping	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Piping	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A, 1
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Piping	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	None	None	H, 2
Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A
Piping	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B
Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A
Tubing	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Table 3.4.2-4f: Turbine Plant Cooling Water System – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Leakage boundary (spatial)	Carbon steel	Air - indoor uncontrolled (external)	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VIII.H.S-29	3.4-1, 034	A
Valve body	Leakage boundary (spatial)	Carbon steel	Air with borated water leakage (external)	Loss of material	Boric Acid Corrosion (B.2.3.4)	VIII.H.S-30	3.4-1, 004	A, 1
Valve body	Leakage boundary (spatial)	Carbon steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.AP-202	3.3-1, 045	B
Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled (external)	None	None	VIII.I.SP-86	3.4-1, 058	A
Valve body	Leakage boundary (spatial)	Stainless steel	Closed-cycle cooling water (internal)	Loss of material	Closed Treated Water Systems (B.2.3.12)	VII.C2.A-52	3.3-1, 049	B

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

H. Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant-Specific Notes

1. Portions of the Turbine Plant Cooling Water System within the AB are susceptible to air with borated water leakage.
2. LR-ISG-2012-02, Appendix H recommends a review of OE for RIC in the Closed Treated Water System AMP. This review was performed, and it identified that RIC exists in the Turbine Plant Cooling Water System. The enhanced Closed Treated Water Systems (B.2.3.12) AMP will be used to address inspection recommended by LR-ISG-2012-02.

3.5. AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1. Introduction

This section provides the results of the AMR for those components identified in Section 2.4, “Scoping and Screening Results: Structures”. The systems, or portions of systems, which are addressed in this section are described in the indicated sections.

- Containment Buildings (2.4.1)
- Auxiliary Building (2.4.2)
- Diesel Generator Buildings (2.4.3)
- Electrical and Control Building (2.4.4)
- Fuel Building (2.4.5)
- Safeguards Buildings (2.4.6)
- Safe Shutdown Impoundment and Dam (2.4.7)
- Service Water Intake Structure (2.4.8)
- Switchgear Buildings (2.4.9)
- Turbine Buildings (2.4.10)
- Yard Structures (2.4.11)
- Switchyard Structures (2.4.12)
- Component Support Commodity Group (2.4.13)
- Crane/Hoist Commodity Group (2.4.14)
- Fire Barrier Commodity Group (2.4.15)

3.5.2. Results

The following tables summarize the results of the AMR for Containments, Structures, and Component Supports.

Table 3.5.2-1: Containment Buildings - Summary of Aging Management Evaluation

Table 3.5.2-2: Auxiliary Building - Summary of Aging Management Evaluation

Table 3.5.2-3: Diesel Generator Buildings - Summary of Aging Management Evaluation

Table 3.5.2-4: Electrical and Control Building - Summary of Aging Management Evaluation

Table 3.5.2-5: Fuel Building - Summary of Aging Management Evaluation

Table 3.5.2-6: Safeguards Buildings - Summary of Aging Management Evaluation

Table 3.5.2-7: Safe Shutdown Impoundment and Dam - Summary of Aging Management Evaluation

3.5.2.1. Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

3.5.2.1.1. Containment Buildings

Materials

The materials of construction for the RCB components are:

- Calcium silicate
- Coatings
- Concrete (reinforced)
- Dissimilar metal welds
- Elastomer
- Grout (Unit 2 RV support reorientation)
- Lubrite®
- RTV foam
- Stainless steel
- Steel (carbon steel)

Environments

The in-scope RCB components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage

- Concrete
- Groundwater/soil (reactor vessel cavity pit)
- Soil
- Treated borated water
- Water-flowing (rainwater, groundwater)

Aging Effects Requiring Management

The following aging effects associated with the RCB structural components require management:

- Cracking
- Cumulative fatigue damage
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of coating or lining integrity
- Loss of leak tightness
- Loss of material
- Loss of mechanical function
- Loss of preload
- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the RCB structural components:

- 10 CFR Part 50, Appendix J (B.2.3.32)
- ASME Section XI, Subsection IWE (B.2.3.29)
- ASME Section XI, Subsection IWF (B.2.3.31)
- ASME Section XI, Subsection IWL (B.2.3.30)
- Boric Acid Corrosion (B.2.3.4)
- One-Time Inspection (B.2.3.19)
- Protective Coating Monitoring and Maintenance (B.2.3.36)
- Structures Monitoring (B.2.3.34)
- TLAA (Section 4.6)
- Water Chemistry (B.2.3.2)

3.5.2.1.2. Auxiliary Building

Materials

The materials of construction for the AB structural components are:

- Carbon steel
- Concrete (reinforced)
- Elastomer
- Galvanized steel
- Grout
- Masonry block

Environments

The AB structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Groundwater/soil (perched water)
- Soil
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the AB structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the AB structural components:

- Boric Acid Corrosion (B.2.3.4)
- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.3. Diesel Generator Buildings

Materials

The materials of construction for the DGBs structural components are:

- Carbon steel
- Concrete (reinforced)
- Elastomer
- Galvanized steel
- Grout
- Masonry block
- Stainless steel

Environments

The DGBs structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/soil (perched water)
- Soil
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the DGBs structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of sealing

- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the DGBs structural components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.4. Electrical and Control Building

Materials

The materials of construction for the ECB structural components are:

- Carbon steel
- Concrete (reinforced)
- Elastomer
- Galvanized steel
- Grout
- Masonry block
- Stainless steel

Environments

The ECB structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/Soil
- Soil
- Water-flowing (heavy rains, groundwater below water table)

Aging Effects Requiring Management

The following aging effects associated with the ECB structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload

- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the ECB structural components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.5. Fuel Building

Materials

The materials of construction for the FB structural components are:

- Boral
- Carbon steel
- Concrete (reinforced)
- Elastomer
- Grout
- Masonry block
- Stainless steel

Environments

The FB structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Groundwater/soil (perched water)
- Soil
- Treated borated water
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the FB structural components require management:

- Changes in dimensions
- Cracking
- Distortion

- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity
- Reduction of neutron-absorbing capacity

Aging Management Programs

The following AMPs manage the aging effects for the FB structural components:

- Boric Acid Corrosion (B.2.3.4)
- Masonry Walls (B.2.3.33)
- Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26)
- One-Time Inspection (B.2.3.19)
- Structures Monitoring (B.2.3.34)
- Water Chemistry (B.2.3.2)

In addition, monitoring of the spent fuel water level in accordance with technical specifications (TSs) (Amendment 176) and monitoring of leakage from the leak chase channels performed as part of the Structures Monitoring (B.2.3.34) AMP verifies the effectiveness of the SFP water chemistry.

3.5.2.1.6. Safeguards Buildings

Materials

The materials of construction for the SGBs structural components are:

- Carbon steel
- Concrete (reinforced)
- Elastomer
- Galvanized steel
- Grout
- Masonry block
- Stainless steel

Environments

The SGBs structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Groundwater/Soil
- Soil
- Water-flowing (heavy rains, groundwater below water table)

Aging Effects Requiring Management

The following aging effects associated with the SGBs structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the SGBs structural components:

- Boric Acid Corrosion (B.2.3.4)
- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.7. Safe Shutdown Impoundment and Dam

Materials

The materials of construction for the SSI and Dam are:

- Earth
- Rip rap (rock-fill)

Environments

The SSI and Dam are exposed to the following environments:

- Air – outdoor
- Water – flowing or standing

Aging Effects Requiring Management

The following aging effects associated with the SSI and Dam require management:

- Loss of material
- Loss of form

Aging Management Programs

The following AMP manages the aging effects for the SSI and Dam components:

- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)

3.5.2.1.8. Service Water Intake Structure

Materials

The materials of construction for the SWIS and structural components are:

- Carbon steel
- Concrete (reinforced)
- Grout
- Masonry block

Environments

The SWIS and structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/Soil
- Soil
- Water - flowing

Aging Effects Requiring Management

The following aging effects associated with the SWIS, and structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the SWIS and structural components:

- Masonry Walls (B.2.3.33)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)
- Structures Monitoring (B.2.3.34)

3.5.2.1.9. Switchgear Buildings

Materials

The materials of construction for the Switchgear buildings and structural components are:

- Carbon steel
- Concrete (reinforced)
- Galvanized steel
- Grout
- Masonry block

Environments

The Switchgear buildings and structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/soil (perched water)

- Soil
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the Switchgear buildings and structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the Switchgear buildings and structural components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.10. Turbine Buildings

Materials

The materials of construction for the TBs and structural components are:

- Carbon steel
- Concrete (reinforced)
- Grout
- Masonry block

Environments

The TBs and structural components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/Soil
- Soil
- Water-flowing (heavy rains, groundwater below the water table)

Aging Effects Requiring Management

The following aging effects associated with the TBs and structural components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the TBs and structural components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.11. Yard Structures

Materials

The materials of construction for the Yard Structures and components are:

- Carbon steel
- Concrete (reinforced)
- Elastomer
- Galvanized steel
- Grout
- Masonry block

Environments

The Yard Structures and components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/soil (perched water)
- Soil
- Stainless steel
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the Yard Structures and components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of sealing
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the Yard Structures and components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.12. Switchyard Structures

Materials

The materials of construction for the Switchyard Structures are:

- Carbon steel
- Concrete (reinforced)
- Galvanized steel
- Grout
- Masonry block

Environments

The in-scope Switchyard Structures and components are exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Groundwater/soil (perched water)
- Soil
- Water-flowing (heavy rains)

Aging Effects Requiring Management

The following aging effects associated with the Switchyard Structures and components require management:

- Cracking
- Distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of preload
- Loss of strength
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the Switchyard Structures and components:

- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.1.13. Component Support Commodity Group

Materials

The materials of construction for the Component Support Commodity Group are:

- Aluminum
- Calcium silicate
- Carbon steel
- Ceramic fiber
- Concrete (reinforced)
- Copper alloy > 15% Zn or > 8% Al
- Elastomer
- Fiberglass
- Galvanized steel
- Grout
- Silicone foam
- Stainless steel

Environments

The Component Support Commodity Group is exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Raw water
- Treated borated water

Aging Effects Requiring Management

The following aging effects associated with the Component Support Commodity Group require management:

- Change in material properties
- Cracking
- Loss of bond
- Loss of material
- Loss of mechanical function
- Loss of preload
- Loss of sealing
- Reduction in concrete anchor capacity

Aging Management Programs

The following AMPs manage the aging effects for the Component Support Commodity Group:

- ASME Section XI, Subsection IWF (B.2.3.31)
- Boric Acid Corrosion (B.2.3.4)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Selective Leaching (B.2.3.20)
- Structures Monitoring (B.2.3.34)
- Water Chemistry (B.2.3.2)

3.5.2.1.14. Crane/Hoist Commodity Group

Materials

The materials of construction for the Crane/Hoist Commodity Group are:

- Carbon steel

Environments

The Crane/Hoist Commodity Group is exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects associated with the Crane/Hoist Commodity Group require management:

- Cumulative fatigue damage
- Loss of material
- Loss of preload

Aging Management Programs

The following AMPs manage the aging effects for the Crane/Hoist Commodity Group:

- Boric Acid Corrosion (B.2.3.4)
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)
- Structures Monitoring (B.2.3.34)
- TLAA (Section 4.7.4)

3.5.2.1.15. Fire Barrier Commodity Group

Materials

The materials of construction for the Fire Barrier Commodity Group are as follows:

- Aluminum
- Carbon steel
- Ceramic fiber/blanket
- Concrete
- Concrete (reinforced)

- Elastomer
- Galvanized steel
- Gypsum
- Masonry block
- Silicate radiant energy shield (Kaowool, Cerafiber, Cera blanket, Siltemp WR 84 CSR, Avsil 84CSR fabric and similar)
- Stainless steel
- Subliming compound (Thermo-lag, Carboline and similar)

Environments

The Fire Barrier Commodity Group is exposed to the following environments:

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects associated with Fire Barrier Commodity Group require management:

- Change in material properties
- Cracking
- Delamination
- Hardening
- Loss of bond
- Loss of material
- Loss of strength
- Separation
- Shrinkage

Aging Management Programs

The following AMPs manage the aging effects for the Fire Barrier Commodity Group:

- Boric Acid Corrosion (B.2.3.4)
- Fire Protection (B.2.3.15)
- Masonry Walls (B.2.3.33)
- Structures Monitoring (B.2.3.34)

3.5.2.2. AMR Results for Which Further Evaluation is Recommended by the GALL Report

3.5.2.2.1. Containments

For the RCB, the following sections provide the CPNPP disposition to those areas requiring FE.

3.5.2.2.1.1. Cracking and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking due to Differential Settlement and Erosion of Porous Concrete Subfoundations

Cracking and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. The existing program relies on ASME Section XI, Subsection IWL to manage these aging effects. Also, reduction of foundation strength and cracking, due to differential settlement and erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments. The existing program relies on the structures monitoring program to manage these aging effects. However, some plants may rely on a dewatering system to lower the site ground water level. If the plant's current licensing basis (CLB) credits a de-watering system to control settlement, the GALL Report recommends further evaluation to verify the continued functionality of the de-watering system during the period of extended operation.

As described in Section 2.4.1, the CPNPP RCB consists of a vertical cylinder and a hemispherical dome; supported on an essentially flat foundation mat with a reactor cavity pit projection. The foundation mat is 12-ft of reinforced concrete, for which the top sits approximately 4-ft 6-in below grade. The foundation consists of firm, unweathered Glen Rose Limestone with no liquefaction susceptible soils present, which constitutes the principal bedrock formation. No structural backfill is used under or against the RCB.

No groundwater was encountered during excavation and construction of the plant structures. Also, there is no dewatering at the site during or after construction. No groundwater was encountered in the primary Glen Rose Limestone, and therefore only normal pumping equipment and procedures were required to remove storm runoff and concrete curing water which collected in the open excavations. The maximum predicted settlement is 0.26-in at the center of the reactor containment. Since the settlement is elastic, it is expected to occur immediately after the final load application. There has been no plant-specific OE indicating notable cracking or distortion due to settlement. As such, reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation is not an applicable aging effect for the CPNPP RCB. Furthermore, differential settlement is not expected to occur. However, consistent with NUREG-1801, the Structures Monitoring (B.2.3.34) AMP, which informs the ASME Section XI, Subsection IWL (B.2.3.30) AMP, will be used to manage potential settlement cracking and distortion for RCB concrete during the PEO.

3.5.2.2.1.2. Reduction of Strength and Modulus due to Elevated Temperature

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments. The implementation of 10 CFR 50.55a and ASME Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3440 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The GALL Report recommends further evaluation of a plant-specific aging management program if any portion of the concrete containment components exceeds specified temperature limits, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F). Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

The average internal temperature of the CPNPP RCB is limited to 120ºF during normal plant operation. General area temperatures inside RCB will not result in concrete temperatures in excess of 150ºF. However, local area temperatures may be elevated above general area temperatures due to process piping carrying high temperature fluids (e.g., MS, and feedwater piping RCB penetrations and RCL cold and hot leg piping through the biological shield tunnel in the primary shield wall).

Stainless steel reflective (mirror) type thermal insulation is placed between “hot pipe” process pipe and carbon steel RCB penetration sleeves. In addition, multiple pipe penetrations include calcium silicate insulation encased in the penetration assembly around the process pipe anchor sleeves. The AFWS is used in Mode 2 and 3 to maintain the SG water levels. During plant startup a switch over of feedwater supply from AFW to the main Feedwater System is made via a preheater bypass line for Unit 2 only. Prior to this switch, main feedwater is preheated, and the switch is made at approximately 15 percent power, at which time feedwater temperatures are above 250ºF. To comply with the requirements of ASME Section III, Division 2, paragraph CC-3430 on concrete temperatures, the unit 2 “cold” penetrations (MV-17, MV-18, MV-19, and MV-20) along the preheater bypass flow path, are subject to an administrative time limit of 24 hours for operating temperatures above 250ºF. The preheater bypass line for Unit 1 has been removed; as such the Unit 1 feedwater bypass penetrations (MV-17, 18, 19, 20) are only subject to the maximum AFW temperature of 122ºF.

Within the RCB, concrete pipe tunnels connect the SG subcompartments to the reactor vessel cavity. The non-safety related reactor coolant pipe penetration cooling in PSW System is designed to dissipate heat conducted to the piping supports by the reactor coolant lines utilizing forced convection to prevent dehydration of concrete during normal operation only. In addition, reflective insulation assemblies are installed on the RCS cold leg and hot leg pipes located inside these biological shield tunnels.

A review of the CPNPP RCB OE has not revealed any reports of localized concrete temperatures exceeding 200ºF. In addition, the RCB penetration and reactor coolant piping insulation contributes to keeping the local concrete temperatures of the RCB and PSW below 200ºF during normal plant operation. As such, this insulation has a LR intended function as described in Table 2.4-1 and is subject to AMR as listed in Table 3.5.2-1. Therefore, reduction of strength and modulus due to elevated temperatures do not require management for RCB concrete during the PEO.

3.5.2.2.1.3. Loss of Material due to General, Pitting and Crevice Corrosion

1. *Loss of material due to general, pitting, and crevice corrosion could occur in steel elements of inaccessible areas for all types of PWR and BWR containments. The existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is indicated from the IWE examinations. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

ASME Section XI, Subsection IWE (B.2.3.29) and 10 CFR Part 50, Appendix J (B.2.3.32) AMP will be used to manage the loss of material of steel elements of Containment, with inspection of accessible areas the leading indicator for inaccessible areas.

OE with inspection of the accessible areas of the containment liner and moisture barrier is summarized in the ASME Section XI, Subsection IWE (B.2.3.29) AMP. In addition, the 10 CFR Part 50, Appendix J (B.2.3.32) AMP inspections include a general visual examination of the Containment during each outage.

Furthermore, during each Containment ISI (CISI) interval, surface areas likely to experience accelerated degradation and aging require augmented examination. Areas previously identified by the CPNPP Coatings Program as "areas/items of specific interest" are also considered to require special attention for CISI examination. An evaluation of the acceptability of inaccessible areas is required when conditions exist in augmented areas that could indicate degradation could also exist or could have extended into the inaccessible areas. Such augmented inspections are either visual (VT-1) or ultrasonic as warranted by the findings during that interval. A review of plant OE and IWE inspection reports has not identified instances of liner corrosion beyond minor surface corrosion that was evaluated and corrected and has not identified any degradation that originated on the inaccessible side of the liner.

Additionally, a Containment alternate access opening in Unit 1 was created and restored to provide access for the SG and reactor vessel head replacement in 2007. The creation and restoration of the access opening required a section of the Containment liner plate to be cut out and then rewelded with a full penetration weld. Post-modification and subsequent inspections of the restored section of the Unit 1 Containment liner did not identify any corrosion or bulging of the liner (as could be expected if water got between the liner and Containment concrete).

As such, for CPNPP no additional plant-specific activities are warranted beyond those described above and those that are currently established for inaccessible areas of the Containment liner.

2. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments. The existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

The CPNPP RCB is a Seismic Category I, fully continuous, steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit projection. CPNPP is a PWR, which does not have a steel torus shell. Therefore, this item does not apply to CPNPP.

3. *Loss of material due to general, pitting, and crevice corrosion could occur in steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments. The existing program relies on ASME Section XI, Subsection IWE to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR)*

The CPNPP RCB is a Seismic Category I, fully continuous, steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit projection. CPNPP is a PWR which does not have a torus ring girder or downcomers; therefore, this item does not apply to CPNPP.

3.5.2.2.1.4. Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments and BWR Mark II prestressed concrete containments is a Time-Limited Aging Analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.5, "Concrete Containment Tendon Prestress Analysis," of this SRP-LR.

The CPNPP RCB is a Seismic Category I, fully continuous, steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit projection. CPNPP concrete Containment is not prestressed. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature does not apply to

CPNPP. Also, RG 1.103, RG 1.107, RG 1.90, and RG 1.35 are not applicable to CPNPP.

3.5.2.2.1.5. Cumulative Fatigue Damage

If included in the current licensing basis, fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.6, "Containment Liner Plates, Metal Containments, and Penetrations Fatigue Analysis," of this SRP-LR.

Fatigue analysis waivers are in place for the steel Containment liner plate and steel piping penetrations. The continued applicability of these waivers through the PEO are TLAAs and are addressed in Sections 4.6.1 and 4.6.2, respectively.

Larger Class metal Containment (MC) penetrations (e.g., air locks, hatch), as well as electrical penetration assemblies and the fuel transfer tube and sleeve, and piping penetrations for stainless steel lines (e.g., SI, RHR) do not have a fatigue analysis waiver. Stainless steel piping or flued heads connection to the steel penetration sleeve involve DMWs. Therefore, cracking due to cyclic loading (such as due to startups, shutdowns, or any earthquakes) is an AERM for the air locks, hatch, electrical penetration assemblies, fuel transfer tube, and piping penetration assemblies with stainless steel/DMWs as described in item number 3.5-1, 027 and will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50 Appendix J AMP through the PEO.

3.5.2.2.1.6. Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking of stainless steel penetration bellows and dissimilar metal welds could occur in all types of PWR and BWR containments. The existing program relies on ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations/evaluations implemented to detect these aging effects for stainless steel penetration bellows and dissimilar metal welds.

Cracking due to SCC is an applicable aging effect when stainless steel is exposed to temperatures in excess of 140ºF. As described in Table 3.5.2-1, CPNPP Containment piping penetration assemblies are carbon steel or stainless steel pipe passing through carbon steel sleeves with carbon steel or stainless steel flued head forgings. The sleeve and stainless steel process pipe/forging are connected via a DMW. The following piping penetration assemblies and the fuel transfer tube involve stainless steel piping and contain process fluid with temperatures above 140ºF and are therefore subject to SCC:

Penetration Number	Service
MII-1	Letdown Line to Letdown Heat Exchanger
MII-2	RHR from Hot Leg Loop #4
MII-3	RHR from Hot Leg Loop #1
MII-4	RHR to Cold Leg Loops #1 & 2
MII-5	RHR to Cold leg Loops #3 & 4
MIII-2	Boron Injection to Cold Leg Loops 1,2,3, & 4
MIII-3	SI to RC System Hot Leg Loops #2 & 3
MIII-4	SI to RC System Hot Leg Loops #1 & 4
MIII-5	SI to RC System Cold Leg Loops #1, 2, 3 & 4
MIII-14	Containment Spray to Spray Header (TR.B)
MIII-15	Containment Spray to Spray Header (TR.A)
MIII-16	Refueling Water Purification to Refueling Cavity
MIII-23	RHR to Hot Leg Loops #2 & 3
MIII-27	To Refueling Water Purification Pump
MIII-31	Refueling Cavity Skimmer Pump Discharge
MIV-1	Sample from Steam Generator #1 and RC Sample from Hot Legs
MIV-2	Sample from Steam Generator #2, Pressurizer Liquid Space, and Pressurizer Steam Space
MIV-3	Sample form Steam Generator #3, Accumulators
MIV-4	Sample from Steam Generator #4, Accumulator Test and Drains, and Hydrogen Monitoring Sample
MS-1	Containment Isolation to RHR Pump (Train A)
MS-2	Containment Isolation to RHR Pump (Train B)
MS-5	Fuel Transfer Tube

Cracking due to SCC of stainless steel penetration assemblies and DMWs is managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP. The ASME Section XI, Subsection IWE AMP includes an enhancement for a one-time volumetric/surface examination of 20 percent of these twenty-two penetrations (i.e., five (5) inspections), if prompted by plant-specific OE. In addition, due to the high temperature, these penetrations are also leading indicators for cyclic load cracking of other susceptible piping penetrations.

3.5.2.2.1.7. Loss of Material (Scaling, Spalling) and Cracking due to Freeze-Thaw

Loss of material (scaling, spalling) and cracking due to freeze-thaw could occur in inaccessible areas of PWR and BWR concrete containments. The GALL Report recommends further evaluation of this aging effect for plants located in moderate to severe weathering conditions.

The regional climate of the CPNPP site is continental and is characterized by rapid changes in temperature, marked extremes, and large daily and annual temperature ranges. Typically, summer has over 100 days with temperatures of 90ºF or above and temperatures often exceed 100ºF. During the winter and early spring, CPNPP experiences outbreaks of polar continental air fronts with little associated weather. On occasion, artic air masses push through the region and cause cold spells that rarely last more than a few days. Normally, temperatures drop to 32ºF or below about 30 days each year. One or two occurrences of snow and one or two occurrences of sleet or freezing rain may be expected in both January and February, the coldest months. The annual mean temperature for the CPNPP site is 66ºF.

As stated in the CPNPP concrete specification, the concrete mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Air entrainment content conforms to the design requirements of ACI 211.1 and was determined by ASTM C231. Air entraining admixture shall be used to produce an air content of 3 percent ± 1 percent by volume, which may be increased to 4 percent ± 1 percent or 5 percent ± 1 percent for concrete with $1^{-1}/_{2}$-in max aggregate or ¾-in max aggregate, respectively, if needed for additional workability. No instances of concrete degradation due to freeze-thaw has been found at CPNPP.

CPNPP is located in a "moderate" weathering region as determined by ASTM C33-90 Figure 1. The exterior concrete of the RCB subject to the outdoor environment is not exposed to temperatures of 32ºF or less for sufficient durations that would cause freeze-thaw aging effects to occur. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw do not require management for the CPNPP RCB or other structures.

3.5.2.2.1.8. Cracking due to Expansion from Reaction with Aggregates

Cracking due to expansion from reaction with aggregates could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL Report recommends further evaluation to determine if a plant-specific aging management program is required to manage this aging effect. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Concrete fine and coarse aggregates conform to ASTM C33, "Standard Specifications for Concrete Aggregates. Petrographic examinations of aggregates used in concrete were performed in accordance with ASTM C295, "Petrographic Examination of Aggregates for Concrete", and ASTM C289, "Potential Reactivity of Aggregates", to demonstrate that the aggregates do not adversely react within the concrete. In addition, concrete structures were constructed in accordance with ACI 318.

Although ASTM C295 and ASTM C289 were the acceptable testing standards at the time of plant construction to prevent reaction of aggregates, the NRC has issued IN 2011-20 addressing OE from Seabrook Station. Seabrook was also constructed in accordance with ASTM C295 and C289; however, it still experienced alkali-silica reaction (ASR) induced degradation.

Cracking and other indications of ASR associated with expansion due to reaction with aggregates has not been observed on the CPNPP RCB; however, the ASME Section XI, Subsection IWL (B.2.3.30) AMP and Structures Monitoring (B.2.3.34) AMP will continue to inspect and monitor for cracking and indications of ASR-induced degradation. CPNPP will also examine exposed portions of the below-grade concrete, when excavated for other reasons, through the Structures Monitoring (B.2.3.34) AMP.

3.5.2.2.1.9. Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Leaching of calcium hydroxide and carbonation is observed on concrete that is alternatively wetted and dried. It becomes significant only if the concrete is exposed to flowing water. In the event that reinforced concrete is exposed to flowing water, such leaching is not significant if the concrete is constructed to ensure that it is dense, well cured, has low permeability, and that cracking is well controlled.

The CPNPP RCB is located in a region where weathering conditions are considered "moderate" as shown in ASTM C33-90, Figure 1. The RCB is exposed to precipitation. On average, there are 79 days of measurable (> 0.01-in) precipitation annually. The RCB is designed in accordance with ACI 318 and constructed in accordance with CC-4200 of ASME-ACI 359. The concrete mix uses Portland cement conforming to ASTM. Concrete aggregates conform to the requirements of ASTM C33. Materials for concrete used in the CPNPP RCB were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. Concrete used in the RCB is constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability.

Normally inaccessible below grade concrete is visually examined when it is exposed by excavation (i.e., inspections of opportunity) for signs of degradation from aggressive chemical attack or corrosion of embedded steel. Accessible areas subject to similar conditions (material, environment, etc.) is evaluated instead of inaccessible areas. Inaccessible areas that are not inspected are documented and evaluated as such in the Structures Monitoring (B.2.3.34) AMP inspection report. The Structures Monitoring (B.2.3.34) AMP evaluates the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.

There has been no plant-specific OE indicating leaching of calcium hydroxide or carbonation in accessible areas of the RCB. Furthermore, a portion of the reactor cavity pit foundation is below the water table and exposed to groundwater. Consistent with NUREG-1801 Section IX.D, both groundwater and rainwater are conservatively considered to be flowing water.

Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation of the RCB exterior and below-grade concrete is an AERM for the PEO and will be managed by the ASME Section XI, Subsection IWL (B.2.3.30) AMP and Structures Monitoring (B.2.3.34) AMP through the PEO.

3.5.2.2.2. <u>Non-Containment Plant Structures</u>

At CPNPP, the non-Containment plant structures fall into the following groups (Groups 2 and 9 structures are not applicable at CPNPP, which is a PWR). CPNPP does not have a shield building for a MC but has a concrete containment with a metal liner that is addressed in Section 3.5.2.2.1:

- Group 1: ECB.
- Group 3: AB, DGBs, SGBs, Switchgear Buildings, Switchyard Structures, TBs, Yard Structures
- Group 4: Containment internal structures – Addressed elsewhere (PSW, major equipment supports, and refueling components are addressed in Section 3.5.2.2.1 and component support, crane, and fire barrier commodity groups are addressed in Sections 3.5.2.1.13, 3.5.2.1.14, and 3.5.2.1.15)
- Group 5: FB
- Group 6: SSI and Dam, SWIS
- Group 7: CST, RMWST, RWST, and concrete missile barriers
- Group 8: Missile doors (The steel FWSTs are addressed in Section 3.5.2.1.11 whereas the foundations are considered with Group 3).

The following sections provide the CPNPP disposition to those areas that warrant further evaluation. *Italicized* text is taken from NUREG-1800.

3.5.2.2.2.1. <u>Aging Management of Inaccessible Areas</u>

1. *Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas of these Groups of structures for plants located in moderate to severe weathering conditions.*

As summarized in item 3.5-1, 042, non-Containment structures at CPNPP consist of Groups 1, and 3 through 8. CPNPP is located in a region where weathering conditions are considered moderate, as shown in ASTM C33-90,

Figure 1. The concrete for the in-scope structures has reached its design strength, and the winter design temperature is 20°F. The Materials, Quality Control, and Special Construction Techniques state that the concrete met the standard code requirements. As stated in the CPNPP concrete specification, the mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Air entrainment content conformed to the design requirements of ACI 211.1 and was determined by ASTM C231.

OE has not identified any loss of material (spalling, scaling) and cracking due to freeze-thaw of reinforced concrete structures within the scope of LR. The CPNPP Structures Monitoring (B.2.3.34) AMP does include inspection of concrete in the accessible areas. The condition of accessible and above grade concrete is used as an indicator for the condition of the inaccessible and below grade structural components and provides reasonable assurance that degradation of inaccessible structural components will be detected before a loss of intended function.

Also, freeze-thaw damage is not significant for reinforced concrete in foundations, and in above and below grade exterior concrete, for plants located in areas in which weathering conditions are considered moderate (100–500 day-in./yr.), provided that the concrete mix design meets the air content (entrained air 3-6 percent) and water-to-cement ratio (0.35–0.45) specified in ACI 318-63 or ACI 349-85. CPNPP structures are located in a region where weathering conditions are considered moderate and CPNPP concrete specifications meet the mix design requirements for the air content and water-to-cement standards.

However, CPNPP will examine exposed portions of the below-grade concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.3.34) AMP, which would identify loss of material and cracking should freeze-thaw occur in rare instances in the moderate weathering conditions.

2. *Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation of inaccessible areas of these Groups of structures if concrete was not constructed in accordance with the recommendations in the GALL Report.*

As summarized in item 3.5-1, 043, non-Containment structures at CPNPP consist of Groups 1, and 3 through 8. Concrete fine and coarse aggregates conform to ASTM C33. Petrographic examinations of aggregates used in concrete were performed in accordance with ASTM C295, “Petrographic Examination of Aggregates for Concrete”, and ASTM C289, “Potential Reactivity of Aggregates”, to demonstrate that the aggregates do not adversely react within the concrete. In addition, concrete structures were constructed in accordance with ACI 318-71. As stated in the CPNPP specification for concrete, potential reactivity of the aggregate has been considered in the design of the concrete mix by the required use of low alkali cement. The results of the tests for Potential Reactivity of Aggregates (ASTM C289) were provided to the Engineer who monitored changes in potential reactivity and assessed their influence on the concrete mix design. The frequency of tests in accordance with ASTM C289 was directed by the Engineer.

Cracking and other indications of ASR associated with expansion due to reaction with aggregates has not been observed on CPNPP concrete structures. Nevertheless, the Structures Monitoring (B.2.3.34) AMP continues to inspect and monitor concrete structures for cracking, including hairline and patterned cracking, that are typical evidence of reaction with aggregates, such as ASR. CPNPP also examines exposed portions of below-grade (inaccessible) concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.3.34) AMP. As such, cracking due to expansion and reaction with aggregates in below-grade inaccessible concrete areas for Groups 1, and 3 through 8 structures is managed the Structures Monitoring (B.2.3.34) AMP.

3. *Cracking and distortion due to increased stress levels from settlement could occur in below-grade inaccessible concrete areas of structures for all Groups, and reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete sub foundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 -9 structures. The existing program relies on structure monitoring programs to manage these aging effects. Some plants may rely on a de-watering system to lower the site ground water level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is included in the scope of the applicant's structures monitoring program.*

Settlement is based directly on the physical properties of soil and a structure's foundation material. Cracks, distortion, and increase in component stresses due to settlement of Seismic Category I concrete foundations are considered in the Structures Monitoring (B.2.3.34) AMP. With the exception of the Category I tanks and pipe tunnels, the Seismic Category I concrete structure walls and columns are supported on thick continuous concrete base mats which rest on the rock subgrade.

As summarized in item 3.5-1, 044, CPNPP plant structures are founded on competent rock. Settlement monitoring and structural inspections indicate no visible evidence of uneven or excessive settlement since construction of the station. Differential settlement of structures, which would be evidenced by cracking or warping of structures and structural components is not a problem at CPNPP. As stated in the Structural Monitoring Inspection Guide, settlement markers are located on exterior walls of various buildings, measurements are taken and compared to previous readings.

CPNPP does not rely on a de-watering system to lower the site groundwater level. No groundwater was encountered during excavation and construction of the plant structures. However, during design validation efforts it was determined that perched water may exist at elevations higher than 775-ft. There has been no dewatering at the site during or after construction.

The Structures Monitoring (B.2.3.34) AMP continues to inspect and monitor concrete structures within the scope of LR. Therefore, cracking and distortion due to settlement is managed by the Structures Monitoring (B.2.3.34) AMP, but porous foundations and dewatering do not exist at CPNPP.

4. *Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation could occur in below-grade inaccessible concrete areas of Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions.*

Groups 1, and 3 through 8 structures at CPNPP are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72 using ingredients/materials conforming to ACI and ASTM standards. Concrete aggregates conform to the requirements of ASTM C-33-74 (fine and coarse aggregate). Materials for concrete used in CPNPP concrete structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. Concrete structures and CC are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability.

As summarized in item 3.5-1, 047, the ECB, SGBs, and TBs are the buildings in the scope of LR whose foundation extends below the water table and are exposed to groundwater that is more than absorbed surface or perched water. Recent monitoring of the groundwater chemistry at CPNPP has revealed that the groundwater is not aggressive (Chloride <500 ppm, Sulfates <1500 ppm, and Ph >5.5) with respect to chlorides, pH, or sulphates. Therefore, below-grade inaccessible concrete for the ECB, SGBs, and TBs are exposed to conditions that may result in increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide or carbonation. Conversely, the below grade portions of the AB, DGBs, FB, switchgear buildings, yard structures, and switchyard structures are located above the water table and leaching is not a concern.

Leaching of calcium hydroxide is commonly applicable for a flowing water environment. Consistent with NUREG-1801, ‘water-flowing’ can include rainwater or groundwater. Leaching of calcium hydroxide or carbonation has not occurred for above-grade concrete at CPNPP. Therefore, increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide or carbonation could occur for exterior above-grade concrete due to water-flowing from heavy rains and for below-grade portions of the ECB, SGBs, and TBs. However, the Structures Monitoring (B.2.3.34) AMP continues to inspect and monitor concrete structures within the scope of LR. CPNPP also examines exposed portions of below-grade (inaccessible) concrete, when excavated for any reason, in accordance with the Structures Monitoring (B.2.3.34) AMP.

3.5.2.2.2.2. <u>Reduction of Strength and Modulus due to Elevated Temperature</u>

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1-5 concrete structures. For any *concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 66°C (150°F) except for local areas, which are allowed to have increased temperatures not to exceed 93°C (200°F). The GALL Report recommends further evaluation of a plant-specific program if any portion of the safety-related and other concrete structures exceeds specified temperature limits, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F). Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

As summarized in item 3.5-1, 048, CPNPP Structures other than Containment are not subject to area temperatures greater than 150°F as shown in FSAR Table 9.4-2. Furthermore, the ECB (Group 1) does not have high temperature piping entering or passing through it such that local concrete temperatures remain well below 150°F. Similarly, the Switchyard Structures and Yard Structures (Group 3), do not have any high temperature piping systems routed near them. The refuel floor and spent fuel storage pool are part of the FB (Group 5). The SFP bulk water temperatures are maintained at less than 150°F for normal operation based on decay heat generation from a normal full core offload at 125 hours after shutdown, plus decay heat from the opposite unit's last refueling discharge plus decay heat from fuel assemblies from a maximum number of previous refueling in both pools. PSW concrete temperatures inside Containment (Group 4) are addressed in Section 3.5.2.2.1.2 along with Containment penetrations.

Where any type of insulated piping goes through a sealed penetration or sleeve, the insulation is removed 1" from each side of the penetration. Where any type insulation goes through an unsealed penetration or sleeve, a minimum of 2" clearance is maintained between the outside diameter of the insulation and the inside diameter of the sleeve.

The AB, and SGBs (Group 3) do have high temperature lines that enter or pass-through them, such as Main Steam, Feedwater, and Steam Generator Blowdown. High temperature lines are also routed on the roof of the Switchgear buildings to the TBs (Group 3). Main Steam (MS) lines enter the SGBs through the containment penetrations. Each of the four MS lines inside the SGBs are in their own compartment and have adequate separation. The MS lines are routed inside the SGBs through open sleeves with a minimum clearance. The MS lines leave the SGB onto the Switchgear building roof also through open sleeves with a minimum clearance on the external walls of the SGB. The open sleeves provided for routing these high temperature lines prevent the surrounding concrete wall from direct contact with the pipes and hence the concrete temperature will not exceed 200°F. The Main steam lines over the Switchgear building are supported above the Switchgear Building roof slab approximately 4-ft and hence the concrete temperature will not exceed 200°F. For the AB, SGBs and TBs, the combination of building ventilation systems and the air gap for unsealed penetrations has been adequate to maintain local concrete temperatures below 200°F for roof/wall penetrations during normal plant operation.

The diesel generators are tested monthly, and operated infrequently for losses of offsite power, such that the fire bricks and mortar between each DG silencer and the roof/wall concrete of the DGBs (Group 3) is subject to high temperature DG exhaust for the brief duration of the test/run. For the DGBs the combination of building ventilation systems and the air gap for unsealed penetrations, as well as the fire bricks, has been adequate to maintain local concrete temperatures below 200°F for the roof, wall, and penetrations during normal plant operation. The Masonry Walls (B.2.3.33) AMP will manage the condition of the fire bricks and mortar during the period of extended operation, and thereby the condition of the underlying concrete and roofing membrane.

Furthermore, plant operating experience has not identified elevated general and local area temperature as a concern for concrete structural components. Therefore, reduction of strength and modulus of concrete due to elevated temperatures are not expected to occur at CPNPP and do not require management for the AB and other (non-Containment) CPNPP structures.

3.5.2.2.2.3. Aging Management of Inaccessible Areas for Group 6 Structures

The GALL Report recommends further evaluation for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with the GALL Report, Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," or FERC/US Army Corp of Engineers dam inspection and maintenance procedures.

1. *Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas for plants located in moderate to severe weathering conditions.*

As summarized in item 3.5-1, 049, CPNPP structures, including the SWIS, are located in a region where weathering conditions are considered moderate, as shown in ASTM C33-90, Figure 1. The concrete for the in-scope structures has reached its design strength, and the winter design temperature is 20°F. The concrete structures are designed and constructed in accordance with ACI 318 and ACI 301. The design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Air entrainment content conformed to the design requirements of ACI 211.1 and was determined by ASTM C231. The concrete mix design has adequate resistance to freezing and thawing. Furthermore, the Texas climate is too warm to allow the development of significant ice on any lake. There are no records of any major river in Texas freezing over at any time, so the possibility of ice flooding can be discounted. Therefore, the loss of material (spalling, scaling) and cracking due to freeze-thaw does not apply to the CPNPP SWIS or SSI and Dam.

Furthermore, OE has not identified loss of material (spalling, scaling) and cracking due to freeze-thaw of the SWIS, which is a reinforced concrete structure within the scope of LR. However, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP does include inspections in the accessible areas of the SWIS (intake bay) for other aging effects. Similarly, the Structures Monitoring (B.2.3.34) AMP includes inspections in accessible (above-grade/water-level) areas of the SWIS, CPNPP will examine inaccessible areas or components as they become accessible for other reasons.

2. *Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible reinforced concrete areas of Group 6 structures. The GALL Report recommends further evaluation to determine if a plant-specific aging management program is required to manage this aging effect. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

Concrete fine and coarse aggregates conform to ASTM C33. Petrographic examinations of aggregates used in concrete were performed in accordance with ASTM C295, "Petrographic Examination of Aggregates for Concrete", and ASTM C289, "Potential Reactivity of Aggregates", to demonstrate that the aggregates do not adversely react within the concrete. In addition, concrete structures were constructed in accordance with ACI 318. As stated in the CPNPP specification for concrete, potential reactivity of the aggregate has been considered in the design of the concrete mix by the required use of low alkali cement. The results of the tests for potential reactivity of aggregates (ASTM C289) were provided to the Engineer who monitored changes in potential reactivity and assessed their influence on the concrete mix design. The frequency of tests in accordance with ASTM C289 was directed by the Engineer.

As summarized in item 3.5-1, 050, cracking and other indications of ASR associated with expansion due to reaction with aggregates has not been observed on CPNPP concrete structures, including the SWIS. However, based on experience at other sites, the potential for reaction with aggregates, such as ASR, cannot be eliminated for the PEO. As such, cracking due to expansion and reaction with aggregates is an applicable aging effect in below-grade inaccessible concrete areas for CPNPP Group 6 structures and will be managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP and the Structures Monitoring (B.2.3.34) AMP.

3. *Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of Group 6 structures. The GALL Report recommends further evaluation if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).*

As summarized in item 3.5-1, 051, structures at CPNPP including Group 6 structures are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72 using ingredients/materials conforming to ACI and ASTM standards. Concrete aggregates conform to the requirements of

ASTM C-33-74 (fine and coarse aggregate). Materials for concrete used in CPNPP concrete structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and CC are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R. However, the below grade surfaces of the SWIS are exposed to raw water and groundwater below the water table, both of which are considered water-flowing for LR. Therefore, a change in material properties (described as increase in porosity and permeability, and loss of strength) due to leaching of calcium hydroxide and carbonation in below-grade concrete may be an aging effect for the CPNPP SWIS. Therefore, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP and the Structures Monitoring (B.2.3.34) AMP will manage the aging effect.

3.5.2.2.2.4. Cracking due to Stress Corrosion Cracking, and Loss of Material due to Pitting and Crevice Corrosion

Cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion could occur for Group 7 and 8 stainless steel tank liners exposed to standing water. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects. The acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

As summarized in item 3.5-1, 052, the RWST, RMWST, and CST for each unit are missile protected, Seismic Category I concrete tanks with stainless steel liners. These Group 7 structures have concrete roofs, with manways and vents. The stainless steel liners inside the Seismic Category 1 tanks are anchored to the concrete. This configuration precludes water getting between the concrete and stainless steel liner, and the concrete forms a tight seal with the liner (walls and bottom). The stainless steel liners are evaluated as tanks within the following systems:

- RWST - CSS
- RMWST - DRMWS
- CST – AFWS

Loss of material due to pitting and crevice corrosion in the treated borated water or treated water contained in these Group 7 tanks will be managed by the Water Chemistry (B.2.3.2) AMP and One-Time Inspection (B.2.3.19) AMP. Cracking due to SCC of stainless steel components in these environments does not require management as the temperatures of the water is less than 140°F. The normal operating environment for the RWST, RMWST, and CST is at ambient temperature.

3.5.2.2.2.5. Cumulative Fatigue Damage Due to Fatigue

Fatigue of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of this SRP-LR.

As summarized in item 3.5-1, 053, there is no fatigue analysis for cumulative fatigue damage due to time-dependent fatigue, cyclic loading, or cyclical displacement of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports at CPNPP requiring evaluation as TLAA. Cumulative fatigue damage due to cyclic loading is an applicable aging effect for cranes (overhead heavy and light load (related to refueling) handling systems) at CPNPP and is addressed in Section 4.7.4, "Crane Load Cycle Limits".

3.5.2.2.2.6. Quality Assurance for Aging Management of Non-nuclear Safety Related Components

QA provisions applicable to LR are discussed in Section B.1.3.

3.5.2.3. Time-Limited Aging Analysis

The TLAAs identified below are associated with the Containment, Structures, and Component Supports:

- Section 4.3, "Metal Fatigue"
- Section 4.6, "Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses"
- Section 4.7.4, "Crane Load Cycle Limit"
- Section 4.7.6, "Protective Coatings"

Note - As discussed in Section 3.5.2.2.1.4 and item 3.5-1, 008, the CPNPP RCB does not use prestressed tendons.

3.5.3. Conclusion

The Containments, Structures, and Component Supports that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the Containments, Structures, and Component Supports are identified in the summaries in Section 3.5.2.1 above.

A description of these AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the PEO.

Therefore, based on the conclusions provided in Appendix B, the effects of aging associated with the Containments, Structures, and Component Supports components will be adequately managed so that there is reasonable assurance that the intended functions are maintained consistent with the CLB during the PEO.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 001	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete elements, all	Cracking and distortion due to increased stress levels from settlement	Chapter XI.S2, "ASME Section XI, Subsection IWL" or Chapter XI.S6, "Structure Monitoring" If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement (See SRP subsection 3.5.2.2.1.1)	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage cracking and distortion due to settlement. CPNPP does not rely upon a de-watering system to control settlement. Further evaluation is contained in Section 3.5.2.2.1.1.
3.5-1, 002	Concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Chapter XI.S6, "Structures Monitoring" If a de-watering system is relied upon for control of erosion, then the licensee is to ensure proper functioning of the dewatering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement (See SRP subsection 3.5.2.2.1.1)	Not applicable. The RCB is not founded on a porous concrete subfoundation and therefore, this aging effect and mechanism is not applicable to CPNPP. Further evaluation is contained in Section 3.5.2.2.1.1.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 003	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete: containment; wall; basemat, Concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded (See SRP subsection 3.5.2.2.1.2)	Not applicable. The average temperature inside Containment at CPNPP is maintained less than 120ºF. Localized concrete temperatures exceeding 200ºF have not been reported. Further evaluation is contained in Section 3.5.2.2.1.2.
3.5-1, 004	This line item only applies to BWRs.				
3.5-1, 005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE" and Chapter XI.S4, "10 CFR Part 50, Appendix J"	Yes, if corrosion is indicated from the IWE examinations (See SRP subsection 3.5.2.2.1.3.1)	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP will be used to manage loss of material of the steel containment liner plate, liner plate anchors, and integral attachments. Further evaluation is contained in Section 3.5.2.2.1.3.1. See also item 3.5-1, 035.
3.5-1, 006	This line item only applies to BWRs.				
3.5-1, 007	This line item only applies to BWRs.				
3.5-1, 008	Prestressing system: tendons	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	Yes, TLAA	Yes, TLAA (See SRP subsection 3.5.2.2.1.4)	Not applicable. CPNPP has a steel liner reinforced concrete containment structure. The RCB does not use prestressed tendons. Further evaluation is contained in Section 3.5.2.2.1.4.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 009	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell; unbraced downcomers, Steel elements: vent header; downcomers	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA (See SRP subsection 3.5.2.2.1.5)	Fatigue is an aging effect for steel piping (mechanical) penetration assemblies and is assessed by a TLAA (waiver). Other penetrations are addressed in items 3.5-1, 010 and 3.5-1, 027 below. Further evaluation is documented in Section 3.5.2.2.1.5.
3.5-1, 010	Penetration sleeves; penetration bellows	Cracking due to stress corrosion cracking	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	Yes, detection of aging effects is to be evaluated (See SRP subsection 3.5.2.2.1.6)	Consistent with NUREG-1801. The ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP will be used to manage cracking of high-temperature stainless steel and DMW mechanical (piping/transfer tube) penetration components. Further evaluation is contained in Section 3.5.2.2.1.6.
3.5-1, 011	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions (See SRP subsection 3.5.2.2.1.7)	Not applicable. CPNPP is located in a “moderate” weathering region as determined by ASTM C33-90 Figure 1. The exterior concrete of the RCB subject to the outdoor environment is not exposed to temperatures of 32 ºF or less for sufficient durations that would cause freeze-thaw aging effects to occur. Further evaluation is contained in Section 3.5.2.2.1.7.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 012	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): containment; wall; basemat, Concrete (inaccessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated function (See SRP subsection 3.5.2.2.1.8)	Consistent with NUREG-1801. Cracking associated with expansion due to reaction with aggregates has not been observed on the CPNPP RCBs. However, the ASME Section XI, Subsection IWL (B.2.3.30) AMP and Structures Monitoring (B.2.3.34) AMP will continue to inspect and monitor for cracking and indications of ASR-induced or similar degradation. Further evaluation is contained in Section 3.5.2.2.1.8.
3.5-1, 013	Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See SRP subsection 3.5.2.2.1.9)	Not used. Inaccessible portions of the foundation mat of the concrete RCB that are exposed to water – flowing (groundwater) are addressed in item 3.5-1, 014 below. Further evaluation is contained in Section 3.5.2.2.1.9.
3.5-1, 014	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See SRP subsection 3.5.2.2.1.9)	Consistent with NUREG-1801. Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of the RCBs are applicable aging effects and will be managed by the ASME Section XI, Subsection IWL (B.2.3.30) AMP and Structures Monitoring (B.2.3.34) AMP. Further evaluation is contained in Section 3.5.2.2.1.9.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 015	Concrete (accessible areas): basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not used. The reinforced concrete foundation/mat for the RCBs is completely below-grade and is not accessible.
3.5-1, 016	Concrete (accessible areas): basemat, Concrete: containment; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Not applicable. Increase in porosity and permeability, cracking, and loss of material due to aggressive chemical attack is not an applicable aging effect/mechanism requiring management as the concrete is not exposed to acidic solutions with a pH < 5.5, chloride solutions > 500ppm, or sulfate solutions > 1500ppm.
3.5-1, 017	This line item only applies to BWRs.				
3.5-1, 018	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not applicable. CPNPP is located in a “moderate” weathering region as determined by ASTM C33-90 Figure 1. The exterior concrete of the RCB subject to the outdoor environment is not exposed to temperatures of 32 ºF or less for sufficient durations that would cause freeze-thaw aging effects to occur.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 019	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat, Concrete (accessible areas): containment; wall; basemat, Concrete (accessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-1801. Cracking associated with expansion due to reaction with aggregates has not been observed on the CPNPP RCB; however, the ASME Section XI, Subsection IWL (B.2.3.30) AMP will continue to inspect and monitor for cracking and indications of ASR-induced degradation.
3.5-1, 020	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-1801. Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in accessible areas of the RCBs, exposed to heavy precipitation/drainage, is an applicable aging effect and mechanism and will be managed by the ASME Section XI, Subsection IWL (B.2.3.30) AMP.
3.5-1, 021	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel, Concrete (accessible areas): basemat; reinforcing steel, Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No	Consistent with NUREG-1801. Cracking, loss of bond, and loss of material due to corrosion of embedded steel are applicable aging effects and will be managed by the ASME Section XI, Subsection IWL (B.2.3.30) AMP.
3.5-1, 022	This line item only applies to BWRs.				

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 023	Concrete (inaccessible areas): basemat; reinforcing steel, Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Not used. CPNPP Containment is a steel lined reinforced concrete structure. This item is only applicable to steel containments. Cracking, loss of bond and loss of material for inaccessible Containment concrete is addressed in item 3.5-1, 025 below.
3.5-1, 024	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Not applicable. Increase in porosity and permeability, cracking, and loss of material due to aggressive chemical attack is not an applicable aging mechanism requiring management as the concrete is not exposed to acidic solutions with a pH < 5.5, chloride solutions > 500ppm, or sulfate solutions > 1500ppm.
3.5-1, 025	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S2, “ASME Section XI, Subsection IWL,” or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. Cracking, loss of bond, and loss of material due to corrosion of embedded steel is an applicable aging effect and will be managed by the ASME Section XI, Subsection IWL (B.2.3.30) AMP.
3.5-1, 026	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	Chapter XI.S1, “ASME Section XI, Subsection IWE”	No	Consistent with NUREG-1801. Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects of the Containment liner moisture barrier are applicable aging effects and will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 027	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-1801. Cracking to due cyclic loading is an applicable aging effect for the Containment airlocks, hatch, electrical penetrations, fuel transfer tube, and (mechanical) piping penetrations that involve stainless steel and DMWs. A CLB fatigue analysis does not exist for these penetrations. Cyclic load cracking will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP. Refer to item 3.5-1, 009 for steel piping (mechanical) penetration assemblies (for which a CLB fatigue waiver exists). Additionally, piping penetrations addressed by item 3.5-1, 010 are also leading indicators for cyclic load cracking, due to the higher temperatures during normal operation than other Containment penetrations without a CLB fatigue waiver.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 028	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion is an applicable aging effect for the emergency airlock, personnel airlock, equipment hatch, outage equipment hatch cover and all associated accessories. Loss of material for these penetrations will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP. Loss of material for the outer cover for the equipment hatch will be managed by the Structures Monitoring (B.2.3.34) AMP.
3.5-1, 029	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear of locks, hinges and closure mechanisms	Chapter XI.S1, "ASME Section XI, Subsection IWE," and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1801. Loss of leak tightness due to mechanical wear is an applicable aging effect for the emergency airlock, personnel airlock, equipment hatch, and all associated accessories. Loss of material for these penetrations will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 030	Pressure-retaining bolting	Loss of preload due to self-loosening	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No	Consistent with NUREG-1800. Loss of preload due to self-loosening is an applicable aging effect for the Containment closure bolting. Loss of preload will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP.
3.5-1, 031	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE”	No	Consistent with NUREG-1800. Loss of material is an applicable aging effect for the steel Containment closure bolting. Loss of material will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP.
3.5-1, 032	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	Chapter XI.S2, “ASME Section XI, Subsection IWL”	No	Not applicable. CPNPP has a steel liner reinforced concrete containment structure. The RCBs do not use prestressed tendons.
3.5-1, 033	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	Chapter XI.S4, “10 CFR Part 50, Appendix J "	No	Consistent with NUREG-1801. Loss of sealing associated with seals for the emergency airlock, personnel airlock, and equipment hatch, as well as the outage equipment hatch cover, or other penetrations is an applicable aging effect and will be managed by the 10 CFR Part 50, Appendix J (B.2.3.32) AMP.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 034	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage	Chapter XI.S8, "Protective Coating Monitoring and Maintenance"	No	Consistent with NUREG-1801. Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage will be managed by the Protective Coating Monitoring and Maintenance (B.2.3.36) AMP.
3.5-1, 035	Steel elements (accessible areas): liner; liner anchors; integral attachments, Penetration sleeves, Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions; Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable), Steel elements (accessible areas): drywell shell; drywell head	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE,” and Chapter XI.S4, “10 CFR Part 50, Appendix J”	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion is an applicable aging effect for the Containment liner plate (and associated attachments), penetration assemblies, fuel transfer tube penetration sleeve and leak chase channels. Loss of material will be managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP and 10 CFR Part 50, Appendix J (B.2.3.32) AMP. Threaded leak chase channel screw caps in depressions in the operating floor are accessible and managed by the ASME Section XI, Subsection IWE (B.2.3.29) AMP. A plant-specific note is used.
3.5-1, 036	This line item only applies to BWRs.				
3.5-1, 037	This line item only applies to BWRs.				
3.5-1, 038	This line item only applies to BWRs.				
3.5-1, 039	This line item only applies to BWRs.				

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 040	This line item only applies to BWRs.				
3.5-1, 041	This line item only applies to BWRs.				
3.5-1, 042	Groups 1-3, 5, 7- 9: Concrete (inaccessible): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr.) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions (See SRP subsection 3.5.2.2.2.1.1)	Not applicable. Group 2 and 9 structures are not present at CPNPP. CPNPP is located in a moderate weathering region with concrete, for group 1, 3-5 and 7 structures, that meet the air-entrainment and water-cement-ratio of ACI 318-71. Further evaluation is documented in subsection 3.5.2.2.2.1, item 1. In addition, the Structures Monitoring (B.2.3.34) AMP is credited with management of other aging effects for the concrete foundations of group 1, 3-5, and 7 structures.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 043	All Groups except Group 6: Concrete (inaccessible): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated (See SRP subsection 3.5.2.2.2.1.2)	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP is credited with managing cracking due to reaction with aggregates (such as ASR), for CPNPP group 1, 3-5, and 7 structures, including inaccessible areas. Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES, a plant-specific AMP is not required. The Structures Monitoring (B.2.3.34) AMP includes opportunistic examination of below-grade inaccessible concrete areas based on conditions in accessible areas. Further evaluation is documented in subsection 3.5.2.2.2.1, item 2.
3.5-1, 044	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	Chapter XI.S6, “Structures Monitoring” If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de- watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement (See SRP subsection 3.5.2.2.2.1.3)	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP is credited to manage cracking and distortion of below-grade exterior and foundation concrete, manholes, handholes, and duct banks exposed to soil. CPNPP does not rely upon a de-watering system to control settlement. Further evaluation is documented in subsection 3.5.2.2.2.1, item 3.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 045	BWR Only				
3.5-1, 046	Groups 1-3, 5-9: concrete: foundation; sub foundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete sub foundation	Chapter XI.S6, “Structures Monitoring” If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement (See SRP subsection 3.5.2.2.2.1.3)	Not applicable. Group 2 and 9 structures are not present at CPNPP. As described for item 3.5-1, 044 above, CPNPP does not rely upon a de-watering system to control settlement. In addition, structures are not founded on porous concrete foundations or sub foundations. Further evaluation is documented in subsection 3.5.2.2.2.1, item 3.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 047	Groups 1-5, 7-9: concrete (inaccessible): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See SRP subsection 3.5.2.2.2.1.4)	Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES, a plant-specific AMP is not required for inaccessible concrete areas of Group 1, and 3 structures with foundations exposed to groundwater. Group 2 and 9 structures are not present at CPNPP. For LR, groundwater (other than seepage from the surface) is considered to be flowing water where leaching or carbonation could occur. The Structures Monitoring (B.2.3.34) AMP includes opportunistic inspection of inaccessible concrete surfaces, when excavated for other reasons, and will include evaluation of impact to inaccessible areas if leaching or carbonation is observed in accessible areas. Further evaluation is documented in subsection 3.5.2.2.2.1, item 4.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 048	Groups 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded (See SRP subsection 3.5.2.2.2.2)	Not Applicable. Group 2 structures are not present at CPNPP. A plant-specific AMP is not required. Reduction of strength and modulus are not aging effects requiring management at CPNPP. CPNPP Group 1, 3, and 5 structures are not subject to general area temperatures greater than 150°F or local concrete temperatures greater than 200°F. Group 4 structures inside Containment (i.e., PSW) are addressed with item 3.5-1, 003. Further evaluation is documented in subsection 3.5.2.2.2.2.
3.5-1, 049	Groups 6 - concrete (inaccessible): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr.) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions (See SRP subsection 3.5.2.2.2.3.1)	Not applicable. CPNPP is located in a moderate weathering region with SWIS concrete that meets the air-entrainment and water-cement-ratio of ACI 318-71. The Texas climate is too warm to allow the development of significant ice on any lake. As such, loss of material and cracking due to freeze-thaw of SWIS concrete are not expected to occur. Further evaluation is documented in subsection 3.5.2.2.2.3, item 1.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 050	Groups 6: concrete (inaccessible): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated (See SRP subsection 3.5.2.2.2.3.2)	Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES a plant-specific AMP is not required for the inaccessible areas of the CPNPP SWIS structure. Fine and coarse aggregates conform to ASTM C33. Petrographic examinations of aggregates were performed in accordance with ASTM C295 and ASTM C289. In addition, SWIS concrete SWIS is constructed in accordance with ACI 318. The Structures Monitoring (B.2.3.34) AMP is credited with managing cracking in inaccessible areas of the SWIS structure based on conditions in accessible areas. Further evaluation is documented in subsection 3.5.2.2.2.3, Item 2.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 051	Groups 6 - concrete (inaccessible): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function (See SRP subsection 3.5.2.2.2.3.3)	Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES, a plant-specific AMP is not required for the inaccessible areas of the CPNPP SWIS (Group 6) structure. The Structures Monitoring (B.2.3.34) AMP will be credited to manage increase in porosity and permeability and loss of strength of inaccessible concrete surfaces of the SWIS (intake bay) exposed to a flowing water environment (squaw creek reservoir water or groundwater), based on the conditions in accessible areas. In addition, accessible areas of the SWIS exposed to water - flowing are addressed in item 3.5-1, 061. Further evaluation is documented in subsection 3.5.2.2.2.3, item 3.
3.5-1, 052	Groups 7, 8 - steel components: tank liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific (See SRP subsection 3.5.2.2.2.4)	Not applicable. Group 7 tanks at CPNPP are missile-protected concrete tanks with stainless steel liners. The concrete forms a tight seal with the liner and the configuration, with a concrete roof, precludes precipitation/rain (standing water) from getting between the concrete and liner. The FWSTs (Group 8 structures) are steel, addressed in item 3.3-1, 067 and managed, including the interface with the tank foundation, by the Fire Water System (B.2.3.16) AMP. Further evaluation is documented in subsection 3.5.2.2.2.4.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 053	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to cyclic loading (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA (See SRP subsection 3.5.2.2.2.5)	Not applicable. CLB fatigue analyses do not exist for support members, bolted connections; and anchorage to building structure. Containment liner and penetration fatigue is addressed in item 3.5-1, 009. Crane/hoist load cycle limits are addressed with item 3.3-1, 001. Further evaluation is documented in Section 3.5.2.2.2.5.
3.5-1, 054	All groups except 6: concrete (accessible): all	Cracking due to expansion from reaction with aggregates	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801 for Group 1, 3, 4, 5, and 7 structures, as well as accessible areas of the SWIS (Group 6 structure) that are above-grade/water-line. Group 2, and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP is credited with managing cracking due to expansion from reaction with aggregates.
3.5-1, 055	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be credited with managing reduction in concrete anchor capacity for component supports and building framing exposed to air – indoor uncontrolled and air – outdoor environments.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 056	Concrete: exterior above - and below - grade: foundation: interior slab	Loss of material due to abrasion: cavitation	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will be used to manage loss of material for exterior above grade and below-grade concrete exposed to flowing water.
3.5-1, 057	Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with exception to NUREG-1801. The ASME Section XI, Subsection IWF (B.2.3.31) AMP will be credited with managing loss of mechanical function for the passive portions of constant and variable load hangers of ASME Class 1, 2 and 3 piping systems exposed to an air – indoor uncontrolled environment. The ASME Section XI, Subsection IWF (B.2.3.31) AMP includes an exception.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 058	Earthen water-control structures: dams; embankments; reservoirs; channels; canals and ponds	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will be used to manage loss of material or loss of form of the SSI and Dam including the spillway.
3.5-1, 059	Group 6: concrete (accessible): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will be used to manage cracking, loss of bond, and loss of material of the accessible above-grade, below-grade, and interior concrete in the SWIS.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 060	Group 6: concrete (accessible): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Not applicable. Loss of material and or cracking due to freeze and thaw is not applicable as the structures are located in a region where weathering conditions are considered moderate, as shown in ASTM C33-90, Figure 1. As described in Section 3.5.2.2.2.3, item 1, the Texas climate is too warm to allow the development of significant ice on any lake.
3.5-1, 061	Group 6: concrete (accessible): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will be used to manage increase in porosity and permeability and loss of strength of the accessible above-grade concrete in SWIS components exposed to a flowing water environment.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 062	Group 6: Wooden Piles; sheeting	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Not applicable. No wooden piles or sheeting are used for any structure at CPNPP.
3.5-1, 063	Groups 1-3, 5, 7-9: concrete (accessible): exterior above - and below-grade foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP will be used to manage increase in porosity and permeability and loss of strength for accessible exterior concrete in Group 1, 3, 5 and 7 structures exposed to flowing water in the form of heavy drainage of rainwater.
3.5-1, 064	Groups 1-3, 5, 7-9: concrete (accessible): exterior above - and below-grade foundation	Loss of Material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S6, “Structures Monitoring”	No	Not applicable. Group 2 and 9 structures are not present at CPNPP. CPNPP is located in a moderate weathering region with concrete, for group 1, 3, 5 and 7 structures, that meet the air-entrainment and water-cement-ratio of ACI 318-71.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 065	Groups 1-3, 5, 7-9: concrete (inaccessible): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible): below-grade exterior; foundation, Groups 6: concrete (inaccessible): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP will be used to manage cracking, loss of bond, and loss of material of inaccessible concrete in Groups 1, 3 and 6 structures exposed to a groundwater/soil environment. Group 5, and 7 structures, as well as certain Group 3 structures are founded above the water-table.
3.5-1, 066	Groups 1-5, 7, 9: concrete (accessible): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP will be used to manage cracking, loss of bond, and loss of material of accessible concrete in Groups 1, 3-7 structures exposed to air indoor, and air outdoor environments. The Structures Monitoring (B.2.3.34) AMP also manages loss of bond and loss of material due to corrosion of masonry wall restraints, and reinforcements.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 067	Groups 1-5, 7, 9: Concrete: Interior; above-grade exterior, Groups 1-3, 5, 7-9 - concrete (inaccessible): below-grade exterior; foundation, Group 6: concrete (inaccessible): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Group 2 and 9 structures are not present at CPNPP. The Structures Monitoring (B.2.3.34) AMP will be used to manage increase in porosity and permeability, cracking, and loss of material of inaccessible concrete in Groups 1, 3 through 7 structures.
3.5-1, 068	High-strength structural bolting	Cracking due to stress corrosion cracking	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Not applicable. Bolting for ASME Class 1, 2, 3 and MC component supports, including moment restraints, do not have a measured yield strength > 150 ksi.
3.5-1, 069	High-strength structural bolting	Cracking due to stress corrosion cracking	Chapter XI.S6, "Structures Monitoring“ Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No	Not applicable. There are no structural bolts at CPNPP with a measured yield strength > 150 ksi. Also, the Structures Monitoring (B.2.3.34) AMP includes storage recommendations and prescription against the use of molybdenum disulfide or similar lubricants.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 070	Masonry walls: all	Cracking due to restraint shrinkage, creep, and aggressive environment	Chapter XI.S5, "Masonry Walls"	No	Consistent with NUREG-1801. The Masonry Walls (B.2.3.33) AMP will be used to manage cracking of masonry walls exposed to indoor air and outdoor air. As described in Table 3.5.2-15, some masonry walls and block openings include fire barriers and the Masonry Walls (B.2.3.33) AMP credits and communicates with the Fire Protection (B.2.3.15) AMP.
3.5-1, 071	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Chapter XI.S5, "Masonry Walls"	No	Not applicable. Freeze-thaw is not an applicable aging mechanism for masonry walls, or other structures, in the moderate North Central Texas environment of CPNPP, as described further in Section 3.5.2.2.2.1, item 1.
3.5-1, 072	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP is credited with managing seals for watertight doors in the DGB, for manway openings of tanks, manhole covers and elastic joint filler in the yard, air-tight doors in the ECB (CRE), and tornado components in the AB, ECB, FB and SGBs as well as roofing membranes.
3.5-1, 073	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage	Chapter XI.S8, "Protective Coating Monitoring and Maintenance"	No	Not used. Aging effects for Service Level 1 coatings are managed by the Protective Coating Monitoring and Maintenance (B.2.3.36) AMP as addressed under item 3.5-1, 034.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 074	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Chapter XI.S6, "Structures Monitoring"	No	Not used. Sliding surfaces are addressed for ASME Class I components in item 3.5-1, 075 below.
3.5-1, 075	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with exception to NUREG-1801. Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, and wear is an applicable aging effect and mechanism for the Lubrite® blocks used on sliding surfaces for the RCS equipment supports Loss of mechanical function for these sliding surfaces will be managed by the ASME Section XI Subsection IWF AMP, which includes an exception.
3.5-1, 076	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt, overload, wear	Chapter XI.S6, "Structures Monitoring"	No	Not used. Sliding surfaces are addressed for ASME Class I components in item 3.5-1, 075 above.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 077	Steel components: all structural steel	Loss of Material due to corrosion	Chapter XI.S6, “Structures Monitoring” If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of material of miscellaneous structural steel components exposed to indoor air, and steel and galvanized steel exposed to outdoor air. Protective coatings are not relied upon to manage the effects of aging of miscellaneous structural steel components at CPNPP.
3.5-1, 078	Steel components: fuel pool liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels	Consistent with NUREG-1801. The Water Chemistry (B.2.3.2) AMP is credited to manage loss of material and cracking of the stainless steel SFP liner and gate and refueling canal liner. The SFP water level is monitored in accordance with TSs. Monitoring of leak chase channels is performed as part of the Structures Monitoring (B.2.3.34) AMP. Fuel transfer tube and supports, fuel transfer upender, refueling canal liner and reactor vessel permanent cavity seal ring inside Containment are included, with the effectiveness of the Water Chemistry (B.2.3.2) AMP verified by the One-Time Inspection (B.2.3.19) AMP. A plant-specific note is used for the non-spent fuel components.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 079	Steel components: piles	Loss of material due to corrosion	Chapter XI.S6, "Structures Monitoring"	No	Not Applicable. CPNPP structures are not supported on pile foundations.
3.5-1, 080	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of material of steel structural bolting exposed to indoor air In addition, as listed in Table 3.5.2-14, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP will be credited with managing loss of material for crane/hoist bolting exposed to indoor air.
3.5-1, 081	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with exception to NUREG-1801. The ASME Section XI, Subsection IWF (B.2.3.31) AMP will be used to manage loss of material of steel structural bolting associated with supports for ASME Class 1, 2, 3 piping and components. The ASME Section XI, Subsection IWF (B.2.3.31) AMP includes an exception.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 082	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S6, structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of material of steel and galvanized steel structural bolting exposed to outdoor air. In addition, as listed in Table 3.5.2-14, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP will be credited with managing loss of material for crane/hoist bolting exposed to outdoor air.
3.5-1, 083	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will be used to manage loss of material of steel structural bolting and miscellaneous structural components associated with Group 6 structures in outdoor air and raw water environments.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 084	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Consistent with exception to NUREG-1801. As listed in Table 3.5.2-13, loss of material for stainless steel bolting associated with ASME Class 2, 3 piping exposed to treated borated water in the fuel transfer canal/spent fuel pool will be managed by the Water Chemistry (B.2.3.2) AMP and ASME Section XI, Subsection IWF (B.2.3.31) AMP, both of which include exceptions. A generic Note B is used. As listed in Table 3.5.2-1, loss of material for stainless steel fuel transfer tube (containment closure) bolting and structural bolting associated with supports for ASME Class 2/MC components in the refueling cavity will be managed by the Water Chemistry (B.2.3.2) AMP, which includes an exception, and the ASME Section XI, Subsection IWE (B.2.3.29) AMP. A generic note E and plant-specific notes are used.
3.5-1, 085	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water, and Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Not used. Loss of material for structural bolting exposed to treated borated water in the refueling cavity/spent fuel pool is addressed in item 3.5-1, 084.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 086	Structural bolting	Loss of material due to pitting and crevice corrosion	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with exception to NUREG-1801. The ASME Section XI, Subsection IWF (B.2.3.31) AMP will be used to manage loss of material of structural bolting associated with supports for ASME Class 3 piping and components exposed to outdoor air. The ASME Section XI, Subsection IWF (B.2.3.31) AMP includes an exception.
3.5-1, 087	Structural bolting	Loss of preload due to self-loosening	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with exception to NUREG-1801. The ASME Section XI, Subsection IWF (B.2.3.31) AMP will be used to manage loss of preload structural bolting associated with supports for ASME Class 1, 2, 3 piping and components. The ASME Section XI, Subsection IWF (B.2.3.31) AMP includes an exception.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 088	Structural bolting	Loss of Preload	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of preload of the steel, galvanized steel, and stainless steel structural bolting in any environment. Loss of preload for bolting associated with supports for ASME Class 1, 2 and 3 piping and components is addressed in item 3.5-1, 087 above. In addition, as listed in Table 3.5.2-14, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP will be credited with managing crane/hoist bolting exposed to outdoor air.
3.5-1, 089	Support members; welds; bolted connections; support anchorage to building	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. The Boric Acid Corrosion (B.2.3.4) AMP will be used to manage loss of material due to BAC of aluminum, steel, and galvanized steel miscellaneous structural components, support members, welds, bolted connections, and support anchorage to building structure for piping and component supports exposed to air with potential borated water leakage. Air locks and accessories, control rod drive missile shield, leak channel screw caps, liner plate, and penetration assemblies inside Containment are also included, as are cabinets, and other structural components and insulation jacketing potentially exposed to air with borated water leakage.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components					
Item Number	**Component**	**Aging Effect Requiring Management**	**Aging Management Program**	**Further Evaluation Recommended**	**Discussion**
3.5-1, 090	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water, and Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with exception to NUREG-1801. The Water Chemistry (B.2.3.2) AMP and ASME Section XI, Subsection IWF (B.2.3.31) AMP will be used to manage loss of material for stainless steel ASME Class 2, 3 piping and component supports exposed to treated borated water in the SFP. The Water Chemistry (B.2.3.2) AMP and ASME Section XI, Subsection IWF (B.2.3.31) AMP each include an exception.
3.5-1, 091	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No	Consistent with exception to NUREG-1801. The ASME Section XI, Subsection IWF (B.2.3.31) AMP will be used to manage loss of material for steel supports, welds, bolted connections, support anchorage to building structure for ASME Class 1, 2, 3 piping and components. The ASME Section XI, Subsection IWF (B.2.3.31) AMP includes an exception.
3.5-1, 092	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of material of steel (Non-ASME) support members, welds, and other structural components that are exposed to an air-indoor uncontrolled and air-outdoor environment.

Table 3.5-1 Summary of Aging Management Programs for Containment Building and Internal Structural Components

Item Number	Component	Aging Effect Requiring Management	Aging Management Program	Further Evaluation Recommended	Discussion
3.5-1, 093	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) AMP will be used to manage loss of material of aluminum, stainless steel, and galvanized steel (Non-ASME) support members, welds, bird screens, cabinets, metal siding, tornado dampers and panels, transmission towers and other structural components that are exposed to an air-outdoor environment. For stainless steel and aluminum, the focus is on areas where water could pool or get within insulation jacketing.
3.5-1, 094	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	Chapter XI.S3, "ASME Section XI, Subsection IWF"	No	Not applicable. The CPNPP supports for ASME Class 1, 2 and 3 piping and components do not include vibration isolation elements.
3.5-1, 095	Aluminum, galvanized steel and stainless steel support members; welds; bolted connections; support anchorage to building structure exposed to Air – indoor, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for support members, bird screens, cabinets, metal siding and other structural components that are not susceptible to frequent or prolonged water pooling.

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Air locks and accessories	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A, 1
Air locks and accessories	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Loss of leak tightness	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-39	3.5-1, 029	A, 1
Air locks and accessories	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.C-16	3.5-1, 028	A, 1
Air locks and accessories	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C, 1
Air locks and accessories	Pressure boundary	Elastomer	Air – indoor uncontrolled	Loss of sealing	10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-41	3.5-1, 033	A, 1
Bolting (containment closure)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29)	II.A3.CP-148	3.5-1, 031	A
Bolting (containment closure)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-150	3.5-1, 030	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (containment closure)	Pressure boundary Structural support	Stainless steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-150	3.5-1, 030	A
Bolting (containment closure)	Pressure boundary Structural support	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.3.2); ASME Section XI, Subsection IWE (B.2.3.29)	III.B1.2.TP-232	3.5-1, 084	E, 1, 10
Bolting (containment closure)	Pressure boundary Structural support	Stainless steel	Treated borated water	Loss of preload	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-150	3.5-1, 030	A, 1, 10
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A4.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.3.2); ASME Section XI, Subsection IWE (B.2.3.29)	III.B1.2.TP-232	3.5-1, 084	E, 10

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Dome; wall; ring girders; buttresses (accessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled; Air – outdoor	Cracking	ASME Section XI, Subsection IWL (B.2.3.30)	II.A1.CP-33	3.5-1, 019	A
Concrete: Dome; wall; ring girders; buttresses (accessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled; Air – outdoor	Cracking; loss of bond; and loss of material	ASME Section XI, Subsection IWL (B.2.3.30)	II.A1.CP-68	3.5-1, 021	A
Concrete: Dome; wall; ring girders; buttresses (accessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	ASME Section XI, Subsection IWL (B.2.3.30)	II.A1.CP-32	3.5-1, 020	A, 3

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Dome; wall; ring girders; buttresses (inaccessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWL (B.2.3.30); Structures Monitoring (B.2.3.34)	II.A1.CP-67	3.5-1, 012	E, 2
Concrete: Dome; wall; ring girders; buttresses (inaccessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled; Air – outdoor	Cracking; loss of bond; and loss of material	ASME Section XI, Subsection IWL (B.2.3.30)	II.A1.CP-97	3.5-1, 025	A
Concrete: Dome; wall; ring girders; buttresses (inaccessible)	HELB shielding Missile barrier Pressure boundary Shielding Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	ASME Section XI, Subsection IWL (B.2.3.30); Structures Monitoring (B.2.3.34)	II.A1.CP-102	3.5-1, 014	E, 2, 3

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation/mat (inaccessible)	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	ASME Section XI, Subsection IWL (B.2.3.30)	II.A1.CP-97	3.5-1, 025	A
Concrete: Foundation/mat (inaccessible)	Structural support	Concrete (reinforced)	Air – indoor uncontrolled; Groundwater/soil	Cracking	ASME Section XI, Subsection IWL (B.2.3.30); Structures Monitoring (B.2.3.34)	II.A1.CP-67	3.5-1, 012	E, 2
Concrete: Foundation/mat (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	II.A1.CP-101	3.5-1, 001	A
Concrete: Foundation/mat (inaccessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	ASME Section XI, Subsection IWL (B.2.3.30); Structures Monitoring (B.2.3.34)	II.A1.CP-102	3.5-1, 014	E, 2, 3
Concrete: Internal columns, beams, slabs, walls (accessible)	Direct flow Missile barrier Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-25	3.5-1, 054	A
Concrete: Internal columns, beams, slabs, walls (accessible)	Direct flow Missile barrier Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-26	3.5-1, 066	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete: Internal columns, beams, slabs, walls (inaccessible)	Direct flow Missile barrier Shielding Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-204	3.5-1, 043	E, 2
Concrete: Refueling canal (accessible)	Direct flow Flood barrier Missile barrier Pressure boundary Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-25	3.5-1, 054	A
Concrete: Refueling canal (accessible)	Direct flow Flood barrier Missile barrier Pressure boundary Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-26	3.5-1, 066	A
Concrete: Refueling canal (inaccessible)	Direct flow Flood barrier Missile barrier Pressure boundary Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-204	3.5-1, 043	E, 2

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Control rod drive shaft missile shield	Missile barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-302	3.5-1, 077	A
Control rod drive shaft missile shield	Missile barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C
Equipment hatch	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A, 1
Equipment hatch	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Loss of leak tightness	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-39	3.5-1, 029	A, 1
Equipment hatch	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.C-16	3.5-1, 028	A, 1
Equipment hatch cover (outage)	Pressure boundary	Carbon steel	Air – indoor uncontrolled; Air – outdoor	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A, 1
Equipment hatch cover (outage)	Pressure boundary	Carbon steel	Air – indoor uncontrolled; Air – outdoor	Loss of leak tightness	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-39	3.5-1, 029	A, 1

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Equipment hatch cover (outage)	Pressure boundary	Carbon steel	Air – indoor uncontrolled; Air – outdoor	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.C-16	3.5-1, 028	A, 1
Equipment hatch cover (outage) (seals)	Pressure boundary	RTV foam	Air – indoor uncontrolled	Loss of sealing	10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-41	3.5-1, 033	A
Equipment hatch missile shield (outer cover)	Missile barrier	Concrete (reinforced)	Air – outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-25	3.5-1, 054	A
Equipment hatch missile shield (outer cover)	Missile barrier	Concrete (reinforced)	Air – outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-26	3.5-1, 066	A
Equipment hatch missile shield (outer cover)	Missile barrier	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	II.A3.C-16	3.5-1, 028	E, 4
Fuel transfer tube (including expansion joints, and blind flange)	Pressure boundary Shielding	Stainless steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-38	3.5-1, 010	A
Fuel transfer tube (including expansion joints, and blind flange)	Pressure boundary Shielding	Stainless steel	Treated borated water	Cracking, Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	III.A5.T-14	3.5-1, 078	E, 5
Fuel transfer tube (including penetration sleeves)	Pressure boundary Shielding	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-36	3.5-1, 035	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fuel transfer tube (penetration sleeves)	Pressure boundary Shielding	Steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A
Fuel transfer tube supports	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8	3.5-1, 095	A, 1
Fuel transfer tube supports	Structural support	Stainless steel	Treated borated water	Cracking, Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	III.A5.T-14	3.5-1, 078	E, 5
Fuel transfer upender	Structural support	Stainless steel	Treated borated water	Cracking, Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	III.A5.T-14	3.5-1, 078	E, 5
Leak chase channels	Pressure boundary	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29)	II.A1.CP-35	3.5-1, 035	C, 9
Leak chase channels (screw caps)	Pressure boundary	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C, 9
Liner (refueling canal)	Pressure boundary Structural support	Stainless steel	Treated borated water	Cracking, Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	III.A5.T-14	3.5-1, 078	E, 5
Liner plate	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Cumulative fatigue damage	TLAA (Section 4.6)	II.A3.C-13	3.5-1, 009	A
Liner plate (accessible)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A1.CP-35	3.5-1, 035	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Liner plate (accessible)	Pressure boundary Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C
Liner plate (inaccessible)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A1.CP-98	3.5-1, 005	A
Liner plate anchors and attachments	Pressure boundary Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C
Liner plate anchors and attachments (accessible)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A1.CP-35	3.5-1, 035	A
Liner plate anchors and attachments (inaccessible)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A1.CP-98	3.5-1, 005	A
Liner plate moisture barrier (sealing compound)	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	ASME Section XI, Subsection IWE (B.2.3.29)	II.A3.CP-40	3.5-1, 026	A
Penetration assemblies (electrical)	Pressure boundary Structural support	Dissimilar metal welds	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Penetration assemblies (electrical)	Pressure boundary Structural support	Carbon steel	Air with borated water leakage	Loss of Material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C
Penetration assemblies (electrical)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A
Penetration assemblies (electrical)	Pressure boundary Structural support	Stainless steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A
Penetration assemblies (electrical)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-36	3.5-1, 035	A
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Dissimilar metal welds	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Stainless steel; Dissimilar metal welds	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-38	3.5-1, 010	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	C
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Stainless steel	Air – indoor uncontrolled	Cracking	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-37	3.5-1, 027	A
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Cumulative fatigue damage	TLAA (Section 4.6)	II.A3.C-13	3.5-1, 009	A
Penetration assemblies (mechanical piping)	Pressure boundary Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWE (B.2.3.29); 10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-36	3.5-1, 035	A
Penetration assemblies (seals)	Pressure boundary Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	10 CFR Part 50, Appendix J (B.2.3.32)	II.A3.CP-41	3.5-1, 033	A
Primary shield wall (reactor cavity) (accessible)	Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-25	3.5-1, 054	A
Primary shield wall (reactor cavity) (accessible)	Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-26	3.5-1, 066	A

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Primary shield wall (reactor cavity) (inaccessible)	Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-204	3.5-1, 043	E, 2
RCS Class 1 support (reactor vessel support structures)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.1.T-24	3.5-1, 091	B
RCS Class 1 support (reactor vessel support structures) (Unit 2 only)	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B1.1.TP-42	3.5-1, 055	A
RCS Class 1 support bolting	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.1.TP-229	3.5-1, 087	B
RCS Class 1 support bolting	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	A
RCS Class 1 supports	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.1.T-24	3.5-1, 091	B
RCS Class 1 supports	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	A
Reactor vessel permanent cavity seal ring	Pressure boundary	Stainless steel	Treated borated water	Cracking, Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	III.A5.T-14	3.5-1, 078	E, 5
Recirculation sump (inaccessible)	Direct flow	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A4.TP-204	3.5-1, 043	E, 2
Recirculation sump cover	Shelter, protection	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8	3.5-1, 095	C
Recirculation sump effluent guard pipe	Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A4.TP-302	3.5-1, 077	C, 6
Recirculation sump effluent guard pipe	Shelter, protection	Carbon steel	Concrete	None	None	VII.J.AP-282	3.3-1, 112	A, 6

Table 3.5.2-1: Containment Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Recirculation sump liner	Pressure boundary Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8	3.5-1, 095	C
Service Level I coatings	Maintain adhesion	Coatings	Air – indoor uncontrolled	Loss of coating or lining integrity	Protective Coating Monitoring and Maintenance (B.2.3.36)	II.A3.CP-152	3.5-1, 034	A
Sliding surfaces	Structural support	Lubrite®	Air – indoor uncontrolled	Loss of mechanical function	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.1.TP-45	3.5-1, 075	B
Thermal insulation (high temperature penetrations)	Insulate	Calcium silicate	Air – indoor uncontrolled	None	None	None	None	H, 8
Thermal insulation (high temperature penetrations)	Insulate	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8	3.5-1, 095	C, 7

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

H. Neither the component nor the material and environment combination are evaluated in NUREG-1801.

Plant-Specific Notes

1. Components are ASME Class 2 and MC.

2. OE reflected in SLR-ISG-2021-03-STRUCTURES indicates that the ASME Section XI, Subsection IWL (B.2.3.30) AMP and/or Structures Monitoring (B.2.3.34) AMP may be credited in place of a plant-specific program.

3. Groundwater below the existing water table (reactor vessel cavity pit protrusion through bottom of the foundation mat) and heavy rainwater are considered as water – flowing. However, leaching has not been observed in accessible exterior Containment Building locations.

4. The outer cover for the emergency hatch is not a pressure boundary component and will be managed by the Structures Monitoring (B.2.3.34) AMP instead of the ASME Section XI, Subsection IWE (B.2.3.29) AMP.

5. Will be managed by the Water Chemistry (B.2.3.2) and One-Time Inspection (B.2.3.19) AMP in accordance with LR-ISG-2011-01: Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1.

6. The recirculation sump effluent guard pipe is not considered part of the barrier between Containment and the external environment and is not tested at Containment design condition.

7. Stainless steel metal reflective insulation is used in Type I, II, and III high temperature Containment penetrations and in the primary shield RCS penetrations as thermal insulation.

8. Calcium silicate is used in Type IV Containment penetrations as thermal insulation.

9. Leak chase channels are inaccessible following construction, with the exception of threaded screw caps in depressions in the operating floor.

10. Stainless steel closure bolting associated with the fuel transfer tube and fuel transfer tube supports inside Containment (refueling canal) are periodically exposed to treated borated water and will be managed by the Water Chemistry (B.2.3.2) AMP and ASME Section XI, Subsection IWE (B.2.3.29) AMP.

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Galvanized steel	Air with Borated Water Leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1-2.TP-3	3.5-1, 089	A
Compressible joint and seal	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Compressible joint and seal	Shelter, protection	Elastomer	Air – outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air – outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air – outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air – outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 2, 3

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air – outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air – outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3, 5
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Interior	HELB Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	HELB Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Interior	HELB Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Door (Tornado)	Pressure relief Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door (Tornado)	Pressure relief Shelter, protection	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door (Tornado)	Pressure relief Shelter, protection	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Door seal	Pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Door seal	Pressure barrier	Elastomer	Air – outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 4
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C

Table 3.5.2-2: Auxiliary Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

2. Bottom of the AB foundation is located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

4. Concrete aging effect conservatively applied to masonry walls.

5. Exterior walls adjacent to other Seismic Category 1 structures are inaccessible due to the elastic joint filler in the gap.

Table 3.5.2-3: Diesel Generator Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Concrete curb	Direct flow	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete curb	Direct flow	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1

Table 3.5.2-3: Diesel Generator Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete curb	Direct flow	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A
Concrete: Above grade exterior (accessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A
Concrete: Above grade exterior (accessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 2, 3
Concrete: Above grade exterior (inaccessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-3: Diesel Generator Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete: Above grade exterior (inaccessible)	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Interior	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Interior	Missile barrier Structural support Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Door (watertight)	Flood barrier Missile barrier Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	C

Table 3.5.2-3: Diesel Generator Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door (watertight)	Flood barrier Missile barrier Shelter, protection	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-123	3.3-1, 120	C
Door (watertight)	Flood barrier Missile barrier Shelter, protection	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Door (watertight)	Flood barrier Missile barrier Shelter, protection	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A, 4
Door seal	Flood barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Hatch/plug	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Hatch/plug	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Hatch/plug	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-3: Diesel Generator Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch/plug	Missile barrier Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch/plug	Missile barrier Shelter, protection Structural support	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Louver housing	Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C
Louver housing	Shelter, protection	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Masonry wall	Shelter, protection	Masonry block	Air - outdoor	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A, 5
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Tornado/missile shield	Missile barrier Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Tornado/missile shield	Missile barrier Shelter, protection	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are the most susceptible.

2. Bottom of the DGB foundation is located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

4. At locations of frequent or prolonged water pooling, such as the lower portion of the watertight doors.

5. Masonry (bricks) and mortar between silencer and DGB roof.

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Compressible joint and seal	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Compressible joint and seal	Shelter, protection	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 3

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3, 5
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/Soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-212	3.5-1, 065	A, 2
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-29	3.5-1, 067	A, 2
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 2, 3
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-29	3.5-1, 067	A, 2

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Door (air tight, missile resisting, tornado)	Missile barrier Pressure barrier Pressure Relief Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	C
Door (air tight, missile resisting, tornado)	Missile barrier Pressure barrier Pressure Relief Shelter, protection	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-123	3.3-1, 120	C
Door (air tight, missile resisting, tornado)	Missile barrier Pressure barrier Pressure Relief Shelter, protection	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Door seal	Pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Door seal	Pressure barrier	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 4
Moisture barrier	Flood barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Steel component: All structural members	Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel component: All structural members	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Table 3.5.2-4: Electrical and Control Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

2. Bottom of the ECB foundation is below the water table, with groundwater limited to absorbed surface water and perched water down to the water table.

3. Rainwater, particularly periodic heavy north central Texas rains, and groundwater below the water table are considered water-flowing.

4. Concrete aging effect conservatively applied to masonry walls.

5. Exterior walls adjacent to other Seismic Category 1 structures are inaccessible due to the elastic joint filler in the gap.

6. Aging effect of cracking due to cracking, loss of bond and loss of material in concrete below grade exterior (inaccessible) will be evaluated and monitored under the Structures Monitoring (B.2.3.34) AMP.

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A5.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1-2.TP-3	3.5-1, 089	A
Compressible joint and seal	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Compressible joint and seal	Shelter, protection	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 3
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-28	3.5-1, 067	A, 1

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 6
Concrete: Below grade exterior (inaccessible)	Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-204	3.5-1, 043	A, 2, 7
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-204	3.5-1, 043	A, 2, 7
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A, 7
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A5.TP-25	3.5-1, 054	A

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Door (missile resisting, tornado)	Missile barrier Pressure relief Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-302	3.5-1, 077	C
Door (missile resisting, tornado)	Missile barrier Pressure relief Shelter, protection	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-123	3.3-1, 120	C

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door (missile resisting, tornado)	Missile barrier Pressure relief Shelter, protection	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-302	3.5-1, 077	C
Door (missile resisting, tornado)	Missile barrier Pressure relief Shelter, protection	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Door seal	Pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Door seal	Pressure barrier	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A5.T-12	3.5-1, 070	A

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-26	3.5-1, 066	C, 4
Spent fuel pool gate	Water retaining boundary	Stainless steel	Treated borated water > 60°C (>140°F)	Cracking; loss of material	Water Chemistry (B.2.3.2) and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	III.A5.T-14	3.5-1, 078	D, 5
Spent fuel pool liner	Structural support Water retaining boundary	Stainless steel	Treated borated water > 60°C (>140°F)	Cracking; loss of material	Water Chemistry (B.2.3.2) and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	III.A5.T-14	3.5-1, 078	B, 5
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A5.TP-302	3.5-1, 077	A
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C

Table 3.5.2-5: Fuel Building – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Soil	Loss of material	Structures Monitoring (B.2.3.34)	VII.C1.AP-198	3.3-1, 106	E, 8
Steel component (collar)	Shelter, protection Structural support	Carbon steel	Soil	Loss of material	Structures Monitoring (B.2.3.34)	VII.C1.AP-198	3.3-1, 106	E, 8
Storage rack (New Fuel)	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-123	3.3-1, 120	C
Storage rack (Spent Fuel)	Absorb neutrons	Boral	Treated Borated Water	Change in dimensions	Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26)	VII.A2.AP-235	3.3-1, 102	A
Storage rack (Spent Fuel)	Absorb neutrons	Boral	Treated Borated Water	Loss of material	Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26)	VII.A2.AP-235	3.3-1, 102	A
Storage rack (Spent Fuel)	Absorb neutrons	Boral	Treated Borated Water	Reduction of neutron-absorbing capacity	Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26)	VII.A2.AP-235	3.3-1, 102	A
Storage rack (Spent Fuel)	Structural support	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.3.2) and One Time Inspections	VII.A2.A-99	3.3-1, 125	B
Storage rack (Spent Fuel)	Structural support	Stainless steel	Treated borated water > 60°C (>140°F)	Cracking	Water Chemistry (B.2.3.2) and One Time Inspections	VII.A2.A-97	3.3-1, 124	B, 6

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are the most susceptible.

2. Bottom of the FB foundation is located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

4. Concrete aging effect conservatively applied to masonry walls.

5. SFP Leak chase channels are monitored as part of the Structures Monitoring (B.2.3.34) AMP.

6. SFP bulk temperature is maintained < 150°F.

7. Includes the exterior of the service water tunnel that passes beneath the FB.

8. Coated steel plate is installed at the wall penetration as an exterior wall sleeve/collar for pipes entering the building/structure and will be monitored as part of the Structures Monitoring (B.2.3.34) AMP instead of the Buried and Underground Piping and Tanks (B.2.3.27) AMP.

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1-2.TP-3	3.5-1, 089	A
Compressible joint and seal	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Compressible joint and seal	Shelter, protection	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A
Concrete: Above grade exterior (accessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 3

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/Soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-212	3.5-1, 065	A, 1
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Groundwater/Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-29	3.5-1, 067	A, 2
Concrete: Below grade exterior (inaccessible)	Missile barrier Pressure barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 2, 3

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Interior	Missile barrier Pressure barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Door (missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	C

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door (missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-123	3.3-1, 120	C
Door (missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door (missile resisting, tornado)	Missile barrier Pressure barrier Pressure relief Shelter, protection	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Door seal	Pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Door seal	Pressure barrier	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Shielding Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Shielding Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 4
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C

Table 3.5.2-6: Safeguards Buildings – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Tornado blowout panel	Pressure relief Shelter, protection	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5-1, 095	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Tornado pressure relief damper housing	Pressure relief Shelter, protection	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	C

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

2. Bottom of the SGB foundation for each unit is below the water table, with groundwater limited to absorbed surface water and perched water down to the water table.

3. Rainwater, particularly periodic heavy north central Texas rains, and groundwater below the water table are considered water-flowing.

4. Concrete aging effect conservatively applied to masonry walls.

5. Exterior walls adjacent to other Seismic Category 1 structures are inaccessible due to the elastic joint filler in the gap.

Table 3.5.2-7: Safe Shutdown Impoundment and Dam – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Earthen water control structures (SSI)	Heat sink Water retaining boundary	Rip-Rap	Air - outdoor	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	None	None	G, 1
Earthen water control structures (SSI)	Heat sink Water retaining boundary	Earth	Air - outdoor	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	None	None	G, 1
Earthen water control structures (SSI)	Heat sink Water retaining boundary	Rip-Rap	Water-flowing or standing	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.T-22	3.5-1, 058	A
Earthen water control structures (SSI)	Heat sink Water retaining boundary	Earth	Water-flowing or standing	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.T-22	3.5-1, 058	A
Earthen water control structures (Spillway)	Direct flow Flood barrier	Rip-Rap	Air - outdoor	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	None	None	G, 1

Table 3.5.2-7: Safe Shutdown Impoundment and Dam – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Earthen water control structures (Spillway)	Direct flow Flood barrier	Earth	Air - outdoor	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	None	None	G, 1
Earthen water control structures (Spillway)	Direct flow Flood barrier	Rip-Rap	Water-flowing or standing	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.T-22	3.5-1, 058	A
Earthen water control structures (Spillway)	Direct flow Flood barrier	Earth	Water-flowing or standing	Loss of material or loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.T-22	3.5-1, 058	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. Consistent with the OE reflected in NUREG-2192 (III.A6.T-22 / 3.5-1, 058), the Air -outdoor environment (portions of the SSI, Dam and Spillway) above the water-line are also included.

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A6.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Carbon steel	Raw water	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	A
Anchorage to building structure	Structural support	Carbon steel	Raw water	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A6.TP-248	3.5-1, 080	A, 6
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A, 6
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	A, 7
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Carbon steel	Raw water	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	A, 7
Bolting (structural)	Structural support	Galvanized steel	Raw water	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	C, 7
Bolting (structural)	Structural support	Carbon steel	Raw water	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Raw water	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 3
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing or standing	Cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	None	None	H, 4

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Below grade exterior (inaccessible)	Direct flow Shelter, protection Structural support Water retaining boundary	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A6.TP-220	3.5-1, 050	E, 5
Concrete: Below grade exterior (inaccessible)	Direct flow Shelter, protection Structural support Water retaining boundary	Concrete (reinforced)	Groundwater/Soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A6.TP-104	3.5-1, 065	A, 7
Concrete: Below grade exterior (inaccessible)	Direct flow Shelter, protection Structural support Water retaining boundary	Concrete (reinforced)	Groundwater/Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A6.TP-107	3.5-1, 067	A, 2
Concrete: Below grade exterior (inaccessible)	Direct flow Shelter, protection Structural support Water retaining boundary	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A6.TP-109	3.5-1, 051	E, 3

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (accessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-37	3.5-1, 061	A, 6
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A6.TP-220	3.5-1, 050	E, 2, 5
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A6.TP-30	3.5-1, 044	A
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A6.TP-109	3.5-1, 051	E, 3, 8
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A6.TP-220	3.5-1, 050	E, 5
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-38	3.5-1, 059	A

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-37	3.5-1, 061	A
Concrete: Interior	Direct flow Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.T-20	3.5-1, 056	A
Hatch / Removable slab	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Hatch / Removable slab	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch / Removable slab	Missile barrier Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Hatch / Removable slab	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Hatch / Removable slab	Missile barrier Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A6.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 4
Steel components: All structural members	Missile barrier Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Table 3.5.2-8: Service Water Intake Structure – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steel components: All structural members	Missile barrier Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Soil	Loss of material	Structures Monitoring (B.2.3.34)	VII.C1.AP-198	3.3-1, 106	E, 9
Steel component: All structural members	Shelter, protection Structural support	Carbon steel	Soil	Loss of material	Structures Monitoring (B.2.3.34)	VII.C1.AP-198	3.3-1, 106	E, 9
Trash Rack	Filter	Carbon steel	Air - outdoor	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	C
Trash Rack	Filter	Carbon steel	Raw water	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)	III.A6.TP-221	3.5-1, 083	C

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

H. Neither the component nor the material and environment combination are evaluated in NUREG-1801.

Plant-Specific Notes

1. Above-grade/water-line locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

2. SWIS foundation and below-grade exterior walls are below the water table.

3. Rainwater, particularly periodic heavy north central Texas rains, and groundwater below the water table are considered water-flowing.

4. Consistent with the OE reflected in NUREG-2191 (III.A6.T-34 / 3.5-1, 096), cracking due to reaction with aggregates (ASR) in the SWIS intake bay will be managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP (See also Section 3.5.2.2.2.3, item 3).

5. Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES, the Structures Monitoring (B.2.3.34) AMP is credited in lieu of a plant-specific program for cracking due to reaction with aggregates (ASR) (See also Section 3.5.2.2.2.3 item 2).

6. Above the intake bay level (≥ EL 796-ft).

7. In the intake bay (< 796-ft as depicted on FSAR Figure 3.8-16).

8. Consistent with the OE reflected in SLR-ISG-2021-03-STRUCTURES, the Structures Monitoring (B.2.3.34) AMP is credited in lieu of a plant-specific program for leaching of calcium hydroxide or carbonation.

9. Coated steel plate is installed at the wall penetration as an exterior wall sleeve/collar for pipes entering the building/structure and will be monitored as part of the Structures Monitoring (B.2.3.34) AMP instead of the Buried and Underground Piping and Tanks (B.2.3.27) AMP.

Table 3.5.2-9: Switchgear Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A

Table 3.5.2-9: Switchgear Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 4
Concrete: Above grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-9: Switchgear Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 3
Metal deck	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Table 3.5.2-9: Switchgear Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Metal siding	Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Metal siding	Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Precast Panel	Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Precast Panel	Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

2. Bottom of the Switchgear Building foundation and precast troughs for each unit are located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Concrete aging effect conservatively applied to masonry walls.

4. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

Table 3.5.2-10: Turbine Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A

Table 3.5.2-10: Turbine Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 3
Concrete: Above grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Concrete: Above grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1, 5
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2

Table 3.5.2-10: Turbine Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/Soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-212	3.5-1, 065	A
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-67	3.5-1, 047	E, 3
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Interior	Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1

Table 3.5.2-10: Turbine Buildings – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hatch	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 4
Metal deck	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Precast panel	Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Precast panel	Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Precast panel	Shelter, protection	Concrete (reinforced)	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel components: All structural members	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corroded embedded steel, are most susceptible.

2. Bottom of the TB foundation for each unit is below the water table, with groundwater limited to absorbed surface water and perched water down to the water table.

3. Rainwater, particularly periodic heavy north central Texas rains, and groundwater below the water table are considered water-flowing.

4. Concrete aging effect conservatively applied to masonry walls.

5. Exterior walls adjacent to other Seismic Category 1 structures are inaccessible due to the elastic joint filler in the gap.

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (accessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 4

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Above-grade interior (inaccessible)	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-25	3.5-1, 054	A, 5
Concrete: Above-grade interior (inaccessible)	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-26	3.5-1, 066	A, 5
Concrete: Above-grade interior (inaccessible)	Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 5
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-204	3.5-1, 043	A, 2
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-212	3.5-1, 065	A, 2
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-212	3.5-1, 065	A, 2

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-29	3.5-1, 067	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-29	3.5-1, 067	A
Concrete: Interior	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-204	3.5-1, 043	A, 7
Concrete: Interior	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-26	3.5-1, 066	A, 1, 7
Concrete: Interior	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-26	3.5-1, 066	A, 1, 6

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Interior	Flood barrier Missile barrier Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1, 6
Elastic joint filler	Shelter, protection	Elastomer	Groundwater/soil	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Manhole, handhole & duct bank	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A
Manhole, handhole & duct bank	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-204	3.5-1, 043	A, 2
Manway seal	Shelter, protection	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Manway seal	Shelter, protection	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Masonry wall: Exterior	Shelter, protection Structural support	Masonry block	Air - outdoor	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Exterior	Shelter, protection Structural support	Masonry block	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 3

Table 3.5.2-11: Yard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 3
Metal deck	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Metal siding	Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Metal siding	Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Steel component: structural member, grating, manhole and manway cover, etc.	Missile barrier Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel component: structural member, grating, manhole and manway cover, etc.	Missile barrier Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corroded embedded steel, are the most susceptible.

2. Bottom of the duct banks, enclosure pits, foundations, handholes, manholes, and slabs in the yard are located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Concrete aging effect conservatively applied to masonry walls.

4. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

5. Stainless steel liner anchored to the interior wall of the CST, RMWST, and RWST for each unit making the interior wall below the top of the liner inaccessible.

6. Inside the CST, RMWST, or RWST wall and vented roof above the liner and water-line or diaphragm, as applicable.

7. Seismic Category 1 tunnels to the CST, RMWST, and RWST contain piping and conduit, include an above-grade portion for tank penetrations, and are accessible and considered as another SGB room/area.

Table 3.5.2-12: Switchyard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Anchorage to building structure	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A
Anchorage to building structure	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Anchorage to building structure	Structural support	Concrete (reinforced)	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage to building structure	Structural support	Grout	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A

Table 3.5.2-12: Switchyard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A3.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.A6.TP-261	3.5-1, 088	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking	Structures Monitoring (B.2.3.34)	III.A3.TP-25	3.5-1, 054	A
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Concrete: Above grade exterior (accessible)	Shelter, protection Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 4
Concrete: Below grade exterior (inaccessible)	Shelter, protection Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-204	3.5-1, 043	A, 2

Table 3.5.2-12: Switchyard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-204	3.5-1, 043	A, 2
Concrete: Foundation, sub-foundation (inaccessible)	Structural support	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A3.TP-30	3.5-1, 044	A
Hatch	Shelter, protection	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A
Masonry wall: Interior	Shelter, protection Structural support	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 3
Metal siding	Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Metal siding	Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Precast concrete troughs	Shelter, protection	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 1
Precast concrete troughs	Shelter, protection	Concrete (reinforced)	Groundwater/soil	Cracking	Structures Monitoring (B.2.3.34)	III.A7.TP-204	3.5-1, 043	A, 2
Precast concrete troughs	Shelter, protection	Concrete (reinforced)	Groundwater/Soil	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-212	3.5-1, 065	A, 2

Table 3.5.2-12: Switchyard Structures – Summary of Aging Management Evaluation								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Precast concrete troughs	Shelter, protection	Concrete (reinforced)	Groundwater/Soil	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A7.TP-29	3.5-1, 067	A, 2
Precast concrete troughs	Shelter, protection	Concrete (reinforced)	Soil	Cracking and distortion	Structures Monitoring (B.2.3.34)	III.A7.TP-30	3.5-1, 044	A
Steel components - Structural member, grating etc.	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Steel components - Structural member, grating etc.	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-302	3.5-1, 077	A
Transmission towers	Structural support	Galvanized steel	Air - Outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant-Specific Notes

1. Locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corroded embedded steel, are the most susceptible.

2. Bottom of the relay house foundation and precast concrete troughs are located above the water table such that groundwater is limited to absorbed surface water and perched water.

3. Concrete aging effect conservatively applied to masonry walls.

4. Rainwater, particularly periodic heavy north central Texas rains, is considered water-flowing.

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage / embedment	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Anchorage / embedment	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Anchorage / embedment	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage / embedment	Structural support	Grout	Air – indoor uncontrolled	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage / embedment	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Anchorage / embedment	Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Anchorage / embedment	Structural support	Concrete (reinforced)	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage / embedment	Structural support	Grout	Air - outdoor	Reduction in concrete anchor capacity	Structures Monitoring (B.2.3.34)	III.B3.TP-42	3.5-1, 055	A
Anchorage / embedment	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Bird screen	Filter	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Bird screen	Filter	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bird screen	Filter	Aluminum	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Bird screen	Filter	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-248	3.5-1, 080	A
Bolting (structural)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Stainless steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B4.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B4.TP-274	3.5-1, 082	A
Bolting (structural)	Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Bolting (structural)	Structural support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Stainless steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.B5.TP-261	3.5-1, 088	A
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.1.T-25	3.5-1, 089	A
Bolting (structural)	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	A
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Aluminum	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Cabinet, panel, rack, and other enclosure	Shelter, protection Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	A
Cable tray	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Cable tray	Shelter, protection Structural support	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Cable tray	Shelter, protection Structural support	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	C
Cable tray	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Conduit	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Conduit	Shelter, protection Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5-1, 095	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation

Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Conduit	Shelter, protection Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Conduit	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Conduit	Shelter, protection Structural support	Galvanized steel	Air - outdoor	Loss of Material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A
Conduit	Shelter, protection Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Conduit	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Conduit	Shelter, protection Structural support	Galvanized steel	Air with borated water leakage	Loss of Material	Boric Acid Corrosion (B.2.3.4)	III.B2.TP-3	3.5-1, 089	A
Door	Shelter, protection Structural pressure barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door	Shelter, protection Structural pressure barrier	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C, 1
Door	Shelter, protection Structural pressure barrier	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Door	Shelter, protection Structural pressure barrier	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Door	Shelter, protection Structural pressure barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Door	Shelter, protection Structural pressure barrier	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	C
Door	Shielding	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door	Shielding	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Door	Shielding	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	C
Equipment foundation pad/pedestal	Structural support	Concrete (reinforced)	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 10
Equipment foundation pad/pedestal	Structural support	Concrete (reinforced)	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A, 10
Equipment foundation pad/pedestal	Structural support	Concrete (reinforced)	Air - outdoor	Increase in porosity and permeability, cracking, loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-28	3.5-1, 067	A, 10
Equipment foundation pad/pedestal	Structural support	Concrete (reinforced)	Water-flowing	Increase in porosity and permeability; loss of strength	Structures Monitoring (B.2.3.34)	III.A3.TP-24	3.5-1, 063	A, 9
Insulation	Thermal Insulation	Fiberglass	Air – indoor uncontrolled	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	F, 2

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Insulation	Thermal Insulation	Calcium silicate	Air – indoor uncontrolled	Change in material properties; Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	None	None	F, 2
Insulation jacketing	Thermal insulation jacket integrity	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Insulation jacketing	Thermal insulation jacket integrity	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Insulation jacketing	Thermal insulation jacket integrity	Aluminum	Air - outdoor	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.I.AP-256	3.3-1, 081	C
Insulation jacketing	Thermal insulation jacket integrity	Stainless steel	Air - outdoor	Loss of material	External Surfaces Monitoring of Mechanical Components (B.2.3.22)	VII.G.AP-221	3.3-1, 006	C
Insulation jacketing	Thermal insulation jacket integrity	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	C
Louver and damper housing	Shelter, protection	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Louver and damper housing	Shelter, protection	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Louver and damper housing	Shelter, protection	Aluminum	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Louver and damper housing	Shelter, protection	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Louver and damper housing	Shelter, protection	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	C
Louver and damper housing	Shelter, protection	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	C
Miscellaneous steel	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Miscellaneous steel	Shelter, protection Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Miscellaneous steel	Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Miscellaneous steel	Shelter, protection Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C
Miscellaneous steel	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Moment restraint	HELB shielding Pipe whip restraint Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C, 5
Moment restraint	HELB shielding Pipe whip restraint Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C, 5
Moment restraint	HELB shielding Pipe whip restraint Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C, 5
Moment restraint	HELB shielding Pipe whip restraint Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C, 5

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Grout	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Ceramic fiber	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	None	None	F, 3
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Silicone foam	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	None	None	F, 3
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Grout	Air - outdoor	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Ceramic fiber	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	None	None	F, 3
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Penetration seal	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Silicone foam	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	None	None	F, 3
Penetration sleeve	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Penetration sleeve	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Penetration sleeve	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Pipe whip restraint and jet impingement shield	HELB shielding Pipe whip restraint Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	A
Pipe whip restraint and jet impingement shield	HELB shielding Pipe whip restraint Shelter, protection Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	A
Pipe whip restraint and jet impingement shield	HELB shielding Pipe whip restraint Shelter, protection Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	A
Pipe whip restraint and jet impingement shield	HELB shielding Pipe whip restraint Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.T-25	3.5-1, 089	A
Roofing membrane	Shelter, protection	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	C
Seal, gasket, and moisture barrier (caulking, flashing and other sealants)	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Seal, gasket, and moisture barrier (caulking, flashing and other sealants)	Flood barrier HELB shielding Shielding Shelter, protection Structural pressure barrier	Elastomer	Air - outdoor	Loss of sealing	Structures Monitoring (B.2.3.34)	III.A6.TP-7	3.5-1, 072	A
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-226	3.5-1, 081	B
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Stainless steel	Air – indoor uncontrolled	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.2.T-25	3.5-1, 089	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support bolting for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1-2.TP-3	3.5-1, 089	A
Support bolting for ASME Class 2, 3 piping and component	Structural support	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.3.2); ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-232	3.5-1, 084	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Stainless steel	Treated borated water	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Carbon steel	Air - outdoor	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-235	3.5-1, 086	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Carbon steel	Air - outdoor	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.T-24	3.5-1, 091	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Carbon steel	Air - outdoor	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Galvanized steel	Air - outdoor	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-235	3.5-1, 086	B
Support bolting for ASME Class 2, 3 piping and component	Structural support	Galvanized steel	Air - outdoor	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	B

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support bolting for ASME Class 3 component	Structural support	Copper alloy >15% Zn or >8% Al	Air - indoor uncontrolled (external)	None	None	III.B1.2.TP-8	3.5-1, 095	F, 7
Support bolting for ASME Class 3 component	Structural support	Copper alloy >15% Zn or >8% Al	Raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	VII.C1.AP-196	3.3-1, 036	E, 7
Support bolting for ASME Class 3 component	Structural support	Copper alloy >15% Zn or >8% Al	Raw water	Loss of material	Selective Leaching (B.2.3.20)	VII.C1.A-47	3.3-1, 072	F, 7
Support bolting for ASME Class 3 component	Structural support	Copper alloy >15% Zn or >8% Al	Raw water	Loss of preload	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-229	3.5-1, 087	F, 7
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.T-24	3.5-1, 091	B
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of mechanical function	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.T-28	3.5-1, 057	B, 4
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1.2.T-25	3.5-1, 089	A
Support for ASME Class 1 (piping) and Class 2, 3 piping and component	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B1-2.TP-3	3.5-1, 089	A
Support for ASME Class 2, 3 piping and component	Structural support	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.3.2); ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.1.TP-10	3.5-1, 090	D, 6
Support for ASME Class 3 component	Structural support	Carbon steel	Raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.A6.TP-221	3.5-1, 083	E, 8
Support for ASME Class 2, 3 piping and component	Structural support	Galvanized steel	Air - outdoor	Loss of material	ASME Section XI, Subsection IWF (B.2.3.31)	III.B1.2.TP-24	3.5-1, 091	B
Support member	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	A
Support member	Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	A

Table 3.5.2-13: Component Support Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support member	Structural support	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	A
Support member	Structural support	Carbon steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	A
Support member	Structural support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A
Support member	Structural support	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	A
Support member	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	A
Support member	Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	A
Tube track	Shelter, protection Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	III.B5.TP-43	3.5-1, 092	C
Tube track	Shelter, protection Structural support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	A
Tube track	Shelter, protection Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Tube track	Shelter, protection Structural support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B5.TP-3	3.5-1, 089	A

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

F. Material not in NUREG-1801 for this component.

Plant-Specific Notes

1. Turbine Building doors are Aluminum, including sills.

2. ESF thermal insulation on piping and equipment is required in select rooms of the Auxiliary and Safeguards Buildings to support the operation of safety related components in those rooms/areas. LR-ISG-2012-02 addresses this thermal insulation material for MS and feedwater components, with aging of this thermal insulation referred to as reduced thermal IR. Consistent with the OE reflected in NUREG-2191 (item V.E.E-422) and NUREG-2192 (item 3.2-1, 087), aging of thermal insulation, that is not for MS and feedwater components, is also managed by the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP.

3. Ceramic fiber and silicone foam materials are not addressed in NUREG-1801 for mechanical components. As the materials are used for non-fire rated penetration seals, the aging effect of loss of sealing is applicable.

4. The passive portions of constant and variable load spring hangers, including the guides and stops, are susceptible to corrosion, distortion, dirt, and overload that could lead to a loss of mechanical function in addition to the loss of material addressed in item 3.5-1, 091.

5. Moment restraints are attached directly to piping and, therefore, are part of the pressure boundary. The internal surfaces of these moment restraints are addressed in Tables 3.1.2-3, 3.3.2-1, 3.4.2-1, 3.4.2-2, and 3.4.2-3.

6. ASME Class 3 piping and component supports in the SFP are exposed to treated borated water rather than treated water.

7. Structural bolting for the ASME Class 3 SSW pumps in the SWIS bay are the same aluminum bronze material as the closure bolting for the pumps.

8. Supports of the ASME Class 3 SSW pumps in the SWIS intake bay.

9. Rainwater, particularly periodic heavy north central Texas rains, and groundwater below the water table are considered water-flowing.

10. Above-grade/water-line locations with prolonged or frequent water pooling that may contain aggressive chemicals or absorb into the concrete, and corrode embedded steel, are most susceptible.

Table 3.5.2-14: Crane/Hoist Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B4.TP-248	3.5-1, 080	E, 1
Bolting (structural)	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B4.TP-261	3.5-1, 088	E,1
Bolting (structural)	Structural Support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B4.TP-261	3.5-1, 088	A, 2
Bolting (structural)	Structural Support	Galvanized steel	Air – indoor uncontrolled	Loss of preload	Structures Monitoring (B.2.3.34)	III.B2.TP-261	3.5-1, 088	A
Bolting (structural)	Structural Support	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.2.TP-8	3.5-1, 095	A

Table 3.5.2-14: Crane/Hoist Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural Support	Carbon steel	Air - outdoor	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B4.TP-274	3.5-1, 082	E, 1
Bolting (structural)	Structural Support	Galvanized steel	Air - outdoor	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B4.TP-274	3.5-1, 082	E, 1
Bolting (structural)	Structural Support	Galvanized steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B4.TP-274	3.5-1, 082	E,1
Bolting (structural)	Structural Support	Carbon steel	Air - outdoor	Loss of preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	III.B4.TP-261	3.5-1, 088	E,1
Bolting (structural)	Structural Support	Carbon steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.B4.TP-261	3.5-1, 088	A, 2
Bolting (structural)	Structural Support	Galvanized steel	Air - outdoor	Loss of preload	Structures Monitoring (B.2.3.34)	III.B4.TP-261	3.5-1, 088	A, 2

Table 3.5.2-14: Crane/Hoist Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting (structural)	Structural Support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	A
Bolting (structural)	Structural Support	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.TP-3	3.5-1, 089	A
Bolting (structural)	Structural Support	Galvanized steel	Air with borated water leakage	Loss of preload	Boric Acid Corrosion (B.2.3.4)	III.B2.TP-261	3.5-1, 088	A
Bridge/trolley/girder	Structural Support	Carbon steel	Air – indoor uncontrolled	Cumulative fatigue damage	TLAA (Section 4.7.4)	VII.B.A-06	3.3-1, 001	A, 3
Bridge/trolley/girder	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	A
Bridge/trolley/girder	Structural Support	Carbon steel	Air - outdoor	Cumulative Fatigue Damage	TLAA (Section 4.7.4)	VII.B.A-06	3.3-1, 001	G, 3
Bridge/trolley/girder	Structural Support	Carbon steel	Air - outdoor	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	G, 4
Bridge/trolley/girder	Structural Support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C

Table 3.5.2-14: Crane/Hoist Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Jib crane/beam/plate/anchorage	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	A
Jib crane/beam/plate/anchorage	Structural Support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Monorail and trolley beam/lifting device/plate	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	A
Monorail and trolley beam/lifting device/plate	Structural Support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Rail system (rail, clip, plate, and anchor)	Structural Support	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	A

Table 3.5.2-14: Crane/Hoist Commodity Group – Summary of Aging Management Evaluation

Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Rail system (rail, clip, plate, and anchor)	Structural Support	Carbon steel	Air - outdoor	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)	VII.B.A-07	3.3-1, 052	G, 4
Rail system (rail, clip, plate, and anchor)	Structural Support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

G. Environment not in NUREG-1801 for this component and material.

Plant-Specific Notes

1. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is supplemented by the Structures Monitoring (B.2.3.34) AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. Consistent with the OE reflected in NUREG-2191 (item VII.B.A-730) and NUREG-2192 (Table 3.3-1, item 199), the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP includes visual inspections of structural bolting associated with the cranes and hoists. The Structures Monitoring (B.2.3.34) AMP provides for preventive measures to ensure structural bolting integrity.

2. The Structures Monitoring (B.2.3.34) AMP includes applicable preventive measures to ensure structural bolting integrity (B.2.3.9) AMP and supplements the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP.

3. Crane load cycle limits through the PEO are evaluated in Section 4.7.4.

4. The Air - Outdoor environment is not in NUREG-1801 for this component and material. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is used to manage the aging effects for this component, material, and environment combination.

Table 3.5.2-15: Fire Barrier Commodity Group – Summary of Aging Management Evaluation

Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cable raceway	Fire barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	C
Cable raceway	Fire barrier	Aluminum	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5-1, 095	C
Cable raceway	Fire barrier	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.TP-3	3.5-1, 089	C
Cable raceway	Fire barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Concrete block (removable) for opening	Fire barrier	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	A, 1
Concrete block (removable) for opening	Fire barrier	Masonry block	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Structures Monitoring (B.2.3.34)	III.A3.TP-26	3.5-1, 066	C, 3
Damper housing	Fire barrier	Galvanized steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5-1, 095	C
Damper housing	Fire barrier	Galvanized steel	Air with borated water leakage	Loss of Material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	C
Door	Fire barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	A
Door	Fire barrier	Galvanized steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5-1, 095	C
Door	Fire barrier	Carbon steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	A
Door	Fire barrier	Galvanized steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	A
Door	Fire barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C

Table 3.5.2-15: Fire Barrier Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Door	Fire barrier	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B4.TP-3	3.5-1, 089	C
Fire Protection hose stations (rack, reel, and support)	Structural support	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	C
Fire Protection hose stations (rack, reel, and support)	Structural support	Carbon steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	C
Fire Protection hose stations (rack, reel, and support)	Structural support	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Hatch	Fire barrier	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection (B.2.3.15)	VII.G.A-90	3.3-1, 060	C
Hatch	Fire barrier	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	VII.G.A-90	3.3-1, 060	C
Hatch	Fire barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	A
Hatch	Fire barrier	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-91	3.3-1, 062	C
Hatch	Fire barrier	Concrete	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-91	3.3-1, 062	A
Hatch	Fire barrier	Concrete	Air - outdoor	Cracking; Loss of material	Fire Protection (B.2.3.15)	VII.G.A-92	3.3-1, 061	C
Hatch	Fire barrier	Concrete	Air - outdoor	Cracking; Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-92	3.3-1, 061	C
Hatch	Fire barrier	Carbon steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	A
Hatch	Fire barrier	Concrete	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-93	3.3-1, 062	C

Table 3.5.2-15: Fire Barrier Commodity Group – Summary of Aging Management Evaluation

Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatch	Fire barrier	Concrete	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-93	3.3-1, 062	A
Hatch	Fire barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Insulation and wrap	Fire barrier	Silicate radiant energy shield (Kaowool, Cerafiber, Cera blanket, Siltemp WR 84 CSR, Avsil 84 CSR fabric or similar)	Air – indoor uncontrolled	Change in material properties; Cracking, Delamination; Loss of material, and Separation	Fire Protection (B.2.3.15)	None	None	F, 2
Insulation and wrap	Fire barrier	Subliming compound (Thermo-Lag, Carboline, or similar)	Air – indoor uncontrolled	Change in material properties; Cracking, Delamination; Loss of material, and Separation	Fire Protection (B.2.3.15)	None	None	F, 2
Insulation and wrap	Fire barrier	Ceramic fiber/blanket	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	None	None	F, 2
Insulation and wrap	Fire barrier	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Insulation and wrap	Fire barrier	Silicate radiant energy shield (Kaowool, Cerafiber, Cera blanket, Siltemp WR 84 CSR, Avsil 84CSR fabric or similar)	Air - outdoor	Change in material properties; Cracking, Delamination; Loss of material, and Separation	Fire Protection (B.2.3.15)	None	None	F, 2

Table 3.5.2-15: Fire Barrier Commodity Group – Summary of Aging Management Evaluation

Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Insulation and wrap	Fire barrier	Subliming compound (Thermo-Lag, Carboline, or similar)	Air - outdoor	Change in material properties; Cracking, Delamination; Loss of material, and Separation	Fire Protection (B.2.3.15)	None	None	F, 2
Insulation and wrap	Fire barrier	Ceramic fiber/blanket	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	None	None	F, 2
Insulation and wrap	Fire barrier	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	C, 5
Penetration seal	Fire barrier	Elastomer	Air – indoor uncontrolled	Hardening, Loss of Strength, and Shrinkage	Fire Protection (B.2.3.15)	VII.G.A-19	3.3-1, 057	A
Penetration seal	Fire barrier	Elastomer	Air - outdoor	Hardening, Loss of Strength, and Shrinkage	Fire Protection (B.2.3.15)	VII.G.A-20	3.3-1, 057	A
Penetration sleeve	Fire barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	C
Penetration sleeve	Fire barrier	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5-1, 095	C
Penetration sleeve	Fire barrier	Carbon steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	C
Penetration sleeve	Fire barrier	Stainless steel	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	III.B2.TP-6	3.5-1, 093	E, 5
Penetration sleeve	Fire barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Fire Protection (B.2.3.15)	VII.G.A-90	3.3-1, 060	A
Wall, floor, and ceiling	Fire barrier	Masonry block	Air – indoor uncontrolled	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	C, 3

Table 3.5.2-15: Fire Barrier Commodity Group – Summary of Aging Management Evaluation								
Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air – indoor uncontrolled	Cracking	Structures Monitoring (B.2.3.34)	VII.G.A-90	3.3-1, 060	A
Wall, floor, and ceiling	Fire barrier	Gypsum	Air – indoor uncontrolled	Cracking; loss of bond; and loss of material	Fire Protection (B.2.3.15)	None	None	F, 4
Wall, floor, and ceiling	Fire barrier	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-21	3.3-1, 059	C
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air – indoor uncontrolled	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-91	3.3-1, 062	A
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air – indoor uncontrolled	Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-91	3.3-1, 062	A
Wall, floor, and ceiling	Fire barrier	Masonry block	Air - outdoor	Cracking	Masonry Walls (B.2.3.33)	III.A3.T-12	3.5-1, 070	C, 3
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air - outdoor	Cracking; Loss of material	Fire Protection (B.2.3.15)	VII.G.A-92	3.3-1, 061	A
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air - outdoor	Cracking; Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-92	3.3-1, 061	A
Wall, floor, and ceiling	Fire barrier	Carbon steel	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-22	3.3-1, 059	C
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air - outdoor	Loss of material	Fire Protection (B.2.3.15)	VII.G.A-93	3.3-1, 062	A
Wall, floor, and ceiling	Fire barrier	Concrete (reinforced)	Air - outdoor	Loss of material	Structures Monitoring (B.2.3.34)	VII.G.A-93	3.3-1, 062	A
Wall, floor, and ceiling	Fire barrier	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion (B.2.3.4)	III.B2.T-25	3.5-1, 089	C

Generic Notes

A. Consistent with component, material, environment, aging effect, and AMP listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment, and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific AMP.

F. Material not in NUREG-1801 for this component.

Plant-Specific Notes

1. Removable concrete blocks for openings in certain walls to facilitate equipment removal and replacement; in areas where a removable concrete block opening exists in a fire wall, a fire hazards analysis evaluation justifies the as-built design, and the concrete blocks are installed in such a way that there are no through openings from one side of the barrier to the other. Furthermore, the Masonry Walls (B.2.3.33) AMP and Fire Protection (B.2.3.15) AMP credit and communicate with each other.

2. This material is not addressed for fire barriers in NUREG-1801. Consistent with the OE reflected in SLR-ISG-2021-02-MECHANICAL (items VII.G.A-805 to VII.G.A-807; SRP items 3.3-1, 267 to 3.3-1, 269), aging of the component materials is managed by the Fire Protection (B.2.3.15) AMP.

3. The Masonry Walls (B.2.3.33) AMP and Fire Protection (B.2.3.15) AMP credit and communicate with each other.

4. Gypsum drywall is utilized throughout the plant to provide a fire barrier which is lightweight and where unit masonry or concrete is not feasible. This lightweight fire barrier material is not addressed in NUREG-1801; however, aging is managed by the Fire Protection (B.2.3.15) AMP.

5. Relative to stainless-steel components located outdoors, the Structures Monitoring (B.2.3.34) AMP is focused on areas with potential for frequent or prolonged water pooling and communicates with the Fire Protection (B.2.3.15) AMP as warranted.

3.6. AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1. Introduction

This section provides the results of the AMR for the electrical commodities identified in Table 2.5-2 of Section 2.5 as being subject to AMR. The commodities addressed in this section include:

- Insulated cables and connections not included in the EQ (10 CFR 50.49) Program[3]
    - Cable connections (metallic parts) not subject to 10 CFR 50.49 EQ requirements
    - Insulated cables and connections not subject to 10 CFR 50.49 EQ requirements
    - Sensitive instrumentation circuits cables and connections not subject to 10 CFR 50.49 EQ requirements
    - Inaccessible power cables (≥ 400 volts) (e.g., installed in conduit or direct buried installations) not subject to 10 CFR 50.49 EQ requirements
    - Connector contacts exposed to borated water leakage
- Switchyard bus and connections
- Transmission conductors and connections
- High-voltage insulators
- Metal Enclosed Bus
- Uninsulated Ground Conductors and Connections

Table 3.6-1, Summary of Aging Management Evaluation for Electrical Commodities, provides the AMR and the programs evaluated in NUREG-1801 for electrical commodities. This table uses the format described in the introduction to Section 3. Links are provided to the program evaluations in Appendix B.

3.6.2. Results

Table 3.6-1, Summary of Aging Management Evaluations for Electrical Commodities, presents the results of AMRs and the NUREG-1801 comparison for electrical commodities.

[3] This commodity group is subdivided for technical clarity and proper identification of applicable aging effects consistent with NUREG-1801 guidance.

3.6.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and AMPs for electrical commodities subject to AMR. Programs are described in Appendix B. Further details are provided in Table 3.6.2-1.

Materials

Electrical commodities subject to AMR are constructed of the following materials.

- Aluminum, aluminum alloy
- Cement
- Copper
- Elastomer
- Galvanized metals
- Insulation material – various organic polymers
- Malleable iron
- Porcelain
- Polymer
- Stainless steel
- Steel, steel alloys, galvanized steel
- Various metals used for bus and electrical connections

Environments

Electrical commodities subject to AMR are exposed to the following environments.

- Adverse localized environment caused by heat, radiation, or moisture
- Adverse localized environment caused by significant moisture
- Air – indoor controlled
- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Soil

Aging Effects Requiring Management

The following aging effects associated with electrical commodities require management.

- Elastomer loss of strength or change in material properties
- Increased resistance of connection
- Loss of material
- Reduced insulation resistance (IR)

Aging Management Programs

The following AMPs will manage the effects of aging on electrical commodities:

- Boric Acid Corrosion (B.2.3.4)
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.41)
- Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.39)
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37)
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.3.38)
- Metal Enclosed Bus (B.2.3.40)
- Structures Monitoring (B.2.3.34)

3.6.2.2 AMR Results for Which Further Evaluation is recommended by the GALL Report

NUREG-1800 indicates that FE is necessary for certain aging effects and programs identified in Section 3.6.2.2 of NUREG-1800. The following sections numbered corresponding to the discussions in NUREG-1800, present the CPNPP evaluation of the areas requiring FE. Programs are described in Appendix B. Italicized text is taken directly from NUREG-1800.

The basic acceptance criteria defined in Section 3.6.2.1 need to be applied first for all of the AMRs and AMPs reviewed as part of this section. In addition, if the GALL Report AMR item to which the LRA AMR item is compared identifies that “further evaluation is recommended,” then additional criteria apply as identified by the GALL Report for each of the following aging effect/aging mechanism combinations. Refer to Table 3.6-1, comparing the “Further Evaluation Recommended” and the “Rev 2 Item” columns, for the AMR items that reference the following subsections. The 2005 AMR item counterpart is provided in the “Rev 1 Item” column.

3.6.2.2.1 <u>Electrical Equipment Subject to Environmental Qualification</u>

Environmental qualification is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4.4, “Environmental Qualification (EQ) of Electrical Equipment,” of this SRP-LR.

Electrical equipment EQ analyses are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c) and addressed in Section 4.4. EQ components are subject to replacement based on a qualified life. Therefore, in accordance with 10 CFR 54.21(a)(1)(ii), EQ components are not subject to AMR.

3.6.2.2.2 Reduced Insulation Resistance due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear Caused by Wind Blowing on Transmission Conductors

Reduced insulation resistance due to presence of any salt deposits and surface contamination could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind blowing on transmission conductors could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

High-voltage insulators are subject to AMR if they are necessary for restoration of offsite power following a SBO. Other CPNPP high-voltage insulators are not subject to AMR because they do not perform or support a LR intended function.

The high-voltage insulators evaluated for CPNPP LR are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses that are within the scope of LR.

Various airborne materials such as dust, salt and industrial effluents can contaminate porcelain insulator surfaces. The buildup of surface contamination is gradual and, in most areas, washed away by rain. The glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as proximity to facilities that discharge soot or near the seacoast where salt spray is prevalent.

There are no major industries within the immediate vicinity of CPNPP. CPNPP is about 65 miles southwest of the Dallas-Fort Worth Metropolitan Area. The site is in an area of low population having a rural farm-ranch community setting. The CPNPP site is on Squaw Creek, a tributary of the Paluxy and the Brazos rivers. SCR is a fresh water reservoir impounded for station cooling by a dam constructed on Squaw Creek approximately 4½ miles upstream of its confluence with the Paluxy and Brazos rivers, so surface contamination from salt spray is not a concern. Regular plant traffic bypasses the switchyard. The buildup of other surface contaminants is gradual and, in most cases, washed away by rain. The glazed insulator surface aids this contamination removal. Consequently, the rate of contamination buildup on insulator surfaces is not significant enough to cause a loss of intended function during the PEO. Since CPNPP is not located near the seacoast or near other sources of airborne particles, reduced IR due to surface contamination is not an applicable aging effect for high-voltage insulators at CPNPP.

Similar to porcelain high-voltage insulators, various airborne contaminants such as dust, salt, or industrial effluent can contaminate CPNPP polymer high-voltage insulator surfaces leading to reduced IR. The buildup of surface contamination is gradual and, in most cases, removed by rainfall. The silicone rubber of the polymer high-voltage insulator is superior to porcelain due to its hydrophobic properties. Hydrophobicity is the surface property that causes a water drop to form a bead. Silicone rubber is naturally hydrophobic, has excellent resistance to UV, electrical aging, corona effect, and minimizes leakage currents on the surface of the insulator, all of which help polymer insulators perform well in contaminated environments. Silicone rubbers are characterized by having a low surface energy that results in highly hydrophobic surfaces. This property prevents the insulator surface from becoming completely wet, thereby suppressing leakage currents under contaminated conditions. Water deposited on the surface of the rubber cannot dissolve the encapsulated contamination thereby preventing the formation of a conductive film. The lightweight silicone chains in the rubber surface material impregnate the contaminant layer, making it hydrophobic as well which is what gives the silicone rubber superior contamination performance. Consequently, silicone rubber insulators can withstand high levels of contamination minimizing the potential aging effects from swelling of the silicone rubber layer due to chemical contamination, sheath wetting caused by chemicals absorbed by oil from the silicone rubber compound and chalking and crazing of the insulator surface resulting in contamination, arcing, and flash over. The insulators hydrophobic surfaces are also effective in the mitigation of aggressive environments such as excrement from birds. OE reviews and results of periodic switchyard inspections have not identified issues with surface contamination for polymer high-voltage insulators. Consequently, the rate of contamination buildup on CPNPP polymer high-voltage insulators is not significant enough to cause a loss of intended function during the PEO.

Loss of material due to mechanical wear is an aging effect for strain and suspension insulators if they are subject to significant movement. Movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and the supporting hardware.

Although this mechanism is possible, industry experience has shown transmission conductors do not normally swing and when subjected to a substantial wind, their movement will subside after a short period. Plant walkdown has verified that the transmission lines in the 138 kV and 345 kV switchyards are equipped with wind spoilers. Wind spoilers are designed to offset the aerodynamic lift forces that cause galloping (a low frequency, high amplitude wind-induced motion that can cause cable damage, damage to supporting structure, and damage to support hardware at their point of connection). Wear has not been apparent during routine switchyard inspections. Therefore, mechanical wear of high-voltage insulators caused by wind blowing on transmission lines or surface contamination is not an aging effect significant enough to cause a loss of intended function during the PEO.

3.6.2.2.3 <u>Loss of Material due to Wind-Induced Abrasion, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load</u>

Loss of material due to wind-induced abrasion, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load could occur in transmission conductors and connections, and in switchyard bus and connections. The GALL Report recommends further *evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1(Appendix A.1 of this SRP-LR).*

Transmission conductors are uninsulated, stranded electrical cables used in switchyards and switching stations to connect two or more elements of an electrical power circuit, such as active disconnect switches, power circuit breakers, and transformers and passive switchyard bus. The transmission conductor commodity group includes the associated fastening hardware but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

Transmission conductors are subject to AMR if they are necessary for restoration of offsite power following a SBO. At CPNPP, a common overhead transmission line from the 138 kV switchyard to startup transformer XST1 and alternate startup transformer XST1A support recovery from a SBO (as the preferred source of offsite power). A common overhead line from the 345 kV switchyard to startup transformer XST2 and alternate startup transformer XST2A also support SBO recovery (as a back-up source of offsite power). Other CPNPP transmission conductors are not subject to AMR since they do not perform or support a LR intended function.

Switchyard bus is the uninsulated, unenclosed, rigid electrical conductor or pipe used in switchyards and switching stations to connect two or more elements of an electrical power circuit, such as active disconnect switches and passive transmission conductors. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators.

Switchyard bus is subject to AMR if it is necessary for restoration of offsite power following a SBO. At CPNPP, switchyard bus from the 138 kV switchyard breakers and 345 kV switchyard breakers to their associated overhead transmission conductors support SBO recovery. Other switchyard bus does not require AMR since it does not perform or support a LR intended function.

- <u>Loss of Material (Wear due to wind-induced abrasion)</u>

  Wind loading could cause transmission conductor vibration or sway. Wind loading that can cause a transmission line and insulators to vibrate is considered in the design and installation of transmission conductors at CPNPP. Tests performed by Ontario Hydroelectric showed that there is little evidence of reduced conductor life due to vibration induced fatigue. This was due to use of low tensions and suitable vibration dampers. Plant walkdown has verified that the transmission lines in the 138 kV and 345 kV switchyards are equipped with wind spoilers. Wind spoilers are designed to offset the aerodynamic lift forces that cause galloping (a low frequency, high amplitude wind-induced motion that can cause cable damage, damage to supporting structure, and damage to support hardware at their point of connection). Plant walkdown also verified that CPNPP transmission lines are equipped with spacer dampers which are designed to dissipate the damaging vibrations caused by wind. Based on these design features, it is concluded that loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not significant enough to cause a loss of intended function, if left unmanaged for the PEO.

A review of industry OE and NRC generic communications related to the aging of transmission conductors ensured that no additional aging effects exist beyond those previously identified. A review of plant-specific OE did not identify any unique aging effects for transmission conductors.

Switchyard bus is connected to active equipment by short sections of flexible conductors. The rigid bus does not normally vibrate because it is supported by station post insulators and ultimately by static, structural components such as concrete footings and structural steel. Vibration issues occur early in plant life because of inadequate design, installation, or maintenance. The flexible conductors prevent the minor vibrations associated with the active switchyard components from propagating into the switchyard bus. Additionally, because switchyard bus is rigidly mounted, it is also not subject to abrasion induced by wind-loading. As a result, loss of material (wear) caused by switchyard bus vibration is not an AERM because it is precluded by design.

A review of industry OE and NRC generic communications related to the aging of switchyard bus ensured that no additional aging effects exist beyond those previously identified. A review of plant-specific OE did not identify any unique aging effects for switchyard bus.

Therefore, loss of material due to wind-induced abrasion of transmission conductors and switchyard bus is not an AERM at CPNPP.

- Loss of Conductor Strength (Corrosion)

  This aging effect applies to aluminum conductor steel reinforced (ACSR) transmission conductors. The CPNPP transmission lines within the scope of this review are constructed of concentrically stranded ACSR conductors consisting of aluminum alloy wires in multi-layer construction around a galvanized steel core. No organic materials are involved. The most prevalent mechanism contributing to loss of conductor strength of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR transmission conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion of ACSR conductors is a very slow acting aging mechanism with corrosion rates dependent largely on air quality, which includes suspended particles chemistry, sulfur dioxide (SO_2) concentration in the air, precipitation, fog chemistry and meteorological conditions. Air quality in rural areas, such as the area surrounding CPNPP, generally contains low concentrations of suspended particles and SO_2, which minimizes the corrosion rate. There are no major industries within the immediate vicinity of CPNPP. The site is in an area of low population having a rural farm-ranch community setting.

  Tests performed by Ontario Hydroelectric showed a 30 percent loss of composite conductor strength of an 80 year old ACSR conductor due to corrosion. The EPRI 1013475 License Renewal Electrical Handbook (Reference 1.7.40), makes statements relative to transmission conductor aged strengths based upon testing performed by Ontario Hydroelectric. CPNPP transmission conductors are 795 kcmil (795 MCM) ACSR. This specific conductor construction type was included in the Ontario Hydroelectric test, so the results of this test are representative of the CPNPP transmission conductors.

The example presented in EPRI 1013475 compares a 4/0 ACSR conductor to the results of the Ontario Hydroelectric Study. The same comparison method is made here for the CPNPP transmission conductors.

There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the intended function of the CPNPP transmission conductors through the PEO.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature. Tests performed by Ontario Hydroelectric showed a 30 percent loss of composite conductor strength of an 80-year-old transmission conductor. Assuming a 30 percent loss of strength, there would still be significant margin between what is required by the NESC and actual conductor strength.

These requirements are reviewed concerning the specific transmission conductors included in this review. The rated ultimate strength per American Society for Testing and Materials (ASTM) standards and NESC design strength tension requirements of 795 MCM 26/7 strand ACSR is 31,500 lbs. and 5,000 lbs., respectively. The margin between the heavy load tension and the ultimate strength is 26,500 lbs.; i.e., there is an 84 percent ultimate strength margin (26,500/31,500). The Ontario Hydroelectric study showed a 30 percent loss of composite conductor strength in an 80-year-old conductor. In the case of the CPNPP 795 MCM ACSR transmission conductors, a 30 percent loss of ultimate strength would mean that there would still be a 54 percent ultimate strength margin between what is required by the NESC and the postulated 80-year ultimate conductor strength.

A review of industry OE and NRC generic communications related to the aging of transmission conductors confirmed that no additional aging effects exist beyond those previously identified. A review of plant-specific OE did not identify any unique aging effects for transmission conductors.

Therefore, loss of conductor strength is not an AERM for ACSR transmission conductors at CPNPP.

- Increased Resistance of Connection due to Oxidation

Increased connection resistance due to surface oxidation is an applicable aging effect but is not significant enough to cause a loss of intended function. The connection components in the CPNPP switchyards are exposed to precipitation, but these components do not experience any appreciable aging effects in this environment, except for minor oxidation, which does not impact the ability of the connections to perform or support their LR intended function. At CPNPP, switchyard connection surfaces are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections thus minimizing the potential for corrosion. Based on plant-specific and industry OE, this method of installation has been proven to provide a corrosion resistant, low electrical resistance connection. In addition, CPNPP periodically performs infrared inspections of switchyard connections to verify the integrity of the connections. These infrared inspections of the 138 kV and 345 kV switchyards verify the effectiveness of the connection design and site installation practices. These inspections and the absence of site-specific OE ensures that this aging effect is not significant for CPNPP.

Therefore, increased connection resistance due to general corrosion resulting from oxidation of switchyard connection metal surfaces is not an AERM at CPNPP.

- Increased Resistance of Connection (Loss of Preload)

  This discussion is applicable to bolted connections for transmission conductors as well as switchyard bus. Increased connection resistance due to loss of pre-load (torque relaxation) for switchyard connections is not an AERM. EPRI 1013475 does not list loss of pre-load as an applicable aging mechanism. The design of transmission conductor and switchyard bus bolted connections precludes torque relaxation as confirmed by plant-specific OE. A site-specific review of OE did not identify any failures of switchyard connections. The design of switchyard bolted connections includes Belleville (conical) and lock washers and the use of an anti-oxidant compound (i.e., a grease-type sealant). The type of bolting plate and the use of Belleville or lock washers is the industry standard to preclude torque relaxation. This design configuration, combined with the proper sizing of mounting hardware, eliminates the need to consider this aging mechanism. In addition, CPNPP periodically performs infrared inspections of switchyard connections to verify the integrity of the connections. These infrared inspections verify the effectiveness of the connection design and site installation practices. These inspections and the absence of plant-specific OE verifies that this aging effect is not significant for CPNPP.

  Based on this information, increased connection resistance due to loss of pre-load on transmission conductor and switchyard bus connections is not an AERM at CPNPP.

  In summary, there are no applicable aging effects that could cause a loss of the intended function of the transmission conductor connections and switchyard bus connections for the PEO. Therefore, there are no aging effects requiring management for CPNPP transmission conductors and switchyard bus connections.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2 of this SRP-LR).

QA provisions applicable to LR for CPNPP are discussed in Appendix B.

3.6.2.3 AMR Results Not Consistent With or Not Addressed in the GALL Report

The reviewer should confirm that the applicant, in the license renewal application, has identified applicable aging effects, listed the appropriate combination of materials and environments, and has credited AMPs that will adequately manage the aging effects. The AMP credited by the applicant could be an AMP that is described and evaluated in the GALL Report or in a plant-specific program. Review procedures are described in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

Fuse Holders (Not Part of Active Equipment): Metallic Clamps

The NUREG-1801 Program, XI.E5 for fuse holders is not applicable to CPNPP EIC components. It was determined that fuse holders (metallic clamps) do not meet the screening criteria of NUREG-1801, XI.E5, and the original guidance in NRC letter dated March 10, 2003 for identification and treatment of electrical fuse holders for license renewal under ISG 5. The CPNPP screening process utilized for the identification of fuse holders is described in more detail below.

Consistent with NUREG-1801, XI.E5, the screening of CPNPP fuse holders (metallic clamps) applies to those that are not part of a larger (active) assembly. Fuse holders inside the enclosure of an active component, such as switchgear, power supplies, power inverters, battery chargers, and circuit boards are considered piece parts of the larger assembly. Since piece parts and subcomponents in such an enclosure are routinely inspected and regularly maintained as part of the plant's normal maintenance and surveillance activities, they are not subject to AMR.

An evaluation of fuse holders at CPNPP was performed to discover the population of fuse holders that were not located in active devices, such as control panels, switchgear, MCCs and termination cabinets. To facilitate this evaluation, a plant equipment database query was developed. The plant equipment database query produced a list of approximately 8700 fuses. Fuses included in the EQ Program were eliminated from this list. Fuses in the CPNPP EQ program do not meet the criteria of 10 CFR 54.21(a)(l)(ii) and are not subject to AMR. The resultant list was further reduced by eliminating any fuse with the word "spare" in the DESCRIPTION field. Then, the fuse locations of the remaining population were determined by evaluating the COMPOSITE TAG field utilizing the CPNPP equipment tagging procedure. Fuses were eliminated from further review if the fuse was determined to be located inside the enclosure of an active component such as switchgear, power supplies, power inverters, battery chargers, and circuit boards. Panels, racks, and termination cabinets were also considered to be another type of active component consistent with the guidance provided in ISG-5 and were eliminated from the process. Any remaining CPNPP fuses were screened by reviewing the component description field itself which showed location information in the text. If necessary, CPNPP plant engineering expertise was used to determine fuse location(s) not readily apparent from the component description field. This screening process eliminated all fuse candidates from further review and confirmed there are no fuses that support a system level intended function that are not part of an active component such as switchgear, power supplies, power inverters, battery chargers, load centers, and circuit boards, etc. Additionally, walkdown of the 138 kV and 345 kV switchyards has confirmed that fuse holders in associated relay and control houses are also part of a larger (active) assembly such as power supplies, relay and equipment racks, and circuit boards.

Therefore, CPNPP fuse holders (metallic clamps) are considered piece parts of a larger assembly and do not require aging management for LR.

3.6.2.4 Time-Limited Aging Analysis

The only TLAAs identified for electrical commodities are evaluations for EQ associated with 10 CFR 50.49. The EQ TLAAs are evaluated in Section 4.4.

3.6.3. Conclusion

Electrical commodities that are subject to AMR have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). AMPs selected to manage aging effects for electrical commodities are identified in Section 3.6.2.1 and in the following tables. A description of AMPs is provided in Appendix B, along with the demonstration that the identified aging effects will be effectively managed.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical commodities will be managed such that the intended functions will be maintained consistent with the CLB during the PEO.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 001	Electrical equipment subject to 10 CFR 50.49 EQ requirements composed of various polymeric and metallic materials exposed to adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	EQ is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.E1, "Environmental Qualification (EQ) of Electric Components," of this report for meeting the requirements of 10 CFR 54.21(c)(1)(i)-(iii).	Yes, TLAA	EQ equipment is not subject to AMR because the equipment is subject to replacement based on a qualified life. EQ analyses are evaluated as TLAAs in Section 4.4. See Section 3.6.2.2.1 for further evaluation.
3.6-1, 002	High-voltage insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement exposed to air – outdoor	Loss of material due to mechanical wear caused by wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP. See Section 3.6.2.2.2 for further evaluation.
3.6-1, 003	High-voltage insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement exposed to air – outdoor	Reduced insulation resistance due to presence of salt deposits or surface contamination	A plant-specific aging management program to be evaluated for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution)	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP high-voltage insulators composed of porcelain or polymer. See Section 3.6.2.2.2 for further evaluation.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 004	Transmission conductors composed of aluminum; steel exposed to air – outdoor	Loss of conductor strength due to corrosion	A plant-specific aging management program is to be evaluated for ACSR	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP. See Section 3.6.2.2.3 for further evaluation.
3.6-1, 005	Transmission connectors composed of aluminum; steel exposed to air – outdoor	Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP. See Section 3.6.2.2.3 for further evaluation.
3.6-1, 006	Switchyard bus and connections composed of aluminum; copper; bronze; stainless steel; galvanized steel exposed to air – outdoor	Loss of material due to wind induced abrasion; Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP. See Section 3.6.2.2.3 for further evaluation.
3.6-1, 007	Transmission conductors composed of aluminum; steel exposed to air – outdoor	Loss of material due to wind-induced abrasion	A plant-specific aging management program is to be evaluated for ACAR and ACSR	Yes, plant-specific	NUREG-1801 aging effects are not applicable to CPNPP. See Section 3.6.2.2.3 for further evaluation.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 008	Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E1, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37) program will be used to manage the reduced insulation resistance of various organic polymers in insulation material for electrical cables and connections, including terminal blocks, fuse holders, splices, and electrical penetration pigtails, exposed to an ALE caused by heat, radiation, or moisture. CPNPP EQ EIC penetration assemblies are managed under the Environmental Qualification of Electric Components (B.2.2.2) AMP.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 009	Insulation material for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	No	Consistent with NUREG-1801. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.3.38) program will be used to manage the reduced insulation resistance of various organic polymers in insulation material for electrical cables and connections used in instrumentation circuits exposed to an ALE caused by heat, radiation, or moisture.
3.6-1, 010	Conductor insulation for inaccessible power cables greater than or equal to 400 volts (e.g., installed in conduit or direct buried) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by significant moisture	Reduced insulation resistance due to moisture	Chapter XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.39) program will be used to manage the reduced insulation resistance of various organic polymers in conductor insulation for inaccessible power cables greater than or equal to 400 volts exposed to an ALE caused by significant moisture.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 011	Metal enclosed bus: enclosure assemblies composed of elastomers exposed to air – indoor controlled or uncontrolled or air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation	Chapter XI.E4, “Metal Enclosed Bus” or Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.3.40) program or Structures Monitoring (B.2.3.34) program will manage these aging effects. There is no in scope metal enclosed bus in an air-outdoor environment at CPNPP.
3.6-1, 012	Metal enclosed bus: bus/connections composed of various metals used for electrical bus and connections exposed to air – indoor controlled or uncontrolled or air – outdoor	Increased resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	Chapter XI.E4, “Metal Enclosed Bus”	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.3.40) program will be used to manage the increased resistance of connection of various metals in metal enclosed bus: bus/connections, exposed to air – indoor, controlled, or uncontrolled. There is no in scope metal enclosed bus in an air-outdoor environment at CPNPP.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 013	Metal enclosed bus: insulation; insulators composed of porcelain; xenoy; thermo-plastic organic polymers exposed to air – indoor, controlled or uncontrolled or air – outdoor	Reduced insulation resistance due to thermal / thermoxidative degradation of organics/thermoplastics radiation-induced oxidation, moisture/debris intrusion, and ohmic heating	Chapter XI.E4, “Metal Enclosed Bus”	No	Consistent with NUREG-1801. The Metal Enclosed Bus (B.2.3.40) program will be used to manage reduced insulation resistance of porcelain and various organic polymers in metal enclosed bus: insulation/insulators, exposed to air – indoor, controlled, or uncontrolled. There is no in scope metal enclosed bus in an air-outdoor environment at CPNPP.
3.6-1, 014	Metal enclosed bus: external surface of enclosure assemblies composed of steel exposed to air – indoor, uncontrolled or air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.E4, “Metal Enclosed Bus” or Chapter XI.S6, "Structures Monitoring"	No	NUREG-1801 aging effects are not applicable to CPNPP. There is no metal enclosed bus, external enclosure assemblies composed of steel within the scope of LR at CPNPP. Metal enclosed bus, external enclosure assemblies within the scope of LR at CPNPP are composed of aluminum.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 015	Metal enclosed bus: external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air – outdoor	Loss of material due to pitting, crevice corrosion	Chapter XI.E4, “Metal Enclosed Bus” or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Structures Monitoring (B.2.3.34) program will be used to manage potential loss of material due to general, pitting, and crevice corrosion in aluminum enclosed bus: external surface of enclosure assemblies, exposed to air – indoor, uncontrolled. Metal enclosed bus, external enclosure assemblies within the scope of license renewal at CPNPP are composed of aluminum and are exposed to an air-indoor, uncontrolled environment. Aluminum in an air-indoor, uncontrolled environment has no credible aging effects. However, CPNPP has elected to manage loss of material of the MEB external enclosure assembly for conservatism.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 016	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air – indoor, uncontrolled	Increased resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply); fatigue due to ohmic heating, thermal cycling, electrical transients	Chapter XI.E5, “Fuse Holders”	No	NUREG-1801 aging effects are not applicable to CPNPP. The electrical screening process determined that there are no safety related fuses, or non-safety related fuses which support a system intended function, that are not part of an active component such as switchgear, power supplies, power inverters, battery chargers, load centers, and circuit boards. Therefore, fuse holders with metallic clamps at CPNPP are not subject to AMR.
3.6-1, 017	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air – indoor, controlled or uncontrolled	Increased resistance of connection due to fatigue caused by frequent manipulation or vibration	Chapter XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms or fatigue caused by frequent manipulation or vibration	No	NUREG-1801 aging effects are not applicable to CPNPP. The electrical screening process determined that there are no safety related fuses, or non-safety related fuses which support a system intended function, that are not part of an active component such as switchgear, power supplies, power inverters, battery chargers, load centers, and circuit boards. Therefore, fuse holders with metallic clamps at CPNPP are not subject to AMR.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6-1, 018	Cable connections (metallic parts) composed of various metals used for electrical contacts exposed to air – indoor controlled or uncontrolled or air – outdoor	Increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Chapter XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	No	Consistent with NUREG-1801. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.41) program will be used to manage the increased resistance of connection of various metals used for electrical contacts in the metallic parts of cable connections, exposed to air – indoor, uncontrolled or air – outdoor.
3.6-1, 019	Connector contacts for electrical connectors exposed to borated water leakage composed of various metals used for electrical contacts exposed to Air with borated water leakage	Increased resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. The Boric Acid Corrosion (B.2.3.4) program will be used to manage increased resistance of connection of various metals used for connector contacts for electrical connectors exposed to air with borated water leakage.
3.6-1, 020	Transmission conductors composed of aluminum exposed to air – outdoor	Loss of conductor strength due to corrosion	None - for Aluminum Conductor Aluminum Alloy Reinforced (ACAR)	None	NUREG-1801 material and aging effects are not applicable to CPNPP.

Table 3.6-1: Summary of Aging Management Evaluations for Electrical Commodities					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6-1, 021	Fuse holders (not part of active equipment): insulation material, Metal enclosed bus: external surface of enclosure assemblies composed of insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other, galvanized steel; aluminum, Steel exposed to Air – indoor, controlled or uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.6.2-1: Electrical Commodities – Summary of Aging Management Evaluation								
Structure and/or Component	**Component Intended Function**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP) / TLAA**	**NUREG-1801 Item**	**SRP Item**	**Notes**
Cable connections (metallic parts)	Electrical Continuity	Various metals used for electrical contacts	Air – indoor, controlled or uncontrolled or Air – outdoor	Increased resistance of connection	Electrical Cable Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements (B.2.3.41)	VI.A.LP-30	3.6-1, 018	A
Conductor insulation for inaccessible power cables greater than or equal to 400 volts	Insulate (electrical)	Various organic polymers	Adverse localized environment caused by significant moisture	Reduced insulation resistance	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.39)	VI.A.LP-35	3.6-1, 010	A
Connector contacts for electrical connectors exposed to borated water leakage	Electrical Continuity	Various metals used for electrical contacts	Air with borated water leakage (external)	Increased resistance of connection	Boric Acid Corrosion (B.2.3.4)	VI.A.LP-36	3.6-1, 019	A
Insulation material for electrical cables and connections (including terminal blocks, fuse holders etc.)	Insulate (electrical)	Various organic polymers	Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37)	VI.A.LP-33	3.6-1, 008	A

Table 3.6.2-1: Electrical Commodities – Summary of Aging Management Evaluation								
Structure and/or Component	**Component Intended Function**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP) / TLAA**	**NUREG-1801 Item**	**SRP Item**	**Notes**
Cable Bus: Insulation material for electrical cables	Insulate (electrical)	Various organic polymers (EPR)	Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37)	None	None	J, 1
Insulation material for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance	Insulate (electrical)	Various organic polymers	Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.3.38)	VI.A.LP-34	3.6-1, 009	A
High-voltage electrical insulators (porcelain)	Insulate (electrical)	Porcelain; malleable iron; aluminum; galvanized steel; cement	Air – outdoor	None	None	VI.A.LP-32	3.6.1, 002	I, 2

Table 3.6.2-1: Electrical Commodities – Summary of Aging Management Evaluation								
Structure and/or Component	**Component Intended Function**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP) / TLAA**	**NUREG-1801 Item**	**SRP Item**	**Notes**
High-voltage electrical insulators (porcelain)	Insulate (electrical)	Porcelain; malleable iron; aluminum; galvanized steel; cement	Air – outdoor	None	None	VI.A.LP-28	3.6.1, 003	I, 3
High-voltage electrical insulators (polymer)	Insulate (electrical)	Silicone rubber, fiberglass, aluminum alloy, stainless steel, galvanized metals	Air – outdoor	None	None	None	None	J, 3
Switchyard bus and connections	Electrical Continuity	Aluminum; copper; stainless steel; galvanized steel	Air – outdoor	None	None	VI.A.LP-39	3.6-1, 006	I, 4
Transmission connectors	Electrical Continuity	Aluminum; steel	Air – outdoor	None	None	VI.A.LP-48	3.6-1, 005	I, 5
Transmission conductors	Electrical Continuity	Aluminum; steel	Air – outdoor	None	None	VI.A.LP-38	3.6-1, 004	I, 6
Transmission conductors	Electrical Continuity	Aluminum; steel	Air – outdoor	None	None	VI.A.LP-47	3.6-1, 007	I, 7

Table 3.6.2-1: Electrical Commodities – Summary of Aging Management Evaluation								
Structure and/or Component	**Component Intended Function**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP) / TLAA**	**NUREG-1801 Item**	**SRP Item**	**Notes**
Electrical equipment subject to 10 CFR 50.49 EQ requirements	Insulate (electrical)	Various polymeric materials	Adverse localized environment	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	Environmental Qualification of Electric Components (B.2.2.2)	VI.B.L-05	3.6-1, 001	A
Electrical equipment subject to 10 CFR 50.49 EQ requirements	Electrical Continuity	Various metallic materials	Adverse localized environment	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	Environmental Qualification of Electric Components (B.2.2.2)	VI.B.L-05	3.6-1, 001	A
Metal enclosed bus: bus/connections	Electrical Continuity	Various metals used for electrical bus and connections	Air – indoor, controlled or uncontrolled	Increased resistance of connection	Metal Enclosed Bus (B.2.3.40)	VI.A.LP-25	3.6-1, 012	A
Metal enclosed bus: enclosure assemblies	Electrical Continuity	Elastomers	Air – indoor, controlled or uncontrolled	Surface cracking, crazing, scuffing, dimensional change, shrinkage, discoloration, hardening and loss of strength	Metal Enclosed Bus (B.2.3.40)	VI.A.LP-29	3.6-1, 011	A

Table 3.6.2-1: Electrical Commodities – Summary of Aging Management Evaluation								
Structure and/or Component	**Component Intended Function**	**Material**	**Environment**	**Aging Effect / Mechanism**	**Aging Management Program (AMP) / TLAA**	**NUREG-1801 Item**	**SRP Item**	**Notes**
Metal enclosed bus: external surface of enclosure assemblies	Electrical Continuity	Aluminum	Air – indoor, controlled or uncontrolled	None	Metal Enclosed Bus (B.2.3.40)	VI.A.LP-41	3.6-1, 015	A, 8
Metal enclosed bus: insulation; insulators	Insulate (electrical)	Porcelain; xenoy; thermo-plastic organic polymers	Air – indoor, controlled or uncontrolled	Reduced insulation resistance	Metal Enclosed Bus (B.2.3.40)	VI.A.LP-26	3.6-1, 013	A
Uninsulated ground conductors and connections	Electrical Continuity	Copper	Air – outdoor, soil	None	None	None	None	I, 9

Generic Notes

A) Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

I) Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J) Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

1. Cable bus is comprised of a metallic cable tray enclosure that solely houses three-phase insulated power cables installed on insulated support blocks. Plant walkdown has verified that the CPNPP cable bus within the scope of LR consists of sections that connect the low side of startup transformers XST1 and XST2, and alternate startup transformers XST1A and XST2A to their respective safety related 6.9 kV buses. The cable bus utilized in the power paths for startup transformers XST1 and XST2 consists of 1000 kcmil, 15 kV (Ethylene Propylene Rubber) EPR insulated cable with one, two or four conductors per phase. Plant walkdown has verified that the cables run through ductwork enclosures fabricated of aluminum, with solid top coverings and solid sides panels, with louvered (slotted) bottom coverings. The duct supports are fabricated of steel as confirmed by plant walkdown. The cable bus utilized in the power paths from startup transformers XST1 and XST2 was installed during original plant construction. Note: the 1000 kcmil, 15 kV EPR insulated cable off the X-winding of startup transformers XST1 is run in dedicated cable tray not cable bus. The cable bus utilized in the power paths from alternate startup transformers XST1A and XST2A was installed within the last 20 years to support the installation of the alternate

startup transformers and consists of 1/C 1000 kcmil (4 per phase) 15 kV EPR insulated cable. Plant walkdown has verified that the cables run through ductwork enclosures fabricated of aluminum, with louvered (slotted) top and bottom coverings, with solid sides panels. The duct supports are fabricated of steel as confirmed by plant walkdown. CPNPP cable bus within the scope of LR is located in both indoor (Turbine, Switchgear and Safeguards Buildings) and outdoor areas. The service conditions for the cable bus are below the 60-year service limiting temperature and radiation thresholds for EPR insulated cable. The 1000 kcmil, 15 kV EPR insulated cables are purposely oversized for this cable bus application and are designed for worse case (vs steady state) loading. Cable blocks are designed to provide spacing of the single conductor cables and supply mechanical support. The cable blocks consist of either Permali sheets of laminate material (composite molding) or are constructed of polymer. Both materials are aptly suited for their benign service environments. In outdoor areas, moisture could enter the duct (via rain), but there is no pathway for moisture to collect on the insulated cable bus because it will simply drain out the slots at the bottom. Moisture is not a factor for the cable bus routed indoors because it is shielded from inclement weather by the structures themselves. Although cable bus design minimizes the potential for reduced insulation resistance, CPNPP will include cable bus in the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37) AMP to manage reduced insulation resistance due to adverse temperature, moisture, and radiation. The external cable bus ductwork enclosure (including external supports) will be visually inspected under the Structures Monitoring (B.2.3.34) program for loss of material. The Structures Monitoring (B.2.3.34) program will also inspect accessible external elastomers (e.g., gaskets, and sealants) for degradation including hardening, and loss of strength.

2. Based on CPNPP design and a review of OE, loss of material is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to mechanical wear caused by wind blowing on transmission conductors. For more information see Section 3.6.2.2.2.

3. Based on CPNPP design and a review of OE, reduced insulation resistance is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to reduced insulation resistance due to the presence of salt deposits or surface contamination. For more information see Section 3.6.2.2.2.

4. Based on CPNPP design and a review of OE, loss of material and increased resistance of connection are not applicable aging effects for CPNPP switchyard bus and connections. CPNPP switchyard bus and connections within the scope of LR are not subject to wind induced abrasion nor oxidation or loss of pre-load. For more information see Section 3.6.2.2.3.

5. Based on CPNPP design and a review of OE increased resistance of connection is not an applicable aging effect for CPNPP transmission connectors. CPNPP transmission connectors within the scope of LR are not subject to oxidation or loss of pre-load. For more information see Section 3.6.2.2.3.

6. Based on CPNPP design and a review of OE loss of conductor strength is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to loss of conductor strength due to corrosion. For more information see Section 3.6.2.2.3.

7. Based on CPNPP design and a review of OE loss of material is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to wind-induced abrasion. For more information see Section 3.6.2.2.3.

8. CPNPP metal enclosed bus, external enclosure assemblies within the scope of LR are composed of aluminum and are exposed to an air-indoor, controlled or uncontrolled environment. Aluminum in an air-indoor, uncontrolled environment has no credible aging effects. Although general

corrosion of the MEB enclosure assembly is typically only an applicable stressor for MEB in an air-outdoor environment, any compromise in the enclosure assembly is highly undesirable as it may adversely impact the MEBs intended function. CPNPP will manage loss of material of the MEB external enclosure assembly.

9. The Uninsulated Ground Conductors and Connections commodity group used for lightning protection includes air terminals (i.e., lightning rods), ground rods, ground cables, and connections. The above grade portions of uninsulated ground conductors and connections are exposed to the outdoor area (yard) service environment. Copper materials exposed to this service environment do not experience any appreciable aging effects, except for minor oxidation, which does not impact the ability of this commodity group to perform its intended function. For the below grade portions of uninsulated ground conductors and connections, sulfates and other chemicals in the ground water and soil may accelerate the aging process. The CPNPP site is located within the Great Plains Physiographic Province, about 4 ½ miles north of Glen Rose, Texas, and approximately four miles west of the Brazos River. The site is underlain by a sedimentary rock sequence which, at the surface, has been weathered to a clayey, silty, sandy overburden soil with some rock fragments. The soils and much of the rock are relatively impermeable to precipitation. CPNPP has a site grade elevation of 810-ft. There is no ground water above the elevation of 775-ft. The CPNPP ground grid consisting of bare copper cables is buried approximately 2.5-ft below grade level. Therefore, the water table at the site is not in contact with the ground grid. Since the below grade portions of uninsulated ground conductors and connections is well above the water table, sulfates and other chemicals in the ground water and soil that may accelerate the aging process are not applicable. The minor surface oxidation on underground conductor copper surfaces due to periodic precipitation does not impact the ability of this commodity group to perform its intended function. Therefore, a change in material properties resulting from oxidation of copper surfaces is not an AERM at CPNPP. Also, torque relaxation of bolted connections on uninsulated ground conductors is not a concern at CPNPP because all connections are bonded together using the powder weld (i.e., CADWELD®) process. OE has proven that this method of bonding produces a permanent exothermic connection that will not loosen. A loosening of bolted connections due torque relaxation of uninsulated ground conductor connections is not an AERM at CPNPP. Therefore, no aging management activities are required for this commodity group for the PEO.

4.0. TIME-LIMITED AGING ANALYSES

This section presents descriptions of the TLAAs for CPNPP Units 1 and 2 in accordance with 10 CFR 54.3(a) and 10 CFR 54.21(c). Section 4.0 is divided into Sections 4.1 through 4.8. Section 4.1 describes the process used to identify TLAAs and exemptions that are based on TLAAs. Each of the Sections 4.2, 4.3, 4.4, 4.5, 4.6, and 4.7 evaluates TLAAs associated with a TLAA category for the PEO. Table 4.1-2 lists the TLAAs in each section and provides a reference to the section where they are evaluated. Section 4.8 provides the list of references.

4.1. IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

10 CFR 54.3 defines TLAAs as those licensee calculations and analyses that:

(1) Involve SSCs within the scope of LR, as delineated in 10 CFR 54.4(a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the SSC to perform its intended functions as delineated in 10 CFR 54.4(b), and;

(6) Are contained or incorporated by reference in the CLB.

4.1.1. Background

10 CFR 54.3 and 10 CFR 54.21 address TLAAs in LRAs. 10 CFR 54.21(c) provides the following content requirements for TLAAs:

Each application must contain the following information:

(c) An evaluation of TLAAs.

(1) A list of TLAAs, as defined in 10 CFR 54.3, must be provided. The applicant shall demonstrate that—

i. The analyses remain valid for the PEO;

ii. The analyses have been projected to the end of the PEO; or

iii. The effects of aging on the intended function(s) will be adequately managed for the PEO.

(2) A list must be provided of all plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs as defined in

10 CFR 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the PEO.

4.1.2. Identification of CPNPP TLAAs

The process used to identify TLAAs for CPNPP utilized methods consistent with NUREG-1800, Revision 2, NEI 95-10, and 10 CFR Part 54.

A review of industry documents and the results of previously completed IPAs was performed to identify TLAAs that are generically applicable to CPNPP Units 1 and 2 and required further evaluation. The list of potential generically applicable TLAAs was assembled from the following sources:

- NUREG-1800, *Revision 2, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants"*
- NUREG-1801, Revision 2, *Generic Aging Lessons Learned (GALL) Report*
- NEI 95-10, Revision 6, *Industry Guideline for Implementing the Requirements of 10 CFR 54, the License Renewal Rule*
- Statements of consideration for 10 CFR Part 54
- Prior LRAs, NRC RAIs, and NRC SERs for LRAs

A review of the CLB was performed to identify potential TLAAs. The CLB search utilized "key word" searches of the following documents:

- FSAR
- TS and TS Bases
- Technical Requirements Manual (TRM) and Bases (TRMB)
- FOLs, including conditions and appendices
- Calculations and design reports referenced in the FSAR, TSs, TSB, TRM, TRMB, and FOLs
- Fire Protection Report
- Offsite Dose Calculation Manual (ODCM)
- Process Control Program (PCP)
- Inservice Testing Program Plan (IST)
- Inservice Inspection Program Plan (ISI)
- Core Operating Limits Report (COLR) (Unit 1 Cycle 22, Unit 2 Cycle 19)
- Pressure-Temperature Limits Report (PTLR)
- NRC SERs
- Docketed licensing correspondence
- DBDs

Each potential TLAA was screened using the six criteria in the definition of a TLAA to determine if the issue involved a TLAA which must be evaluated for the renewal term. Those that met all six criteria were identified as TLAAs which require evaluation for the PEO. Table 4.1-1 lists the example TLAAs provided in NUREG-1800, Tables 4.1-2 and 4.1-3, and specifies if these have been identified as

TLAAs for CPNPP. Those with a "Yes" entry apply to CPNPP and the section where they are evaluated is provided. Those with a "No" entry were determined to not apply to CPNPP. No TLAAs were identified for these categories either because they are associated with design features not employed at CPNPP or because no analyses were identified in this category that meet all six TLAA criteria.

Table 4.1-1 Review of Analyses Listed in NUREG-1800 Table 4.1-2 and 4.1-3

NUREG-1800 Examples	**Applicable to CPNPP Units 1 and 2**	**LRA Section**
NUREG-1800, Table 4.1-2 Generic Time-Limited Aging Analyses		
Reactor vessel neutron embrittlement	Yes	4.2
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Concrete containment tendon prestress	No(1)	4.5
Inservice local metal containment corrosion analyses	Yes	4.6
NUREG-1800 Table 4.1-3 Additional Examples of Plant-Specific TLAAs		
Intergranular separation in the heat-affected zone of reactor vessel low-alloy steel under austenitic SS cladding	No(2)	N/A
Low-temperature over pressure protection (LTOP) analyses	Yes	4.2.5
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	Yes	4.3.3
Fatigue analysis of the RCP flywheel	Yes	4.7.3
Fatigue analysis of polar crane	Yes	4.7.4
Flow-induced vibration endurance limit for the RVI	Yes	4.3.5
Transient cycle count assumptions for the RVI	Yes	4.3.1
Ductility reduction of fracture toughness for the RVI	No(3)	N/A
Leak before break	Yes	4.7.1
Fatigue analysis for the containment liner plate	Yes	4.6.1
Containment penetration pressurization cycles	Yes	4.6.2
Metal corrosion allowance	Yes	4.7.5, 4.7.7
High-energy line-break postulation based on fatigue cumulative usage factor	Yes	4.3.6
Inservice flaw growth analyses that demonstrate structure stability for 40 years	Yes	4.7.10

Notes:

(1) CPNPP containment design does not include tendons.
(2) No applicable TLAAs related to underclad cracking were identified for CPNPP that meet the criteria in 10 CFR 54.3(a).
(3) No TLAA exists since no CLB analysis was identified to address ductility reduction fracture toughness for the CPNPP RVI.

4.1.3. Evaluation of Time-Limited Aging Analyses

Each section of Chapter 4 evaluates one or more related TLAAs. Information is provided using the following definitions:

TLAA Description:

A description of the CLB analysis that has been identified as a TLAA, including a description of the aging effect evaluated, the time-limited variable used in the analysis, and its basis.

TLAA Evaluation:

An evaluation of the TLAA for the PEO, provides information associated with 60 years of operation for comparison with the information used in the TLAA that considered 40 years of operation. This evaluation will provide the basis for the disposition, which will fall into one of the three disposition categories described below.

TLAA Disposition:

The disposition is classified in accordance with one or more of the acceptance criteria from 10 CFR 54.21(c)(1) specified below in Section 4.1.6.

4.1.4. Acceptance Criteria

10 CFR 54.21, Contents of application – technical information, states that an application must contain the following information:

(c) An evaluation of TLAAs.

(1) A list of TLAAs, as defined in §54.3, must be provided. The applicant shall demonstrate that:

(i) The analyses remain valid for the PEO;

(ii) The analyses have been projected to the end of the PEO; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the PEO.

One or more of these three methods were used to disposition each TLAA identified for CPNPP. The disposition methods used are described in each TLAA evaluation section.

4.1.5. Identification of Exemptions

10 CFR 54.21(c)(2) identifies that a list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs as defined in 10 CFR 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the PEO.

All exemptions granted by the Regulatory Authority on the CPNPP Units 1 and 2 dockets shall be reviewed for potential TLAAs. For each exemption, the Regulatory Authority letter and associated safety evaluation reports were reviewed to identify the following:

- The exemption must be granted pursuant to 10 CFR 50.12
- It must involve an SSC within the scope of the Rule (either passive or active)
- It must involve a TLAA
- It must remain in effect during any period of operation
- It is based on time-limited assumptions

If necessary, the licensee correspondence associated with the exemption request should also be reviewed for a potential TLAA.

Each potential TLAA associated with an exemption is screened and evaluated using the methodology described above. There are no exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs for CPNPP Units 1 and 2.

Analysis

No active exemptions granted pursuant to 10 CFR 50.12 and based on a TLAA, as defined in 10 CFR 54.3, have been identified for CPNPP Units 1 or 2.

4.1.6. Summary of Results

Table 4.1-2: Time-Limited Aging Analyses Applicable to CPNPP, summarizes TLAAs identified within the CLB of CPNPP Units 1 and 2. The table provides a list of CPNPP TLAAs with the disposition method used for each as well as the section of the LRA where each is discussed.

Table 4.1-2 Time-Limited Aging Analyses Applicable to CPNPP

Section Title	Disposition Method(s)	Section Number
Reactor Vessel Neutron Embrittlement Analysis		**4.2**
Neutron Fluence Analysis	10 CFR 54.21(c)(1)(ii)	4.2.1
Pressurized Thermal Shock	10 CFR 54.21(c)(1)(ii)	4.2.2
Upper-Shelf Energy	10 CFR 54.21(c)(1)(ii)	4.2.3
Adjusted Reference Temperature	10 CFR 54.21(c)(1)(ii)	4.2.4
Pressure-Temperature Limits Including Low Temperature Over Pressure Protection Analysis	10 CFR 54.21(c)(1)(iii)	4.2.5
Metal Fatigue		**4.3**
Transient Cycle Projections for 60 Years	10 CFR 54.21(c)(1)(ii)	4.3.1
ASME Section III, Class 1 Fatigue Analysis of Piping, Piping Components, and Equipment	10 CFR 54.21(c)(1)(iii)	4.3.2

Table 4.1-2 Time-Limited Aging Analyses Applicable to CPNPP		
Section Title	**Disposition Method(s)**	**Section Number**
ASME Section III, Class 2 and 3 and ANSI B31.1 Allowable Stress Analyses	10 CFR 54.21(c)(1)(iii)	4.3.3
Environmentally Assisted Fatigue	10 CFR 54.21(c)(1)(iii)	4.3.4
RVI Fatigue Analyses	10 CFR 54.21(c)(1)(iii)	4.3.5
High-Energy Line Break Analyses	10 CFR 54.21(c)(1)(iii)	4.3.6
Environmental Qualification (EQ) of Electric Components	10 CFR 54.21(c)(1)(iii)	**4.4**
Concrete Containment Tendon Prestress Analysis	N/A	**4.5**
Containment Liner Plate, Metal Containments, and Penetrations Fatigue		**4.6**
Containment Liner Plate Fatigue	10 CFR 54.21(c)(1)(i)	4.6.1
Containment Piping Penetrations Fatigue (pressurizations cycles)	10 CFR 54.21(c)(1)(i)	4.6.2
Other Plant-Specific Time-Limited Aging Analyses		**4.7**
Leak-Before-Break	10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(ii)	4.7.1
RCP Casings ASME Code Case N-481	10 CFR 54.21(c)(1)(i)	4.7.2
RCP Flywheel Fatigue Crack	10 CFR 54.21(c)(1)(i)	4.7.3
Crane Load Cycle Limits	10 CFR 54.21(c)(1)(i)	4.7.4
Spent Fuel Pool Metal Corrosion Allowance	10 CFR 54.21(c)(1)(i)	4.7.5
Protective Coatings	10 CFR 54.21(c)(1)(ii)	4.7.6
Steam Generator Tubes Metal Corrosion Allowance	10 CFR 54.21(c)(1)(i)	4.7.7
Steam Generator Flow-Induced Vibration and Tube Wear Evaluations	10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(ii)	4.7.8
Steam Generator U-Bend Tube Vibration and Fatigue Assessment	10 CFR 54.21(c)(1)(i)	4.7.9
Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components	10 CFR 54.21(c)(1)(i)	4.7.10
Safe Shutdown Impoundment Sedimentation	10 CFR 54.21(c)(1)(iii)	4.7.11

4.2. REACTOR VESSEL NEUTRON EMBRITTLEMENT ANALYSIS

Carbon and low-alloy steels exposed to high levels of high energy neutron irradiation over time (fluence) are susceptible to reduction of fracture toughness, an increase in material strength and decrease in ductility. Fracture toughness is temperature dependent and is indirectly measured in foot-pounds (ft-lbs) of absorbed energy in a Charpy impact test. Neutron embrittlement is measured in terms of Charpy transition temperature shift, Charpy upper-shelf energy (USE) decrease, and yield and ultimate tensile strength increase. Neutron embrittlement varies with material but is directly dependent upon the integrated total neutron exposure for energy levels above 1 MeV.

To reduce the potential for brittle fracture during reactor vessel operation, pressure temperature (P-T) limit curves are developed that require the reactor vessel temperature to reach specified minimum limits prior to the application of significant pressure loading to assure the materials have adequate ductility to resist the loads. Since these minimum temperatures are increased as a function of predicted cumulative fluence, the reduced material toughness as a function of fluence is offset. Adequate fracture toughness is assured at or above the minimum temperatures specified by the P-T limit curves.

A number of tests and calculations must be performed to develop P-T limit curves. The initial nil-ductility test reference temperature (RT_{NDT}) is the temperature at which a material transitions from brittle-to-ductile behavior, and this temperature is determined for each reactor vessel beltline material prior to neutron exposure. Samples of each material are tested again after various degrees of neutron exposure up to end-of-license extension (EOLE) fluence levels to determine how much this transition temperature will increase during plant operation as a function of neutron irradiation. Since no capsules have experienced the projected fluence at 60 years of operation (i.e., 3.59×10^{19} n/cm^2), a capsule will be reinserted into the RPV to achieve a fluence in excess of one-times the projected EOLE vessel fluence and less than two-times the projected EOLE vessel fluence.

This is performed as part of the Reactor Vessel Surveillance program, and the acceptable fluence intervals for these tests are specified by ASTM E-185 requirements (Reference 4.8.1). This increase or shift in the nil-ductility RT_{NDT} is the amount of temperature increase required for the material to continue to act in a ductile manner for a given fluence level. The P-T limit curves are periodically updated for incremental fluence increase using the initial RT_{NDT} and increase in RT_{NDT} (ΔRT_{NDT}) values associated with fluence value used, along with appropriate uncertainty margins. As the actual plant exposure approaches the fluence value used in a particular set of P-T limit curves, new curves are prepared for higher fluence values, up to the EOLE fluence value.

For CPNPP Units 1 and 2, the reactor vessel material ΔRT_{NDT} and USE values, calculated on the basis of 36 Effective Full Power Years (EFPY) neutron fluence, are determined as part of the CLB and support safety determinations. Therefore, these calculations are TLAAs. For LR, these must be updated to account for the fluence expected to occur during 60 years of plant operation (56 EFPY). The governing requirements for these updated analyses are summarized below.

NRC Regulation 10 CFR 50.60, *Acceptance Criteria for Fracture Prevention Measures for Light Water Nuclear Power Reactors for Normal Operation* requires that all light water nuclear power reactors meet the requirements of 10 CFR 50, Appendix G, *Fracture*

Toughness Requirements and 10 CFR, Appendix H, *Reactor Vessel Material Surveillance Program Requirements*. Appendix G specifies fracture toughness requirements for the RCPB to provide margins of safety against fracture during any condition of normal plant operation, including anticipated operational occurrences and system hydrostatic tests. The CPNPP Units 1 and 2 Reactor Vessel Surveillance AMP, Section B.2.3.18, is required to monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline and extended beltline region resulting from exposure of these materials to neutron irradiation and thermal environment. Materials and fluence data obtained from this program are used in these fracture toughness analyses.

NRC Regulation 10 CFR 50.61, *Fracture Toughness Requirements for Protection against Pressurized Thermal Shock Events,* provides requirements for computing the PTS reference temperature (RT_{PTS}) for the EOLE fluence for each of the reactor vessel beltline materials, which is a measure of the fracture toughness after exposure to EOLE fluence. It also provides a PTS screening criterion for each type of beltline material, which limits how high the minimum reference temperature can be raised. The RT_{PTS} screening criteria serve as limits on the degree of ΔRT_{NDT} that can be applied to account for neutron embrittlement. The RT_{PTS} values are a function of material composition and neutron fluence, and they increase as cumulative fluence increases, possibly approaching the screening criterion if the material is highly susceptible to neutron embrittlement. If the RT_{PTS} value is projected to exceed the screening criteria using the EOLE fluence, licensees are required to implement flux reduction programs to prevent this from occurring.

4.2.1. Neutron Fluence Projections

TLAA Description

Neutron fluence represents the cumulative number of neutrons per unit area that contact the reactor vessel shell and its internal components over a given period of time. The fluence projections that quantify the number of neutrons that contact these surfaces have been used as inputs to the neutron embrittlement analyses that evaluate the loss of fracture toughness aging effect resulting from neutron fluence.

The current license period reactor vessel embrittlement analyses that evaluate reduction of fracture toughness of the CPNPP Units 1 and 2 reactor vessel beltline materials are based on predicted 40-year EOLE fluence values. The fluence analysis and the neutron embrittlement analyses that are based upon the fluence analysis are TLAAs as defined by 10 CFR 54.21(c) that must be evaluated for the increased neutron fluence associated with 60 years of operation. These TLAAs include the analyses for neutron fluence, PTS USE, adjusted reference temperature (ART), and pressure-temperature limits including low temperature over pressure protection analysis. The neutron fluence TLAA is evaluated in this section with the others evaluated in Sections 4.2.2, 4.2.3, 4.2.4, and 4.2.5.

TLAA Evaluation

Updating fluence projections for 40 years and 60 years requires updating EFPY projections based on actual unit operating history and a conservative capacity factor estimate for future cycles through the end of the PEO. The information used to develop these EFPY projections is summarized below.

EFPY Projection

The EFPY projections are the sum of the accumulated EFPYs and the future EFPYs accrued through the end of the PEO at a certain capacity factor. For future cycles through the end of the PEO, EFPYs were calculated using average core power distributions and include a 10 percent bias on the peripheral and re-entrant corner assembly relative powers. For CPNPP Unit 1, the projections use Cycle 21 as the basis for future projections. For CPNPP Unit 2, the projections use Cycle 18 as the basis for future projections.

Fluence Projections

For LR, updated fluence projections based upon 56 EFPY were prepared for use as inputs in the neutron embrittlement analyses for 60 years of operation.

The reactor vessel beltline neutron fluence values for 60 years of operation were calculated for CPNPP Units 1 and 2 reactor vessel beltline material. The analysis methods used to calculate the predicted 60-year CPNPP Units 1 and 2 vessel fluence values satisfy the requirements set forth in RG 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*. These methodologies have been approved by the U.S. NRC and are described in WCAP-14040-A and WCAP-18124-A (References 4.8.2 and 4.8.3).

In accordance with 10 CFR 50, Appendix H, any materials exceeding $1.0X10^{17}$ n/cm^2 (E > 1.0 MeV) must be monitored to evaluate changes in fracture toughness. Reactor vessel materials that are not traditionally thought of as being plant limiting were evaluated to determine their cumulative fluence values at 56 EFPY. Fluence calculations were performed for the CPNPP Units 1 and 2 RPV lowest extent of the outlet nozzle weld, lowest extent of the inlet nozzle weld, upper shell to intermediate shell girth weld, upper shell longitudinal weld, intermediate to lower shell girth weld, and lower shell to lower head girth weld to determine if they will exceed $1.0X10^{17}$ n/cm^2 (E > 1.0 MeV) at 56 EFPY. The materials that exceed this threshold are referred to as the extended beltline materials. Reactor vessel beltline region material and locations are identified in FSAR Figures 5.3-1A and 5.3-1B for Units 1 and 2, respectively.

Table 4.2.1-1 summarizes the results of the fluence projections for 56 EFPY for CPNPP Units 1 and 2 beltline, extended belt line, and non-beltline materials.

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The fluence analyses have been projected to the end of the PEO. They are to be used as inputs in the neutron embrittlement TLAA evaluations in the remainder of Section 4.2. The materials to be included in the extended beltline requiring additional evaluation have been identified.

Table 4.2.1-1 CPNPP Units 1 and 2 Reactor Pressure Vessel Maximum Fast Neutron Fluence Projections at Shells and Welds		
Reactor Vessel Material	**56 EFPY Neutron Fluence (E > 1.0 MeV) [n/cm^2]**	
	Unit 1[(a)]	**Unit 2[(b)]**
Reactor Vessel Beltline Materials		
Intermediate Shell Plate R-1107-1	3.59X10^{19}	N/A
Intermediate Shell Plate R-1107-2	3.59X10^{19}	N/A
Intermediate Shell Plate R-1107-3	3.59X10^{19}	N/A
Lower Shell Plate R-1108-1	3.58X10^{19}	N/A
Lower Shell Plate R-1108-2	3.58X10^{19}	N/A
Lower Shell Plate R-1108-3	3.58X10^{19}	N/A
Intermediate Shell Plate R-3807-1	N/A	3.37X10^{19}
Intermediate Shell Plate R-3807-2	N/A	3.37X10^{19}
Intermediate Shell Plate R-3807-3	N/A	3.37X10^{19}
Lower Shell Plate R-3816-1	N/A	3.28X10^{19}
Lower Shell Plate R-3816-2	N/A	3.28X10^{19}
Lower Shell Plate R-3816-3	N/A	3.28X10^{19}
Intermediate to Lower Shell Girth Weld Seam 101-171	3.58X10^{19}	3.28X10^{19}
Intermediate Shell Longitudinal Weld Seam 101-124A (0°)	1.77X10^{19}	1.79X10^{19}
Intermediate Shell Longitudinal Weld Seams 101-124B & C (60°)	3.21X10^{19}	3.14X10^{19}
Lower Shell Longitudinal Weld Seams 101-142B & C (30°)	2.19X10^{19}	2.07X10^{19}
Lower Shell Longitudinal Weld Seam 101-142A (90°)	1.75X10^{19}	1.73X10^{19}
Extended Beltline		
Upper Shell Plate R-1104-1	5.04X10^{17}	N/A
Upper Shell Plate R-1104-2	5.04X10^{17}	N/A
Upper Shell Plate R-1104-3	5.04X10^{17}	N/A
Upper Shell Plate R-3806-1	N/A	5.56X10^{17}
Upper Shell Plate R-3806-2	N/A	5.56X10^{17}
Upper Shell Plate R-3806-3	N/A	5.56X10^{17}

Table 4.2.1-1 CPNPP Units 1 and 2 Reactor Pressure Vessel Maximum Fast Neutron Fluence Projections at Shells and Welds

Reactor Vessel Material	56 EFPY Neutron Fluence (E > 1.0 MeV) [n/cm^2]	
	Unit 1[(a)]	Unit 2[(b)]
Upper Shell to Inter. Shell Girth Weld Seam 103-121	5.79X10^{17}	6.52X10^{17}
Upper Shell Long. Weld Seams 101-122 A, B and C[(d)]	5.79X10^{17}	6.52X10^{17}
Non-Beltline[(c)]		
Inlet nozzle to nozzle belt forging weld (lowest extent)	3.32X10^{16}	3.82X10^{16}
Outlet nozzle to nozzle belt forging weld (lowest extent)	1.88X10^{16}	2.03X10^{16}
Lower shell to lower head circumferential weld	1.12X10^{16}	1.18X10^{16}

Notes:

(a) Values beyond Cycle 22 are based on the average core power distributions and reactor operating conditions of Cycle 21 but include a 1.1 bias on the peripheral and re-entrant corner assembly relative powers.

(b) Values beyond Cycle 19 are based on the average core power distributions and reactor operating conditions of Cycle 18 but include a 1.1 bias on the peripheral and re-entrant corner assembly relative powers.

(c) These components are less than the 1.0X10^{17} n/cm^2; therefore, these components do not need to consider irradiation embrittlement and are not considered further.

(d) The upper to intermediate shell girth weld fluence is applied to the upper shell longitudinal welds.

4.2.2. <u>Pressurized Thermal Shock</u>

TLAA Description

10 CFR 50.61(b)(1) provides rules for protection against PTS events for PWRs. Licensees are required to perform an updated assessment of the projected values of the RT_{PTS} whenever there is a significant change in projected values of RT_{PTS} or upon request for a change in the expiration date for operation of the facility. The current RT_{PTS} analyses for CPNPP Units 1 and 2 were prepared for each reactor vessel beltline material based upon projected neutron fluence values for 40 years. These are TLAAs requiring evaluation using the projected 60-year fluence values.

TLAA Evaluation

10 CFR 50.61(c) provides two methods for determining RT_{PTS}. These methods are also described as Positions 1 and 2 in RG 1.99, Revision 2 (Reference 4.8.4). Position 1 applies for material that does not have credible surveillance data available and Position 2 is used for material that has two or more credible surveillance data sets available. These accepted methods were used with the clad/base metal interface fluence values to calculate the following RT_{PTS} values for the CPNPP Units 1 and 2 RPV materials at 56 EFPY (EOLE) in Section 4.2.1. The RT_{PTS}

calculations are summarized below in Tables 4.2.2-1 and 4.2.2-2 for CPNPP Units 1 and 2, respectively.

10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and axial welds and 300°F for circumferential welds. If the RT_{PTS} does not exceed the PTS screening criteria, then only the reactor vessel is relied upon to mitigate the consequences of a PTS event described in 10 CFR 50.61.

All of the beltline reactor vessel materials for CPNPP Units 1 and 2 are projected to remain below the RT_{PTS} screening criteria values of 270°F for plates, forgings, and longitudinal welds, and 300°F for circumferentially-oriented welds (per 10 CFR 50.61) at EOLE. The CPNPP Unit 1 limiting RT_{PTS} value for base metal or longitudinal weld materials at 56 EFPY is 102.6°F (see Table 4.2.2-1), which corresponds to Intermediate Shell Plate R-1107-1. CPNPP Unit 1 Intermediate Shell Plate R-1108-2 has a higher projected RT_{PTS}, 103.3°F, when considering only Position 1.1 chemistry factor (CF); however, the use of credible data and Position 2.1 chemistry factor for this material results in a projected RT_{PTS} value of 69.5°F at EOLE.

The CPNPP Unit 1 limiting RT_{PTS} value for circumferentially oriented weld materials at 56 EFPY is -24.2°F (see Table 4.2.2-1), which corresponds to the beltline region weld metal with credible surveillance data. The CPNPP Unit 2 limiting RT_{PTS} value for base metal or longitudinal weld materials at 56 EFPY is 92.8°F (see Table 4.2.2-2), which corresponds to Intermediate Shell Plate R-3807-2. The CPNPP Unit 2 limiting RT_{PTS} value for circumferentially oriented weld materials at 56 EFPY is 32.1°F (see Table 4.2.2-2), which corresponds to the Intermediate to Lower Shell Girth weld (Heat #89833).

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The PTS analyses have been projected to the end of the PEO and have been demonstrated to be below the applicable PTS screening criterion.

Table 4.2.2-1 RT_{PTS} Calculations for CPNPP Unit 1 Reactor Vessel Beltline and Extended Beltline Materials at 56 EFPY[(a)]												
Material	**Heat Number**	**Cu (WT %)**	**Ni (WT %)**	**CF[(a)]**	**Surface Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**Surf. FF[(c)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_U (°F)**	**σ_Δ[(e)] (°F)**	**M (°F)**	**RT_{PTS} (°F)**
Beltline												
Intermediate Shell Plate R-1107-1	C4021-1	0.07	0.62	44.0	3.59	1.332	10	58.6	0	17.0	34.0	102.6
Intermediate Shell Plate R-1107-2	B7854-1	0.07	0.67	44.0	3.59	1.332	-10	58.6	0	17.0	34.0	82.6
Intermediate Shell Plate R-1107-3	C4106-2	0.06	0.65	37.0	3.59	1.332	10	49.3	0	17.0	34.0	93.3
Lower Shell Plate R-1108-1	C4464-1	0.08	0.65	51.0	3.58	1.332	0	67.9	0	17.0	34.0	101.9
Lower Shell Plate R-1108-2	C4533-2	0.06	0.60	37.0	3.58	1.332	20	49.3	0	17.0	34.0	103.3
with **credible** surveillance data[(f)]	C4533-2	0.06	0.60	24.4	3.58	1.332	20	32.5	0	8.5	17.0	69.5
Lower Shell Plate R-1108-3	C4589-1	0.08	0.65	51.0	3.58	1.332	0	67.9	0	17.0	34.0	101.9
Beltline Region Weld Metal	88112	0.045	0.2	46.0	3.58	1.332	-70	61.3	0	28.0	56.0	47.3
with **credible** surveillance data[(f)]	88112	0.045	0.2	17.2	3.58	1.332	-70	22.9	0	11.5	22.9	-24.2
Extended Beltline[(d)]												
Upper Shell Plate R-1104-1	C4143-2	0.07	0.61	44.0	0.0504	0.294	40	12.9	0	6.5	12.9	65.9
Upper Shell Plate R-1104-2	C4142-2	0.08	0.67	51.0	0.0504	0.294	40	15.0	0	7.5	15.0	70.0
Upper Shell Plate R-1104-3	C4164-2	0.05	0.60	31.0	0.0504	0.294	10	9.1	0	4.6	9.1	28.2
Upper Shell to Inter. Shell Girth Weld Seam 103-121	90149	0.04	0.04	27.8	0.0579	0.317	-60	8.8	0	4.4	8.8	-42.4
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C	4P6052	0.047	0.049	30.7	0.0579	0.317	-50	9.7	0	4.9	9.7	-30.6

Table 4.2.2-1 RT_{PTS} Calculations for CPNPP Unit 1 Reactor Vessel Beltline and Extended Beltline Materials at 56 EFPY[(a)]												
Material	**Heat Number**	**Cu (WT %)**	**Ni (WT %)**	**CF[(a)]**	**Surface Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**Surf. FF[(c)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_U (°F)**	**σ_Δ[(e)] (°F)**	**M (°F)**	**RT_{PTS} (°F)**
with **credible** surveillance data[(f)]	4P6052	0.047	0.049	20.3	0.0579	0.317	-50	6.4	0	3.2	6.4	-37.1

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1).

(b) The 56 EFPY surface fluence values for the reactor vessel materials are taken from Table 4.2.1-1.

(c) FF = fluence factor = $f^{(0.28 - 0.10 * \log(f))}$.

(d) The base materials chemistry initial RT_{NDT}, and USE values for the base metal material are contained in Final Safety Analysis Report (FSAR) Table 5.3-2A. The initial RT_{NDT} values for the extended beltline weld materials are contained in FSAR Table 5.3-15A.

(e) Per 10 CFR 50.61, the base metal σ_Δ = 17°F when surveillance data is non-credible or not used to determine the CF, and the base metal σ_Δ = 8.5°F when credible surveillance data is used to determine the CF. Also, per 10 CFR 50.61, the weld metal σ_Δ = 28°F when surveillance data is non-credible or not used to determine the CF, and the weld metal σ_Δ = 14°F when credible surveillance data is used to determine the CF. However, σ_Δ need not exceed 0.5 * ΔRT_{NDT}.

(f) The credibility evaluation for the CPNPP Unit 1 surveillance data determined that the CPNPP Unit 1 surveillance data for the Lower Shell Plate R-1108-2 and weld Heat # 88112 materials are deemed credible. Therefore, the Position 2.1 CF can be used with a reduced margin term in lieu of the Position 1.1 CF.

Table 4.2.2-2 RT_{PTS} Calculations for CPNPP Unit 2 Reactor Vessel Beltline and Extended Beltline Materials at 56 EFPY

Material	Heat Number	Cu (WT %)	Ni (WT %)	CF	Surface Fluence(b) (x 10^{19} n/cm^2, E > 1.0 MeV)	Surf. FF(c)	$RT_{NDT(U)}$ (°F)	Predicted ΔRT_{NDT} (°F)	σ_U (°F)	σ_Δ(e) (°F)	M (°F)	RT_{PTS} (°F)
Beltline												
Intermediate Shell Plate R-3807-1	C5522-1	0.06	0.64	37.0	3.37	1.318	-20	48.8	0	17.0	34.0	62.8
Intermediate Shell Plate R-3807-2	C5522-2	0.06	0.64	37.0	3.37	1.318	10	48.8	0	17.0	34.0	92.8
with **non-credible** surveillance data(f)	C5522-2	0.06	0.64	29.0	3.37	1.318	10	38.2	0	17.0	34.0	82.2
Intermediate Shell Plate R-3807-3	B9566-1	0.05	0.6	31.0	3.37	1.318	-20	40.9	0	17.0	34.0	54.9
Lower Shell Plate R-3816-1	NR 64-435-1	0.05	0.59	31.0	3.28	1.312	-30	40.7	0	17.0	34.0	44.7
Lower Shell Plate R-3816-2	NR 64-439-1	0.03	0.65	20.0	3.28	1.312	0	26.2	0	13.1	26.2	52.5
Lower Shell Plate R-3816-3	NR 64-443-1	0.04	0.63	26.0	3.28	1.312	-40	34.1	0	17.0	34.0	28.1
Intermediate and Lower Shell Longitudinal Welds	89833	0.046	0.059	31.5	3.14	1.302	-50	41.0	0	20.5	41.0	32.0
with **credible** surveillance data(f)	89833	0.046	0.059	48.9	3.14	1.302	-50	63.6	0	14.0	28.0	41.6
Intermediate to Lower Shell Girth Weld	89833	0.046	0.059	31.5	3.28	1.312	-60	41.3	0	20.7	41.3	22.6
with **credible** surveillance data(f)	89833	0.046	0.059	48.9	3.28	1.312	-60	64.1	0	14.0	28.0	32.1
Extended Beltline(d)												
Upper Shell Plate R-3806-1	D1691-1	0.05	0.61	31.0	0.0556	0.310	40	9.6	0	4.8	9.6	59.2
Upper Shell Plate R-3806-2	B9486-1	0.06	0.62	37.0	0.0556	0.310	10	11.5	0	5.7	11.5	32.9
Upper Shell Plate R-3806-3	D1691-2	0.06	0.70	37.0	0.0556	0.310	40	11.5	0	5.7	11.5	62.9

Table 4.2.2-2 RT_{PTS} Calculations for CPNPP Unit 2 Reactor Vessel Beltline and Extended Beltline Materials at 56 EFPY												
Material	**Heat Number**	**Cu (WT %)**	**Ni (WT %)**	**CF**	**Surface Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**Surf. FF[(c)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_U (°F)**	**σ_Δ[(e)] (°F)**	**M (°F)**	**RT_{PTS} (°F)**
Upper Shell to Inter. Shell Girth Weld Seam 103-121	3P7317	0.074	0.067	41.2	0.0652	0.337	-80	13.9	0	6.9	13.9	-52.2
with **credible** surveillance data[(f)]	3P7317	0.074	0.067	3.3	0.0652	0.337	-80	1.1	0	0.6	1.1	-77.8
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C	89827	0.13	0.03	60.7	0.0652	0.337	-80	20.4	0	10.2	20.4	-39.1

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1).

(b) The 56 EFPY surface fluence values for the reactor vessel materials are taken from Table 4.2.1-1.

(c) FF = fluence factor = $f^{(0.28 - 0.10 * \log(f))}$.

(d) The base materials chemistry initial RT_{NDT}, and USE values for the base metal material are contained in Final Safety Analysis Report (FSAR) Table 5.3-2A. The initial RT_{NDT} values for the extended beltline weld materials are contained in FSAR Table 5.3-15A.

(e) Per 10 CFR 50.61, the base metal σ_Δ = 17°F when surveillance data is non-credible or not used to determine the CF, and the base metal σ_Δ = 8.5°F when credible surveillance data is used to determine the CF. Also, per 10 CFR 50.61, the weld metal σ_Δ = 28°F when surveillance data is non-credible or not used to determine the CF, and the weld metal σ_Δ = 14°F when credible surveillance data is used to determine the CF. However, σ_Δ need not exceed 0.5 * ΔRT_{NDT}.

(f) The credibility evaluation for the CPNPP Unit 1 surveillance data determined that the CPNPP Unit 1 surveillance data for the Lower Shell Plate R-1108-2 and weld Heat # 88112 materials are deemed credible. Therefore, the Position 2.1 CF can be used with a reduced margin term in lieu of the Position 1.1 CF.

4.2.3. Upper-Shelf Energy

TLAA Description

The USE calculations were prepared for CPNPP Units 1 and 2 reactor vessel beltline values for 40 years. These are TLAAs requiring evaluation using the projected 60-year fluence values.

TLAA Evaluation

Appendix G of 10 CFR 50, Paragraph IV.A.1.a, states that reactor vessel beltline materials must have Charpy USE in the transverse direction for base material and along the weld for weld material of no less than 75 ft-lb initially, and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation (NRR) that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code (Reference 4.8.5).

There are two methods that can be used to predict the decrease in USE with irradiation, depending on the availability of credible surveillance capsule data as defined by RG 1.99, Revision 2. For vessel beltline materials that are not in the surveillance program or have non-credible data, the Charpy USE (Position 1.2) is assumed to decrease as a function of fluence and copper content, as indicated in RG 1.99, Revision 2.

When two or more credible surveillance sets become available from the reactor, they may be used to determine the Charpy USE of the surveillance material. The surveillance data are then used in conjunction with the RG to predict the change in USE (Position 2.2) of the RPV material due to irradiation. Per RG 1.99, Revision 2, when credible data exist, the Position 2.2 projected USE value should be used in preference to the Position 1.2 projected USE value.

The 56 EFPY Position 1.2 USE values of the vessel materials can be predicted using the corresponding 1/4T fluence projections, the copper content of the materials, and Figure 2 in RG 1.99, Revision 2.

The predicted Position 2.2 USE values are determined for the reactor vessel materials that are contained in the surveillance program by using the reduced plant surveillance data along with the corresponding 1/4T fluence projection. The surveillance data was plotted against RG 1.99, Revision 2, Figure 2. This data was fitted by drawing a line parallel to the existing lines as the upper bound of all the surveillance data. These reduced lines were used instead of the existing lines to determine the Position 2.2 EOLE USE values.

The projected USE values were calculated to determine if the CPNPP Units 1 and 2 beltline and extended beltline materials remain above the 50 ft-lb criterion at 56 EFPY (EOLE). These calculations are summarized in Tables 4.2.3-1 and 4.2.3-2.

The CPNPP Unit 2 base metal surveillance material, Intermediate Shell Plate R-3807-2 exhibited an increase in USE or no decrease in USE for each capsule; thus, for conservatism, no Position 2.2 prediction is made for this material.

The CPNPP Units 1 and 2 reactor vessel beltline materials are projected to remain above the USE screening criterion of 50 ft-lb (per 10 CFR 50, Appendix G) at 56 EFPY (EOLE). The limiting projected USE value at EOLE for CPNPP Unit 1 is Lower Shell Plate R-1108-1 with a projected USE of 65 ft-lb. CPNPP Unit 1 Lower Shell Plate R-1180-2 has a lower projected USE when considering only Position 1.2; however, the use of credible Position 2.2 data for this material results in a projected USE value of 70 ft-lb at EOLE. The limiting projected USE value at EOLE for CPNPP Unit 2 is Upper Shell Plate R-3806-1 with a projected USE of 69 ft-lb.

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The USE analyses have been projected to the EOLE. All vessel beltline and extended beltline materials are projected to remain above the USE screening criterion value of 50 ft-lbs (per 10 CFR 50, Appendix G) through EOLE (56 EFPY).

Table 4.2.3-1 Predicted USE Values at 56 EFPY for the CPNPP Unit 1 Beltline and Extended Beltline Materials					
Material	**Weight % Cu(a)**	**1/4T EOLE Fluence(b) (x 10^{19} n/cm^2, E > 1.0 MeV)**	**Unirradiated USE(a) (ft-lb)**	**Projected USE Decrease(c) (%)**	**Projected EOLE USE (ft-lb)**
Beltline Materials Position 1.2 Results					
Intermediate Shell Plate R-1107-1	0.07	2.14	94	23	72
Intermediate Shell Plate R-1107-2	0.07	2.14	103	23	79
Intermediate Shell Plate R-1107-3	0.06	2.14	88	23	68
Lower Shell Plate R-1108-1	0.08	2.13	85	23	65
Lower Shell Plate R-1108-2	0.06	2.13	78	23	60
Lower Shell Plate R-1108-3	0.08	2.13	98	23	75
Beltline Region Weld Metal (Heat # 88112)	0.045	2.13	133	23	102
Extended Beltline Materials Position 1.2 Results					
Upper Shell Plate R-1104-1	0.07	0.0300	83	9	76
Upper Shell Plate R-1104-2	0.08	0.0300	75	9	69
Upper Shell Plate R-1104-3	0.05	0.0300	107.5	9	98
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 90149)	0.05	0.0345	144	9	131
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 4P6052)	0.047	0.0345	197	9	179
Beltline Materials Position 2.2 Results					
Lower Shell Plate R-1108-2	0.07	2.13	78	10	70
Beltline Region Weld Metal (Heat # 88112)	0.045	2.13	133	6	125

Notes:

(a) The base materials chemistry, initial RTNDT, and USE values for the base metal material are contained in FSAR Table 5.3-2A. If the base metal or weld Cu weight percentages are below the minimum value presented in Figure 2 of RG 1.99, Revision 2 (0.1 for base metal and 0.05 for welds), then the Cu weight percentages were conservatively rounded up to the minimum value for projected USE decrease determination.

(b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches).

(c) Position 1.2 percentage USE decrease values were calculated by plotting the 1/4T fluence values on RG 1.99, Figure 2 and using the material-specific Cu wt. % values. The percent-loss lines were extended into the low fluence area of RG 1.99, Figure 2, i.e., below 10^{18} n/cm^2, in order to determine the USE percent decrease, as needed. Position 2.2 percentage USE decrease values were determined by drawing an upper-bound line parallel to the existing RG 1.99, Figure 2 lines through the applicable surveillance data points. These results should be used in preference to the existing graph lines for determining the decrease in USE, because the surveillance data is credible.

Table 4.2.3-2 Predicted USE Values at 56 EFPY for the CPNPP Unit 2 Beltline and Extended Beltline Materials					
Material	**Weight % Cu[(a)]**	**1/4T EOLE Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**Unirradiated USE[(a)] (ft-lb)**	**Projected USE Decrease[(c)] (%)**	**Projected EOLE USE (ft-lb)**
Beltline Materials Position 1.2 Results					
Intermediate Shell Plate R-3807-1	0.06	2.01	108	23	83
Intermediate Shell Plate R-3807-2	0.06	2.01	101	23	78
Intermediate Shell Plate R-3807-3	0.05	2.01	105	23	81
Lower Shell Plate R-3816-1	0.05	1.95	107	23	82
Lower Shell Plate R-3816-2	0.03	1.95	106	23	82
Lower Shell Plate R-3816-3	0.04	1.95	108	23	83
Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)	0.046	1.87	172	23	132
Intermediate to Lower Shell Girth Weld (Heat # 89833)	0.046	1.95	96	23	74
Extended Beltline Materials Position 1.2 Results					
Upper Shell Plate R-3806-1	0.05	0.0331	76	9	69
Upper Shell Plate R-3806-2	0.06	0.0331	87	9	79
Upper Shell Plate R-3806-3	0.06	0.0331	86	9	78
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 3P7317)	0.074	0.0388	99	10	89
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 89827)	0.13	0.0388	142	13	124
Beltline Materials Position 2.2 Results					
Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)	0.046	1.87	172	16	144
Intermediate to Lower Shell Girth Weld (Heat # 89833)	0.046	1.95	96	16	81

Table 4.2.3-2 Predicted USE Values at 56 EFPY for the CPNPP Unit 2 Beltline and Extended Beltline Materials Continued
Notes: (a) The base materials chemistry, initial RTNDT, and USE values for the base metal material are contained in FSAR Table 5.3-2B. If the base metal or weld Cu weight percentages are below the minimum value presented in Figure 2 of RG 1.99, Revision 2 (0.1 for base metal and 0.05 for welds), then the Cu weight percentages were conservatively rounded up to the minimum value for projected USE decrease determination. (b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches). (c) Position 1.2 percentage USE decrease values were calculated by plotting the 1/4T fluence values on RG 1.99, Figure 2 and using the material-specific Cu wt. % values. The percent-loss lines were extended into the low fluence area of RG 1.99, Figure 2, i.e., below 1018 n/cm^2, in order to determine the USE percent decrease, as needed. Position 2.2 percentage USE decrease values were determined by drawing an upper-bound line parallel to the existing RG 1.99, Figure 2 lines through the applicable surveillance data points. These results should be used in preference to the existing graph lines for determining the decrease in USE, because the surveillance data is credible.

4.2.4. Adjusted Reference Temperature

TLAA Description

The ART of the limiting beltline material is used to determine the beltline P-T limit curves to account for irradiation effects. RG 1.99, Revision 2, provides the methodology for determining the ART of the limiting material. (Reference 4.8.4) The initial RT_{NDT} is the temperature at which a non-irradiated metal (ferritic steel) changes its fracture characteristics from ductile to brittle behavior. RT_{NDT} is evaluated according to the procedures in the ASME B&PV Code, Section III, Paragraph NB-2331 (Reference 4.8.6). Neutron embrittlement increases the RT_{NDT} beyond its initial value.

10 CFR 50, Appendix G, defines the fracture toughness requirements for the life of the vessel. The shift in the initial RT_{NDT} (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to behave in a ductile manner. The ART is defined as: Initial RT_{NDT} + (ΔRT_{NDT}) + Margin. Since the ΔRT_{NDT} value is a function of 36 EFPY fluence, associated with the 40-year licensed operating period, these ART calculations meet the criteria of 10 CFR 54.3(a) and have been identified as TLAAs requiring evaluation for 60 years.

TLAA Evaluation

As described in Section 4.2.1, 56 EFPY fluence values were determined for CPNPP for the reactor vessel beltline and extended beltline components. The 56 EFPY quarter thickness (1/4T) and three-quarter thickness (3/4T) fluence values were used to compute the ART values of CPNPP, in accordance with RG 1.99, Revision 2. Tables 4.2.4-1 and 4.2.4-2 present the 56 EFPY ART values at the 1/4T locations for

CPNPP Units 1 and 2, respectively. Tables 4.2.4-3 and 4.2.4-4 present the 56 EFPY ART values at the 3/4T location for CPNPP Units 1 and 2, respectively.

The limiting 56 EFPY axial flaw ART values correspond to CPNPP Unit 1 Intermediate Shell Plate R01107-1. The plant-specific CPNPP Units 1 and 2 fluence at the nozzle corners remain less than the screening criterion of $4.28X10^{17}$ n/cm^2 of PWROG-15109-NP-A, as described in Section 4.2.1 (Reference 4.8.7). Thus, the nozzle P-T limit curves need no further consideration.

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The ART analyses have been projected to the EOLE. They may be used as inputs to 56 EFPY P-T limits.

Table 4.2.4-1 Calculation of the CPNPP Unit 1 ART Values at the 1/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)										
Material	**RG 1.99, Rev. 2 Position**	**CF[(a)]**	**1/4T Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**1/4T FF[(b)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_I (°F)**	**σ_Δ[(c)] (°F)**	**M (°F)**	**ART (°F)**
Beltline										
Intermediate Shell Plate R-1107-1	1.1	44.0	2.14	1.207	10	53.1	0	17.0	34.0	97.1
Intermediate Shell Plate R-1107-2	1.1	44.0	2.14	1.207	-10	53.1	0	17.0	34.0	77.1
Intermediate Shell Plate R-1107-3	1.1	37.0	2.14	1.207	10	44.6	0	17.0	34.0	88.6
Lower Shell Plate R-1108-1	1.1	51.0	2.13	1.206	0	61.5	0	17.0	34.0	95.5
Lower Shell Plate R-1108-2	1.1	37.0	2.13	1.206	20	44.6	0	17.0	34.0	98.6
with **credible** surveillance data[(d)]	2.1	24.4	2.13	1.206	20	29.4	0	8.5	17.0	66.4
Lower Shell Plate R-1108-3	1.1	51.0	2.13	1.206	0	61.5	0	17.0	34.0	95.5
Beltline Region Weld Metal (Heat # 88112)	1.1	46.0	2.13	1.206	-70	55.5	0	27.7	55.5	40.9
with **credible** surveillance data[(d)]	2.1	17.2	2.13	1.206	-70	20.7	0	10.4	20.7	-28.5
Extended Beltline										
Upper Shell Plate R-1104-1	1.1	44.0	0.0300	0.220	40	9.7	0	4.8	9.7	59.3
Upper Shell Plate R-1104-2	1.1	51.0	0.0300	0.220	40	11.2	0	5.6	11.2	62.4
Upper Shell Plate R-1104-3	1.1	31.0	0.0300	0.220	10	6.8	0	3.4	6.8	23.6
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 90149)	1.1	27.8	0.0345	0.238	-60	6.6	0	3.3	6.6	-46.8
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 4P6052)	1.1	30.7	0.0345	0.238	-50	7.3	0	3.7	7.3	-35.4
with **credible** surveillance data[(d)]	2.1	20.3	0.0345	0.238	-50	4.8	0	2.4	4.8	-40.3

Table 4.2.4-1 Calculation of the CPNPP Unit 1 ART Values at the 1/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1) using the Cu and Ni weight percent values in Table 4.2.2-1.

(b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches).

(c) Per the guidance of RG 1.99, Revision 2, the base metal σ_Δ = 17°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the base metal σ_Δ = 8.5°F for Position 2.1 with credible surveillance data. Also, per RG 1.99, Revision 2, the weld metal σ_Δ = 28°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the weld metal σ_Δ = 14°F for Position 2.1 with credible surveillance data. However, σ_Δ need not exceed $0.5*\Delta RT_{NDT}$ for either base metals or welds, with or without surveillance data.

(d) The credibility evaluation for the CPNPP Unit 1 surveillance data determined that the CPNPP Unit 1 surveillance data for the Lower Shell Plate R-1108-2 and weld Heat # 88112 materials are deemed credible.

Table 4.2.4-2 Calculation of the CPNPP Unit 1 ART Values at the 3/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)										
Material	RG 1.99, Rev. 2 Position	CF[(a)]	3/4T Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)	3/4T FF[(b)]	$RT_{NDT(U)}$ (°F)	Predicted ΔRT_{NDT} (°F)	σ_I (°F)	σ_Δ[(c)] (°F)	M (°F)	ART (°F)
Beltline										
Intermediate Shell Plate R-1107-1	1.1	44.0	0.759	0.923	10	40.6	0	17.0	34.0	84.6
Intermediate Shell Plate R-1107-2	1.1	44.0	0.759	0.923	-10	40.6	0	17.0	34.0	64.6
Intermediate Shell Plate R-1107-3	1.1	37.0	0.759	0.923	10	34.1	0	17.0	34.0	78.1
Lower Shell Plate R-1108-1	1.1	51.0	0.757	0.922	0	47.0	0	17.0	34.0	81.0
Lower Shell Plate R-1108-2	1.1	37.0	0.757	0.922	20	34.1	0	17.0	34.0	88.1
with **credible** surveillance data[(d)]	2.1	24.4	0.757	0.922	20	22.5	0	8.5	17.0	59.5
Lower Shell Plate R-1108-3	1.1	51.0	0.757	0.922	0	47.0	0	17.0	34.0	81.0
Beltline Region Weld Metal (Heat # 88112)	1.1	46.0	0.757	0.922	-70	42.4	0	21.2	42.4	14.8
with **credible** surveillance data[(d)]	2.1	17.2	0.757	0.922	-70	15.9	0	7.9	15.9	-38.3
Extended Beltline										
Upper Shell Plate R-1104-1	1.1	44.0	0.0107	0.115	40	5.0	0	2.5	5.0	50.1
Upper Shell Plate R-1104-2	1.1	51.0	0.0107	0.115	40	5.8	0	2.9	5.8	51.7
Upper Shell Plate R-1104-3	1.1	31.0	0.0107	0.115	10	3.5	0	1.8	3.5	17.1
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 90149)	1.1	27.8	0.0122	0.126	-60	3.5	0	1.7	3.5	-53.0
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 4P6052)	1.1	30.7	0.0122	0.126	-50	3.9	0	1.9	3.9	-42.3
with **credible** surveillance data[(d)]	2.1	20.3	0.0122	0.126	-50	2.6	0	1.3	2.6	-44.9

Table 4.2.4-2 Calculation of the CPNPP Unit 1 ART Values at the 3/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1) using the Cu and Ni weight percent values in Table 4.2.2-1.

(b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches).

(c) Per the guidance of RG 1.99, Revision 2, the base metal σ_{Δ} = 17°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the base metal σ_{Δ} = 8.5°F for Position 2.1 with credible surveillance data. Also, per RG 1.99, Revision 2, the weld metal σ_{Δ} = 28°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the weld metal σ_{Δ} = 14°F for Position 2.1 with credible surveillance data. However, σ_{Δ} need not exceed $0.5*\Delta RT_{NDT}$ for either base metals or welds, with or without surveillance data.

(d) The credibility evaluation for the CPNPP Unit 1 surveillance data determined that the CPNPP Unit 1 surveillance data for the Lower Shell Plate R-1108-2 and weld Heat # 88112 materials are deemed credible.

Table 4.2.4-3 Calculation of the CPNPP Unit 2 ART Values at the 1/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)										
Material	**RG 1.99, Rev. 2 Position**	**CF[(a)]**	**1/4T Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**1/4T FF[(b)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_I (°F)**	**σ_Δ[(c)] (°F)**	**M (°F)**	**ART (°F)**
Beltline										
Intermediate Shell Plate R-3807-1	1.1	37.0	2.01	1.190	-20	44.0	0	17.0	34.0	58.0
Intermediate Shell Plate R-3807-2	1.1	37.0	2.01	1.190	10	44.0	0	17.0	34.0	88.0
with **non-credible** surveillance data[(e)]	2.1	29.0	2.01	1.190	10	34.5	0	17.0	34.0	78.5
Intermediate Shell Plate R-3807-3	1.1	31.0	2.01	1.190	-20	36.9	0	17.0	34.0	50.9
Lower Shell Plate R-3816-1	1.1	31.0	1.95	1.183	-30	36.7	0	17.0	34.0	40.7
Lower Shell Plate R-3816-2	1.1	20.0	1.95	1.183	0	23.7	0	11.8	23.7	47.3
Lower Shell Plate R-3816-3	1.1	26.0	1.95	1.183	-40	30.8	0	15.4	30.8	21.5
Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)	1.1	31.5	1.87	1.172	-50	36.9	0	18.5	36.9	23.8
with **credible** surveillance data[(d)]	2.1	48.9	1.87	1.172	-50	57.3	0	14.0	28.0	35.3
Intermediate to Lower Shell Girth Weld (Heat # 89833)	1.1	31.5	1.95	1.183	-60	37.3	0	18.6	37.3	14.5
with **credible** surveillance data[(d)]	2.1	48.9	1.95	1.183	-60	57.9	0	14.0	28.0	25.9
Extended Beltline										
Upper Shell Plate R-3806-1	1.1	31.0	0.0331	0.233	40	7.2	0	3.6	7.2	54.4
Upper Shell Plate R-3806-2	1.1	37.0	0.0331	0.233	10	8.6	0	4.3	8.6	27.2
Upper Shell Plate R-3806-3	1.1	37.0	0.0331	0.233	40	8.6	0	4.3	8.6	57.2
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 3P7317)	1.1	41.2	0.0388	0.255	-80	10.5	0	5.2	10.5	-59.0
with **credible** surveillance data[(d)]	2.1	3.3	0.0388	0.255	-80	0.8	0	0.4	0.8	-78.3
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 89827)	1.1	60.7	0.0388	0.255	-80	15.5	0	7.7	15.5	-49.1

Table 4.2.4-3 Calculation of the CPNPP Unit 2 ART Values at the 1/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1) using the Cu and Ni weight percent values in Table 4.2.2-2.

(b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches).

(c) Per the guidance of RG 1.99, Revision 2, the base metal σ_Δ = 17°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the base metal σ_Δ = 8.5°F for Position 2.1 with credible surveillance data. Also, per RG 1.99, Revision 2, the weld metal σ_Δ = 28°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the weld metal σ_Δ = 14°F for Position 2.1 with credible surveillance data. However, σ_Δ need not exceed $0.5*\Delta RT_{NDT}$ for either base metals or welds, with or without surveillance data.

(d) The credibility evaluation for the CPNPP Unit 2 surveillance data determined that the CPNPP Unit 2 surveillance data for the Intermediate Shell Plate R-3807-2 are deemed non-credible, while the surveillance data for weld Heat # 89833 are deemed credible.

Table 4.2.4-4 Calculation of the CPNPP Unit 2 ART Values at the 3/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)										
Material	**RG 1.99, Rev. 2 Position**	**CF[(a)]**	**3/4T Fluence[(b)] (x 10^{19} n/cm^2, E > 1.0 MeV)**	**3/4T FF[(b)]**	**$RT_{NDT(U)}$ (°F)**	**Predicted ΔRT_{NDT} (°F)**	**σ_I (°F)**	**σ_Δ[(c)] (°F)**	**M (°F)**	**ART (°F)**
Beltline										
Intermediate Shell Plate R-3807-1	1.1	37.0	0.713	0.905	-20	33.5	0	16.7	33.5	47.0
Intermediate Shell Plate R-3807-2	1.1	37.0	0.713	0.905	10	33.5	0	16.7	33.5	77.0
with **non-credible** surveillance data[(e)]	2.1	29.0	0.713	0.905	10	26.2	0	13.1	26.2	62.5
Intermediate Shell Plate R-3807-3	1.1	31.0	0.713	0.905	-20	28.1	0	14.0	28.1	36.1
Lower Shell Plate R-3816-1	1.1	31.0	0.694	0.897	-30	27.8	0	13.9	27.8	25.6
Lower Shell Plate R-3816-2	1.1	20.0	0.694	0.897	0	17.9	0	9.0	17.9	35.9
Lower Shell Plate R-3816-3	1.1	26.0	0.694	0.897	-40	23.3	0	11.7	23.3	6.7
Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)	1.1	31.5	0.664	0.885	-50	27.9	0	13.9	27.9	5.8
with **credible** surveillance data[(d)]	2.1	48.9	0.664	0.885	-50	43.3	0	14.0	28.0	21.3
Intermediate to Lower Shell Girth Weld (Heat # 89833)	1.1	31.5	0.694	0.897	-60	28.3	0	14.1	28.3	-3.5
with **credible** surveillance data[(d)]	2.1	48.9	0.694	0.897	-60	43.9	0	14.0	28.0	11.9
Extended Beltline										
Upper Shell Plate R-3806-1	1.1	31.0	0.0118	0.122	40	3.8	0	1.9	3.8	47.6
Upper Shell Plate R-3806-2	1.1	37.0	0.0118	0.122	10	4.5	0	2.3	4.5	19.0
Upper Shell Plate R-3806-3	1.1	37.0	0.0118	0.122	40	4.5	0	2.3	4.5	49.0
Upper Shell to Inter. Shell Girth Weld Seam 103-121 (Heat # 3P7317)	1.1	41.2	0.0138	0.136	-80	5.6	0	2.8	5.6	-68.8
with **credible** surveillance data[(d)]	2.1	3.3	0.0138	0.136	-80	0.4	0	0.2	0.4	-79.1
Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 89827)	1.1	60.7	0.0138	0.136	-80	8.2	0	4.1	8.2	-63.5

Table 4.2.4-4 Calculation of the CPNPP Unit 2 ART Values at the 3/4T Location for the Reactor Vessel Beltline and Extended Beltline Materials at EOLE (56 EFPY)

Notes:

(a) All values are based on Tables 1 and 2 of RG 1.99, Revision 2 (Position 1.1) using the Cu and Ni weight percent values in Table 4.2.2-2.

(b) The 1/4T and 3/4T fluence values were calculated from the surface fluence, the reactor vessel beltline thickness (8.63 inches) and equation $f = f_{surf} * e^{-0.24(x)}$ from RG 1.99, Revision 2, where x = the depth into the vessel wall (inches).

(c) Per the guidance of RG 1.99, Revision 2, the base metal σ_Δ = 17°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the base metal σ_Δ = 8.5°F for Position 2.1 with credible surveillance data. Also, per RG 1.99, Revision 2, the weld metal σ_Δ = 28°F for Position 1.1 and Position 2.1 with non-credible surveillance data, and the weld metal σ_Δ = 14°F for Position 2.1 with credible surveillance data. However, σ_Δ need not exceed $0.5*\Delta RT_{NDT}$ for either base metals or welds, with or without surveillance data.

(d) The credibility evaluation for the CPNPP Unit 2 surveillance data determined that the CPNPP Unit 2 surveillance data for the Intermediate Shell Plate R-3807-2 are deemed non-credible, while the surveillance data for weld Heat # 89833 are deemed credible.

4.2.5. Pressure Temperature Limits including Low Temperature Over Pressure Protection Analysis

TLAA Description

10 CFR 50 Appendix G requires that the RPV be maintained within established P-T limits, including heatup and cooldown operations. These limits specify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel is exposed to increased neutron irradiation, its fracture toughness is reduced. The P-T limits must account for the anticipated reactor vessel fluence.

The current P-T limits considered the amount of power to be generated over 40 years of plant operation. The projections were based on the current reactor power level of 3612 MWt and the assumption that the core power distributions and associated plant operating characteristics from the current operating cycle at the time of the analysis were representative of future plant operation. Since the projections were originally based upon a 40-year assumption regarding capacity factor, the P-T limits satisfy the criteria of 10 CFR 54.3(a) and have been identified as a TLAA.

TLAA Evaluation

In accordance with NUREG-1800, Revision 2, Section 4.2.2.1.3, the P-T limits for the PEO need not be submitted as part of the LRA since the P-T limits are required to be updated through the 10 CFR 50.90 licensing process when necessary for P-T limits that are located in the TSs. The 10 CFR 50.90 process will ensure that the P-T limits for the PEO will be updated prior to expiration of the P-T limits for the current period of operation. It further states that those plants that have approved PTLRs, the P-T limits for the PEO will be updated at the appropriate time through the plant's Administrative Section of the TSs and the plant's PTLR process. In either case, the 10 CFR 50.90 or the PTLR processes, which constitute the CLB, will ensure that the P-T limits for the PEO will be updated prior to expiration of the P-T limits for the current period of operation.

The CPNPP Units 1 and 2 heatup and cooldown P-T limit curves were generated using the "axial flaw" methodology of 1998 ASME Code, Section XI through the 2000 Addenda, which allows the use of the K_{Ic} methodology. The heatup and cooldown curves were generated using the most limiting ART values (i.e., highest value at 1/4t and 3/4t locations). Specifically, the material with the highest ART was the Unit 1 Intermediate Shell Plate R-1107-1. Unit 1 Lower Shell Plate R-1108-2 has higher ART values; however, the availability of credible surveillance data allows the results calculated with Position 1.1 to be superseded by the results calculated with Position 2.1. The bounding values from Unit 1 are used in generation of the CPNPP Units 1 and 2 reactor vessel P-T limit curves. The P-T limit curves were generated for 36 EFPY using heatup rates of 20, 60 and 100°F/hr and cooldown rates of 0, 20, 40, 60 and 100°F/hr.

An evaluation was performed to validate that the current low temperature overprotection system (LTOPS) analyses remain valid to at least 36 EFPY and reconcile any changes to the applicability term. The current LTOPS analysis was performed using NRC-approved methodology in WCAP-14040-A to develop the LTOPS pressurizer PORV setpoint and other operational requirements necessary to protect the steady-state isothermal P-T limits. The evaluation determined that there have been no changes to the key input parameters used in the analysis.

Therefore, the current LTOPS requirements remain valid to at least 36 EFPY. Specifically, the maximum allowable LTOPS pressurizer PORV setpoints specified in the PTLR remain valid with no limitation on RCP operation. The LTOPS enable temperature of 350°F also remains valid since it is bounding of the enable temperature determined based on an ART value considering operation through 36 EFPY. The LTOP requirements will need to be updated when new P-T curves are generated through the end of EOLE and/or if plant changes are made that affect the LTOPS transients or mitigation capabilities.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) of the reactor vessels will be adequately managed for the PEO. The Reactor Vessel Surveillance AMP described in B.2.3.18 will ensure that updated P-T limits based upon updated ART values will be submitted to the NRC for approval prior to exceeding the current terms of applicability of CPNPP Units 1 and 2.

4.3. METAL FATIGUE

Metal fatigue was evaluated in the design process for CPNPP Units 1 and 2, including the reactor vessel, RCPs, steam generators, pressurizer, CRDMs, piping and valves and components of primary and auxiliary systems. The current design analyses for these components are based on anticipated cycles associated with 40-year design transients and have been determined to be TLAAs requiring evaluation for the PEO. Fatigue TLAAs for CPNPP Units 1 and 2 are characterized by determining the applicable design code and design specifications that specify the fatigue design requirements. Fatigue analyses are required for components designed to ASME, Section III, Class 1. In addition, certain other codes such as ASME Section III, Class 2 and 3, and ANSI B31.1 may require a fatigue analysis or assume a stated number of full-range thermal and displacement cycles. NUREG-1801 provides a listing of components that are likely to have TLAAs in place that require evaluation for LR. Each of these has been reviewed and the applicable TLAAs are evaluated in the following sections, as appropriate.

4.3.1. Transient Cycle Projections for 60 Years

TLAA Description

ASME Section III, Class 1, 2, and 3 fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients described in the design specifications for 40-year plant operation. These analyses include the Class 2 heat exchanger and Class 1, 2, and 3 valve transients. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature, pressure, and flow. Since the fatigue analyses and exemptions from fatigue analysis are based upon a number of cycles postulated to bound 40 years of service, projection of the transients' cycles through the PEO is required as an input to demonstrate that the analyses and exemptions remain valid.

TLAA Evaluation

Cycle projections are necessary to:

- Demonstrate that the cycles associated with 40 years of design transients will not be exceeded in 60 years of projected plant operation,
- Demonstrate the applicability of existing TLAA evaluations based on the CLB cycles bounding the 60-year projected cycles, and
- Provide transient cycle inputs for any additional 60-year TLAA evaluations.

Various sources of plant data were used to determine the CPNPP 60-year transient cycle projections for the applicable transients. For those transients included in the plant cycle counting program (WESTEMS™), historic transient cycle occurrences are available from the program logs and were used to project cycles to 60 years. For those transients that are not in the cycle counting program, alternate sources of data must be used, such as historical plant data, operator interviews, plant LERs, plant procedures, and transient definitions.

Two main cycle projection methods were utilized to determine the 60-year cycle counts for each transient: full life rate (FLR) and improved operational performance rate (IOPR). The FLR method calculates the projected 60-year cycles based on an extrapolation of the cycle counts accumulated from the time of the start of the respective transient's monitoring period. If, for a particular transient, no cycle has occurred to date, then two additional cycles are assumed to occur during the remaining years of operation.

The IOPR method calculates the projected 60-year cycles based on cycle accumulation over the last 11.75 years of operation based on the assumption that recent plant operating history is generally a better predictor of future plant operation. The accumulation period is representative of future plant operation. Representative of future plant operations, 11.75 years was chosen for the transients in the cycle counting monitoring system (WESTEMS™) monitoring program due to the cycle counting reporting periods. Typically, review of plant operating records has found that plant operation improves over the life of the plant given the industry focus on aging management and operational improvement. Thus, projections calculated using the cycle counting program as an input provides a better prediction of future plant operations and, thus, a more realistic estimation of 60-year transients. If, for a particular transient, no cycles occurred over the last 11.75 years, then two additional cycles are assumed to occur during the remaining years of operation.

The final 60-year projected cycles represent the bounding (higher) result of the two methods. The time input parameters used for the transient cycle projections are shown in Table 4.3.1-1.

Additional transient projection methodologies were utilized as needed. For example, certain plant transients only occurred during component fabrication or pre-startup activities. These test transients will not be performed again in the PEO. Therefore, no additional cycles were projected for the PEO, and the CLB cycles for these test transients are still bounding.

All ASME Section III Class 1 transient cycles were projected to 60 years of operation using both projection methods. The projected 60-year cycles for all transients remain below the cycle limits except for the Unit 1 Letdown Flow Shutoff with Prompt Return to Service which is not projected to exceed the 40-year design limit of cycles until entering the PEO. Consequently, the resulting impact on these stress analyzed lines will be evaluated for the PEO.

The 60-year transient cycle projection methodology used for ASME Section III Class 2 and 3 piping is consistent with ASME Section III Class 1 piping. The piping lines designed to ASME Section III Class 2 and 3, and B31.1 extensions to these lines when applicable, within the scope of this application are the following:

- RCL Piping
- Auxiliary Piping Systems:
    - RHR
    - SI System Hot Leg
    - ECCS Injection (BIT)
    - Accumulator

- PZR Surge
- Loop Drain
- RCP Seal Water
- Normal Letdown with Drain
- Alternate Charging
- PZR Spray
- Normal Charging
- Excess Letdown with Drain
- PZR Safety and Relief

• Piping not associated with RCS or Auxiliary Systems

- Feed Water
- Main Steam
- Process Sampling
- Liquid Waste Processing
- Steam Generator Blowdown and Heater Drains
- Auxiliary Steam

The projected transient cycles presented in Table 4.3.1-4 show the more limiting projected cycles of the two methods for Units 1 and 2. The total 60-year projected cycles for these lines are the summation of the RCS transients and the line specific transient cycles. Each of the ASME Class 2 and 3 lines within the scope of this application remain bounded by the ASME Section III 7,000 cycle limit.

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The 40-year design transients bound the number of cycles projected to occur during 60 years of plant operations except for Unit 1 Letdown Flow Shutoff with Prompt Return to Service. They are to be used as inputs in the metal fatigue TLAA evaluations in the remainder of Section 4.3.

Additional evaluation of the critical locations defined in NUREG/CR-6260 (Reference 4.8.8) of the Unit 1 Letdown Flow Shutoff with Prompt Return to Service transient were evaluated for environmentally assisted fatigue (EAF) for 60 years of operation, which included the charging nozzles. This EAF screening evaluation is described in Subsection 4.3.4 and was performed to determine if any locations within the charging line are potentially more limiting than the charging nozzles. As a result of the screening evaluation, any locations that are potentially more limiting were also evaluated for EAF utilizing the 60-year cycles. The EAF analyses are projected to the end of the PEO and demonstrate that the CUF will remain below the ASME Code allowable of 1.0.

Table 4.3.1-1 60-year Transient Cycle Projection Input Parameters

Time Input Parameter	Unit 1	Unit 2
Beginning of Plant Operation [(a)]	3/20/1990	3/14/1993
Current Date [(b)]	12/31/2018	12/31/2018
11.75 Years Prior to Current Date	3/31/2007	3/31/2007
End of Plant Operation (60 Years)	3/20/2050	3/14/2053
11.75-Year Operation Period (Years)	11.75	11.75
Current Operating Life (Years)	28.8	25.8
Remaining Operating Life (Years)	31.2	34.2

Notes:

(a) The beginning of plant operation was defined as the date that the operating license was issued.

(b) The current date was defined as the end date for the last WESTEMS™ monitoring reports.

Table 4.3.1-2 CPNPP 60-Year Transients RCS Transient Events			
Transient	CPNPP Projected Cycles		CLB Cycles
	Unit 1	Unit 2	
Normal Condition RCS Transient Events			
Heatup <= 100 °F/hr	80	75	200
Cooldown <= 100 °F /hr	75	86	200
RCS Venting	164	160	320
Plant Loading between 0 and 15% of Full Power	2	2	500
Plant Unloading between 0 and 15% of Full Power	2	2	500
Loading at 5% of Full Power/Min	242	303	13200
Unloading at 5% of Full Power/Min	228	249	13200
Plant Loading from 15% to 100% Power	242	303	13200
Plant Unloading from 100% to 15% Power	228	249	13200
Step Load Increase of 10% of Full Power	2	2	2000
Step Load Decrease of 10% of Full Power	2	2	2000
RCP Startup and Shutdown	1200	1125	3000
Large Step Load Decrease with Steam Dump	9	10	200
Steady State Fluctuations – Initial[(a)]	N/A	N/A	1.5×10^5
Steady State Fluctuations – Random[(a)]	N/A	N/A	3×10^6
Feedwater Cycling / Hot Shutdown	5	8	2000
Loop Out of Service - Normal Loop Shutdown[(b)]	N/A	N/A	80
Loop Out of Service - Normal Loop Startup[(b)]	N/A	N/A	70
Boron Concentration Equalization	470	552	26400
Refueling	41	40	80
RV Stud Tensioning	54	53	57
Upset Condition RCS Transient Events			
Loss of Load	11	10	80
Loss of Power	9	12	40
Partial Loss of Flow	7	12	80
Reactor Trip from Full Power without Cooldown (Case A)	73	42	230
Reactor Trip from Full Power with Cooldown, No SI (Case B)	3	26	160
Reactor Trip from Full Power with Cooldown and SI (Case C)	5	2	10
Inadvertent RCS Depressurization	3	3	20
Inadvertent Startup of an Inactive Loop	7	7	10
Control Rod Drop	5	2	80
Inadvertent SI (Inadvertent ECCS Actuation)	7	10	60
Excessive Feedwater Flow	2	4	30
Excessive Bypass Feedwater Flow[(c)]	N/A	2	40
Bypass Line Tempering Valve[(c)]	N/A	2	20
Operational Basis Earthquake	2	2	200
RCS Cold Overpressurization	2	2	10

Table 4.3.1-2 CPNPP 60-Year Transients RCS Transient Events

Transient	CPNPP Projected Cycles		CLB Cycles
	Unit 1	Unit 2	
Test Condition RCS Transient Events			
Turbine Roll Test	2	2	20
Primary Side Hydrotest[d]	10	10	10
Secondary Side Hydrotest[d]	10	10	10
Primary Side Leak Test[d]	200	200	200
Secondary Side Leak Test[d]	80	80	80
Tube Leak Test	410	400	800
Accumulator Check Valve Test	22	20	43
Boron Injection Tank (BIT) Check Valve Test	10[d][e]	N/A	10
Emergency RCS Transient Events			
Small LOCA [d]	5	5	5
Small Steam Line Break[d]	5	5	5
Complete Loss of Flow[d]	5	5	5
Faulted RCS Transient Events			
Large LOCA[d]	1	1	1
RCP Locked Rotor[d]	1	1	1
Control Rod Ejection[d]	1	1	1
Large Steam Line Break[d]	1	1	1
Large Feedwater Line Break[d]	1	1	1
Steam Generator Tube Rupture[d]	1	1	1
Safe Shutdown Earthquake (SSE) [d]	1	1	1

Notes:

(a) This transient is insignificant to fatigue and was excluded from the 60-year projections.
(b) The CPNPP units are not licensed to operate with a loop shutdown. Therefore, no cycles of this transient have occurred, and none are projected.
(c) This transient is only applicable to Unit 2.
(d) Transients with no margin are test, emergency, or faulted condition transients for which 60-year projected values were not calculated, but instead the design value was applied to 60-years.
(e) This transient only applicable to Unit 1.

Table 4.3.1-3 CPNPP 60-year Transients Normal Condition Auxiliary System Transient Events			
Transient	CPNPP Projected Cycles		CLB Cycles
	Unit 1	Unit 2	
Accumulator Inadvertent Depressurization	3	3	20
Accumulator Line Refueling	41	40	80
Accumulator Line High Head SI	31	31	89
RHR Pump Suction Line Transient	75	86	200
Inadvertent Accumulator Blowdown	2	2	4
Post LOCA Operation	1	1	1
RHR Operation Plant Cooldown	75	86	200
BIT High Head Safety Injection (HHSI)	35	35	110
Inadvertent Auxiliary Spray Increase and Decrease	2	2	10
Step Decrease from 130°F to 75°F	40	41	180
Loss of Seal Injection Flow	14	17	40
Elevated Seal Water Injection Temperature	75	86	200
Charging and Letdown Flow Shutoff and Return to Service	2	2	60
Letdown Flow Shutoff with Prompt Return to Service	233	191	200
Letdown Flow Shutoff with Delayed Return to Service	2	2	20
Charging Flow Shutoff with Prompt Return to Service	2	2	20
Charging Flow Shutoff with Delayed Return to Service	7	6	20
Charging Flow Step Decrease and Return to Normal	4373	4477	24000
Charging Flow Step Increase and Return to Normal	578	540	24000
Letdown Flow Step Decrease and Return to Normal	137	127	2000
Letdown Flow Step Increase and Return to Normal	234	207	24000
Charging / Letdown Cooldown	75	86	200
Charging / Letdown Heatup	80	75	200
Excess Letdown Flow Increase with Delayed Return to Service	14	13	100
Operation of Pressurizer (PZR) Safety Valve	14	13	40
Operation of PZR Relief Valve	53	59	100

Table 4.3.1-4 CPNPP 60-year Projected Transient Cycles For Auxiliary System Transients and Applicable Components			
Transient	CPNPP Projected Cycles		ASME Section III Class 2 and 3 Cycle Limit
	Unit 1	Unit 2	
RHR Hot Leg Loops 1 and 4	4001	4167	7000
ECCS/BIT Cold Legs 1, 2, 3, and 4 Transients	3961	4116	7000
Accumulator Cold Legs 1, 2, 3, and 4, SI/RHR Return, and SIS Connection to Accumulator Transients	3959	4114	7000
RCP Seal Water Injection Line	4055	4225	7000
Normal and Alternate Charging and Letdown Branch Line Transients	4228	4341	7000
Normal Letdown and Excess Letdown Branch Line Transients	3940	4094	7000
Pressurizer Auxiliary Spray Line Transients	3928	4083	7000
Pressurizer Safety and Relief Valve Inlet Line Transients	3993	4153	7000
Feed Water Piping Transients	897	676	7000
Main Steam Line – Piping Upstream of MISVs Transients	3926	4081	7000
Main Steam Line – Piping Downstream of MSIVs Transients	477	271	7000
Main Steam Line – Admitted for Operation of the Turbine Drive Auxiliary Feed Water Pump Transients	3225	4759	7000
Process Sampling – Hot Leg Isolation Transients	4756	3890	7000
Process Sampling – Pressurizer Liquid Sample Isolation Transients	5183	5195	7000
Liquid Waste Processing Transients	710	690	7000
Steam Generator Blowdown and Heater Drains Transients	5613	5635	7000
Auxiliary Steam Transients	2947	2863	7000

4.3.2. ASME Section III, Class 1 Fatigue Analysis of Piping, Piping Components, and Equipment

TLAA Description

The CPNPP RCPB piping, piping components, equipment, and auxiliary lines were designed in accordance with ASME Section III, Class 1 requirements. Fatigue analyses were prepared to determine the effects of cyclic loadings resulting from changes in system temperature, pressure, and seismic loading cycles. The evaluations included the following equipment:

- Reactor Vessel
- CRDMs
- Pressurizer
- Steam Generator
- RCPs
- Heat Exchangers
- Valves

These ASME Section III, Class 1 fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients and seismic loadings described in the design specifications. If equipment or components conform to the waiver of fatigue requirements of ASME Section III, a detailed fatigue evaluation is not required. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature, pressure, and flow. The fatigue analyses were required to demonstrate that the CUF will not exceed the design allowable limit of 1.0 when the equipment is exposed to all postulated transients. Since the calculation of fatigue usage factors is part of the CLB and is used to support safety determinations and the number of occurrences of each transient type was based upon 40-year assumptions, these Class 1 fatigue analyses have been identified as TLAAs requiring evaluation for the PEO.

TLAA Evaluation

The CPNPP ASME Section III equipment, piping, and components have fatigue monitoring analyses that are based on the transient cycles listed in design specifications, as shown in Table 4.3.1-1, 4.3.1-2, and 4.3.1-3. As demonstrated in Section 4.3.1, the 40-year transient cycle numbers and severity remain bounding for 60 years of plant operation, except for Unit 1 Letdown Flow Shutoff with Prompt Return to Service which is not projected to exceed the 40-year design limit of cycles until entering the PEO. The Unit 1 Letdown Flow Shutoff with Prompt Return to Service limiting components were evaluated for EAF for 60 years of operation, which includes the charging nozzles. As a result of the screening evaluation, any locations that are potentially more limiting were also evaluated for EAF utilizing the 60-year cycles. The EAF analyses are projected to the end of the PEO and demonstrate that the CUF will remain below the ASME Code allowable of 1.0. Therefore, the fatigue analyses for CPNPP Units 1 and 2 vessels, piping, and components remain valid for the PEO. The RCPs conform to the waiver of fatigue requirements of ASME Code, Section III and therefore do not require a detailed fatigue evaluation. The projected transient cycles associated with the RCP waiver of fatigue are bounded by the CLB cycles for each transient and therefore the waiver remains valid through the PEO.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – The Fatigue Monitoring (B.2.2.1) Program will be used to monitor transient cycles and ensure the numbers of transients analyzed in the ASME Section III Class 1 fatigue analyses will not be exceeded during the PEO.

4.3.3. ASME Section III, Class 2 and 3 Allowable Stress Analyses

TLAA Description

Piping designed in accordance with ASME Section III Class 2 and 3 and ANSI B31.1 design rules is not required to have an explicit analysis of cumulative fatigue usage, but cyclic loading is considered in a simplified manner in the design process. These codes first require prediction of the overall number of full thermal range transient cycles expected during the lifetime of these components. Then a stress range reduction factor is determined for that number of cycles using a table from the applicable design code. If the total number of cycles is 7,000 or less, the stress range reduction factor of 1.0 is applied that would not reduce the allowable stress value. For high numbers of cycles, a stress range reduction factor of less than 1.0 is applied that limits the allowable stresses applied to the piping, which reduces the likelihood of failure due to cyclic loading.

TLAA Evaluation

A set of transients and cycles applicable to the RCL piping, the auxiliary piping, and other lines not associated with the RCS or auxiliary systems were developed for the purposes of validating the 7,000-cycle limit were developed based on the fatigue analyses of record for the piping lines to demonstrate that the applicable cycles for 60 years of operation for CPNPP Class 2 and 3 and B31.1 piping remain below the 7,000 cycle limit.

The total RCS projected cycles were conservatively obtained from the summation of the normal, upset, and test condition transient projected cycles for each unit. Portions of each system under investigation are subject to the RCS transients as well as the auxiliary transients. Therefore, the total projected 60-year cycles from both RCS and auxiliary transients are compared to the ASME Section III allowable of 7,000 cycles for each system.

The total 60-year projected cycles for these lines is the summation of the RCS transients and the line specific transient cycles.

For CPNPP Unit 1, the RCS total 60-year projected transients are: 3926.

For CPNPP Unit 2, the RCS total 60-year projected transients are: 4081.

Each of the ASME Class 2 and 3 lines within the scope of this application remain bounded by the ASME Section III 7,000 cycle limit. Therefore, the maximum allowable stress range values for the existing fatigue analyses remain valid because the allowable limit for the number of thermal range transient cycles will not be exceeded during the PEO.

Table 4.3.1-4 shows that each of the ASME Class 2 and 3 auxiliary lines within the scope of this application remain bounded by the ASME Section III 7,000 cycle limit. Therefore, the maximum allowable stress range values for the existing fatigue analyses remain valid because the allowable limit for the number of full thermal range transient cycles will not be exceeded during the PEO.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – The Fatigue Monitoring (B.2.2.1) Program will be used to monitor transient cycles and ensure the numbers of transients analyzed in the ASME Section III Class 2 and 3 lines within the scope of this application remain valid for the PEO.

4.3.4. Environmentally Assisted Fatigue

TLAA Description

Although not part of the CLB, NUREG-1800, Revision 2 provides a recommendation for evaluating the effects of the reactor water environment on the fatigue life of ASME Section III Class 1 pressure boundary components that contact reactor coolant. One method acceptable to the NRC for satisfying this recommendation is to assess the impact of the reactor coolant environment on a sample of critical components. These critical components should include those selected in NUREG/CR-6260. The components that are applicable to CPNPP Units 1 and 2 are the ones listed for a newer vintage Westinghouse plant. CPNPP added additional component locations if they were considered to be more limiting than those considered in NUREG/CR-6260.

NUREG-1801, Revision 2, contains recommendations on specific areas for which existing programs should be augmented for LR. The program description of AMP X.M1, Fatigue Monitoring, provides guidance for addressing environmental fatigue for LR. It states that an acceptable program addresses the effects of the reactor coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant. Examples of these components are identified in NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components”.

For CPNPP Units 1 and 2, the evaluation methodology included identifying the plant-specific components to be evaluated, calculating ASME fatigue usage factors, and calculating and applying the environmental correction factors (F_{en}) penalties to obtain the updated fatigue results. Since CPNPP piping was designed to ASME Section III, fatigue usage factors for the piping systems are available. To identify the CPNPP specific piping components to be evaluated for environment fatigue, a review of the fatigue calculations for each piping system were reviewed to determine the limiting component locations with respect to the ASME usage factors, considering reactor water environmental effects.

For the component locations identified, 60-year fatigue calculations were performed. Applicable F_{en} multipliers for the selected locations were determined in accordance with NUREG/CR-6909 Revision 1 (Reference 4.8.9) to obtain an adjusted cumulative fatigue usage (CUF_{en}) including the effects of reactor water environment since it is the latest endorsed publication of F_{en} penalty factors and related fatigue curves in the industry for the required materials and presents a revised F_{en} method based on additional data evaluation following publication of NUREG/CR-6583 and NUREG/CR-5704.

NUREG/CR-6260 identifies six sample locations for newer vintage Westinghouse plants which need to consider the effects of reactor coolant environment on component fatigue life for LR:

- Reactor Vessel Shell and Lower Head
- Reactor Vessel Inlet and Outlet Nozzles
- Reactor Coolant System Pressurizer Surge Line
- Reactor Coolant System Charging Nozzle
- Reactor Coolant System Safety Injection Nozzle
- Reactor Coolant System RHRS Class 1 Piping

TLAA Evaluation

Screening for Limiting Locations for Environmentally Assisted Fatigue

To ensure that the limiting plant-specific EAF locations have been identified, a screening evaluation for limiting locations susceptible to EAF was performed. The screening evaluation was for Safety Class 1 RCPB components in major equipment and piping that meet the six criteria for TLAAs in 10 CFR 54.3(a), including the locations listed in NUREG/CR-6260. The screening evaluation uses NUREG/CR-6909 Revision 1 to calculate CUF_{en} to establish a list of sentinel locations that have the highest potential susceptibility to the effects of the reactor water environment. These sentinel locations supplement those identified in NUREG/CR-6260, to be addressed through separate aging management plans, such as EAF evaluations or inspections supported by fracture mechanics evaluations to determine inspection intervals for the locations where the EAF CUF values could not be less than 1.0, as applicable. Specifically, the following Safety Class 1 equipment and piping components were considered in the EAF screening evaluation:

- Equipment Components:
    - RV
    - CRDMs
    - PZR
    - RCPs
    - SGs
- Piping Lines:
    - RCL Piping
    - Auxiliary Piping Systems:
    - RHR
    - SIS Hot Leg
    - BIT/ ECCS Injection
    - Accumulator

- PZR Surge
- Loop Drain
- RCP Seal Water
- Normal Letdown with Drain
- Alternate Charging
- PZR Spray
- Normal Charging
- Excess Letdown with Drain
- PZR Safety and Relief

In order to perform the EAF screening process, all the Safety Class 1 RCPB piping and equipment components in scope that are susceptible to EAF must be reviewed and categorized into transient sections for the purpose of identifying sentinel locations for EAF consideration. These sentinel locations are meant to supplement the locations identified in NUREG/CR-6260. The EAF screening approach utilizes extensive design and analysis information and experience to consistently compare plant component locations without performing new analyses or extensive calculations in the screening process. The method is supported by comprehensive definitions of regions exposed to similar transients, referred to as transient sections.

The transient sections definition provides a framework to compare locations based on relative effects of the reactor water environment using F_{en} screening assignments. It further supports comparison of fatigue values based on a ranking system for the complexity of the analysis relative to the other locations. This stress basis comparison ranking system provides a consistent characterization of the level of conservatism in the fatigue analysis, which can be used to differentiate between, for example, a simple analysis with a large CUF value and a complex analysis with a moderate CUF value. Using the combined levels of F_{en} and stress basis comparison ranking, the comparison and selection process identifies potential sentinel locations, first within transient sections, then between transient sections in a system, and ultimately between systems, to define the number of EAF locations for consideration.

A transient section is defined as a group of sub-components/locations that experience the same transients (i.e., thermal, and related loadings). The concept of transient sections is typically used in design fatigue evaluations of system components for efficiency of application and is also effective for the screening process. In addition, the transient sections are developed based on knowledge of the system functions in relations to plant transients, system layouts and flow paths, and/or equipment configurations to further integrate the fatigue results with the current industry guidance. Components that reside in the same transient section can be first compared with each other to determine the most limiting component (or sentinel location). For locations within a given transient section evaluated with common stress analysis methods, the differences in stresses experienced by each component are generally the result of the material and geometry differences and can be quantified. A typical piping system or major equipment will be divided into several transient sections. Often, it is the section transients themselves that control which components have the highest usage factors in a given system. So, within a particular system, those transient sections with the most severe system transients will usually have components with the highest usage factors.

Determination of Sentinel Locations

The process elements of the screening method used to determine the list of sentinel locations are as follows:

1. **Data Collection**: Pertinent inputs, including information on the applicable locations identified in NUREG/CR-6260, were collected. This includes the materials, drawings, and CLB fatigue evaluations if they exist. Any location that was not part of the Class 1 RCPB was removed from consideration. If the results of this task indicate design differences between comparable components within a unit, the information pertaining to the design differences is evaluated for consideration in the comparisons and then consolidated as part of Step 4. Locations are also excluded during this step based on the following criteria:

    a. Not in contact with primary coolant.

    b. Locations excluded from fatigue usage factor calculation based on fatigue waivers from ASME B&PV Code, Section III, Division I, Subsection NB.

    c. Locations with a CUF of 0.000.

2. **Transient Section Definition**: The transient sections for all applicable piping systems and equipment included in the screening evaluation were determined. Components within transient sections were evaluated initially as a group before they were compared against other components within the same system or equipment. The transient sections were developed based on knowledge of the system function in relation to plant transients, system layouts and flow paths, and/or equipment configurations. This is typically determined from the fatigue analysis of record (AOR), since common transient local effects required for the analysis are defined for various groups of components.

3. **Screening Environmental Fatigue Multiplier Calculation**: The fatigue information collected in Step 1 is combined with the transient section definitions established in Step 2 to determine a screening CUF_{en} value for each location susceptible to the effects of the light water reactor environment. The result of this step is an initial list of leading locations that will be further examined in the subsequent steps to determine the plant-specific list of sentinel locations. The method for calculating fatigue multiplier is as follows:

    a. Organize the locations susceptible to EAF identified in Step 1 into the transient sections defined in Step 2.

    b. Adjust the CUF values by any applicable factors to correct for differences between the fatigue curves used in the source fatigue evaluation (e.g., Section III Appendix I of the ASME Code) and the fatigue curves applicable to the industry document used to determine the screening F_{en}, as required. This factor is represented by F_{adj} and the result of this calculation is CUF_{adj}. The impact of the

NUREG/CR-6909 fatigue curves on the component CUF values were considered per the guidance in RG 1.207 (Reference 4.8.10). Since the AORs were performed to earlier ASME Code editions, an adjustment factor was applied in the calculation of the CUF_{en} to account for the differences between the AOR fatigue curves and NUREG/CR-6909 fatigue curves, when necessary.

c. Apply the maximum F_{en} of all materials to all components corresponding to the F_{en} formulas from the applicable industry EAF document. If the screening CUF_{en} is less than unity, the location can be removed from the potential sentinel location list.

d. For the remaining potential sentinel locations, determine the maximum F_{en} and F_{adj} for each component based on actual material. These material specific F_{en} and F_{adj} values are used to determine a screening CUF_{en} for each component (designated material F_{en}, F_{adj}, and CUF_{en}). Perform this calculation following the F_{en} formulas and design fatigue curves outlined in the appropriate industry EAF document for the application. If the CUF_{en} is less than unity the location can be removed from the list of potential sentinel locations. Retain at least one location per transient section, for example a CUF_{en} close to 1.0 if none exceeds 1.0, for completeness at this stage. Further treatment of these locations is addressed in Step 4a.

e. As applicable, calculate reduced screening F_{en} factors for each component in each transient section simply based on the maximum temperature experienced in the section, in an effort to reduce the screening CUF_{en} from Step 3d to a value below 1.0 (designated temperature F_{en} and CUF_{en}).

4. **Sentinel Location Identification**: Establish the stress basis comparison ranking for the detailed comparison between components and the corresponding down-selection of the leading locations for EAF. The result of this step is the plant-specific list of sentinel locations.

   a. Remove components with a material or temperature (Steps 3c through 3e) screening CUF_{en} of less than 1.0 from the potential sentinel location list. The screening CUF_{en} values for these locations are conservative based on the approach used to derive the screening F_{en} values. Therefore, a detailed evaluation would be expected to result in a lower CUF_{en} value, so further evaluations would not be required for locations with a screening CUF_{en} less than unity.

   b. Identify the locations with the maximum screening CUF_{en}, for each applicable material type, in each transient section.

   c. Determine the stress basis comparison ranking for each remaining component.

      i. Determine the level of technical rigor and qualification criteria for each component within the transient section.

ii. Qualitatively determine the most limiting components in each transient section, using a consistent stress analysis method ranking basis for comparison. This ranking is based on the amount of conservatism considered in the analysis. If the location of interest corresponds to a surface not in contact with primary coolant, the corresponding or next most limiting surface in contact with primary coolant must be considered in the stress basis comparisons. This removes from consideration potential high-CUF value locations which are not impacted by environmental effects. For example, a piping anchor may be excluded from the possible sentinel locations because it is not in contact with primary coolant and therefore not impacted by environmental effects.

iii. For each transient section, systematically compare each location to the maximum screening CUF_{en} location considering the stress basis comparison ranking. Remove locations with both a lower screening CUF_{en} and lower analysis rank, until the minimum number of locations is established. The goal is to identify one location in the transient section.

d. Compare sentinel components of different transient sections within common systems or equipment. This may require additional stress basis comparisons to determine one or two sentinel locations per system or equipment.

e. The list of potential sentinel locations can be further reduced without detailed analysis by removing conservatism from the fatigue AOR or further refinement of the F_{en} multiplication factors.

f. Compare candidate sentinel locations against any NUREG/CR-6260 locations within the system. Those components with a screening CUF_{en} less than the screening CUF_{en} for the NUREG/CR-6260 location are removed from the final set of sentinel locations. The final list of sentinel locations is included in the fatigue aging management plan for the plant (B.2.2.1).

Table 4.3.4-1 and Table 4.3.4-2 provide a summary of the sentinel locations for the CPNPP Units 1 and 2 Class 1 equipment and piping components.

Evaluation of Environmental Fatigue

NUREG/CR-6909 Revision 1 is used to calculate CUF_{en} for all applicable material types since it is the latest endorsed publication of F_{en} penalty factors and related fatigue curves in the industry for the required materials and presents a revised F_{en} method based on additional data evaluation following publication of NUREG/CR-6583 and NUREG/CR-5704. The detailed stress and fatigue analysis considered six stress components, as discussed in ASME Code, Section III, Subsection NB, Sub article NB-3200.

The EAF evaluations of the sentinel locations were categorized into two groups: 1) Simplified Evaluations, and 2) Detailed Evaluations. For the Group 1 evaluations, minor conservatisms in the AOR were removed through approaches such as stress algorithm refinement and the maximum F_{en} for a given material type, per Reference 4.8.9, is applied to the CUF. For the Group 2 evaluations, AOR conservatisms were removed through detailed evaluations, such as redefinition of transient time histories based on actual plant operations/operational data. In addition, Group 2 evaluations may use a more detailed F_{en} derivation, following the modified rate approach methodology outlined in Reference 4.8.9 along with detailed finite element modeling. For both groups of analyses, the fatigue evaluations used the design fatigue curves outlined in Reference 4.8.9 and the updated CUF values were then adjusted to account for environmental effects (CUF_{en}) by using F_{en} values derived using the equations in Reference 4.8.9.

Group 1 evaluations were performed for the sentinel locations identified in Table 4.3.4-1 by first reducing conservatism in the AOR CUF analyses. For this group, the conservatisms were reduced by implementing minor reductions in analysis conservatisms (i.e., use of more appropriate stress concentration factors, etc.) and implementing 60-year projected transient cycles described in Section 4.3.1.

For the Group 2 evaluations, the AOR CUF was reduced by implementing minor reductions in analysis conservatisms or implementing plant data to appropriately represent transients encountered during operation. In addition, detailed methods such as finite element modeling and the implementation of the modified rate approach are used to refine to both transient stresses and F_{en} values. Each of these evaluations accounts for environmental effects by using detailed methods to calculated F_{en} values, per Reference 4.8.9, and reports both an updated CUF as well as the corresponding CUF_{en}.

The EAF analyses for the sentinel locations were evaluated with the goal of demonstrating acceptable fatigue usage using the 40-year allowable design cycle limits. If a component could not be qualified with these design cycles, plant-specific cycle projections for the LR period were used to reduce conservatism for that component. All evaluations were done using transient cycle counts that envelop 60 years of plant operations. Though the 60-year projected cycles do exceed the 40-year allowable design cycles limits for the Unit 1 Letdown Flow Shutoff with Prompt Return to Service, the 40-year design limits are not projected to be exceed until after the start of the PEO as described in Section 4.3.1. The analysis incorporated the 60-year projected cycles for this transient to ensure the EAF analysis was applicable for the PEO. Conservatism was also removed from the design definition of this transient by establishing sub-transients that more accurately represent CPNPP operation for use in the applicable EAF evaluation.

There was sufficient margin in the AOR fatigue evaluations of the limiting locations of the reactor vessel to allow for a simplified EAF analysis (i.e., maximum F_{en} value multiplied by the AOR CUF) to be performed. Therefore, the results of individual transient analyses in the AOR for these locations are not included in this application.

The results of the EAF calculations are summarized in Table 4.3.4-1 and 4.3.4-2 for each sentinel location identified in NUREG/CR-6260. EAF analyses for the sentinel locations identified in addition to those identified in NUREG/CR-6260 will be performed as part of the Fatigue Monitoring AMP described in B.2.2.1. The Fatigue Monitoring AMP is also modified to monitor the environmental effects at the sentinel locations. The metal fatigue, and corresponding integrity, of SG tubes is managed as part of the Steam Generators AMP described in Section B.2.3.10. Therefore, the effects of EAF for the SG tubes are managed by the CPNPP SG Program.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – The Fatigue Monitoring (B.2.2.1) AMP will be used to manage the effects of aging due to fatigue by monitoring one or more relevant fatigue parameters, which include, but are not limited to, the CUF factors, the environmentally-adjusted (CUF_{en}), transient cycle limits, and the predicted flaw size (for a fatigue crack growth analysis), including EAF analyses for the plant-specific sentinel locations identified in addition to those identified in NUREG/CR-6260. The metal fatigue, and corresponding integrity, of SG tubes is managed as part of the CPNPP Steam Generators AMP described in B.2.3.10. The analytical effort will be completed prior to the PEO. The follow-up effort (Fatigue Monitoring for cycle count and/or Inspections), will be for the life of the plant.

Table 4.3.4-1: Summary of Equipment Sentinel Locations Requiring EAF Evaluations				
Line/System	**Component/Location**	**Material Category**	**CUF_{en}**	**Evaluation Group**
RV (Units 1 & 2)	CETNA Seal Carrier	Stainless Steel	N/A[b]	N/A[b]
	CRDM Housings (Unit 1)	Ni-Cr-Fe Alloy	N/A[b]	N/A[b]
	Bottom Mounted Instrumentation Tubes (Unit 2)	Ni-Cr-Fe Alloy	N/A[b]	N/A[b]
	Outlet Nozzle (Unit 2) [a]	Low Alloy Steel	0.965	1
	Inlet Nozzle (Unit 2) [a]	Low Alloy Steel	0.722	1
	Vessel Wall Transition [a]	Low Alloy Steel	0.138	1
	Bottom Head to Shell Juncture [a]	Low Alloy Steel	0.075	1
PZR Upper Head/Shell (Units 1 & 2)	Upper Head and Shell (Region F-F)	Low Alloy Steel	N/A[b]	N/A[b]
CRDM (Unit 1)	Lower Section (Lower Joint Canopy Weld)	Stainless Steel	N/A[b]	N/A[b]
CRDM (Unit 2)	Upper Joint Canopy	Stainless Steel	N/A[b]	N/A[b]
SG (Unit 1)	Tube (Section A-A)[c]	Ni-Cr-Fe Alloy	N/A[c]	N/A[c]
	Tube Plate/Lower Shell ASN 2	Low Alloy Steel	N/A[c]	N/A[c]
SG (Unit 2)	Tube (Section B-B)[c]	Ni-Cr-Fe Alloy	N/A[c]	N/A[c]
	Tube Sheet Center (Upper Surface)	Low Alloy Steel	N/A[c]	N/A[c]
	Tubesheet Primary Side Junction, Lower Shell Channel Head	Carbon Steel	N/A[c]	N/A[c]
RCP (Units 1 & 2)	Casing to Discharge Nozzle Interface	Stainless Steel	N/A[b]	N/A[b]

Notes:
(a) This location was identified as a limiting location based on the guidance in NUREG/CR-6260. In some cases, these locations have screened out with a screening CUF_{en} less than 1.0 but are provided here for completeness.
(b) This sentinel location is addressed through the Fatigue Monitoring (B.2.2.1) AMP.
(c) Metal fatigue, and corresponding integrity, of SG tubes is managed as part of the Steam Generators AMP (Section B.2.3.10).

Table 4.3.4-2: Summary of Piping Sentinel Locations Requiring EAF Evaluations

Line/System	Transient Section	Component/Location	Material Category	CUF_{en}	Evaluation Group
RCL	Hot Leg	RPV Outlet Nozzle Safe-End to Pipe Weld with MSIP[c]	Stainless Steel	N/A[b]	N/A[b]
BIT/ECCS	1	3” BIT/ECCS Injection Nozzle[a]	Stainless Steel	0.988	2
				0.947	
Accumulator/RHR	1	10” Accumulator Nozzle – Safe-End to Pipe Weld[a]	Stainless Steel	0.994	2
		10” Accumulator Nozzle – Crotch Region[a]		0.974	
PZR Surge	Horizontal Stratification Section	Hot Leg Surge Nozzle – Safe-End to Pipe Weld[a]	Stainless Steel	0.878	2
				0.741	
Drain	1	2” Socket Weld at Valve	Stainless Steel	N/A[b]	N/A[b]
Normal Letdown with Drain	2	3” Transition at Valve or 3” Butt-Weld at Valve	Stainless Steel	N/A[b]	N/A[b]
Normal/Alternate Charging	1	3” Normal/Alternate Charging Nozzle – Reinforcement[a]	Stainless Steel	0.801	2
				0.842	
		3” Transition (Unit 2)	Stainless Steel	N/A[b]	N/A[b]
PZR Spray	6	2” Socket Welded Joint	Stainless Steel	N/A[b]	N/A[b]
	7	4” Spray Nozzle	Stainless Steel	N/A[b]	N/A[b]
Excess Letdown with Drain	2	2” Butt-Welded Reducer	Stainless Steel	N/A[b]	N/A[b]
PZR Safety and Relief	10, 11	3” Valve Transition	Stainless Steel	N/A[b]	N/A[b]

Notes:

(a) This location was identified as a limiting location based on the guidance in NUREG/CR-6260. In some cases, these locations have screened out with a screening CUF_{en} less than 1.0 but are provided here for completeness.

(b) This sentinel location is addressed through the Fatigue Monitoring (B.2.2.1) AMP.

(c) Unit 2 MSIP was only implemented at two of the eight locations, however, the calculated CUF conservatively bounds the partial MSIP implementation at the remaining locations.

4.3.5. Reactor Vessel Internals Fatigue Analyses

TLAA Description

CPNPP Units 1 and 2 reactor internals were designed and built prior to the implementation of ASME Section III, Subsection NG. The structural integrity of the Units 1 and 2 reactor internals design has been ensured by analysis performed on both generic and plant-specific bases to meet the intent of the ASME Code. Using the RVI stress reports, CUFs less than 1.0 were determined for the maximum alternating stresses using the design transient cycles from each transient and the design ASME Code fatigue curve. Since the calculation of CUF is based on the number of occurrences of each transient type and 40-year assumptions, these analyses have been identified as TLAAs requiring evaluation for the PEO.

TLAA Evaluation

Westinghouse Report, WCAP-16840-NP, CPNPP Stretch Power Uprate (SPU) Licensing Report (Reference 4.8.11) includes the most recent fatigue evaluations in the CLB for the reactor internals components. The evaluation determined that the stretch power uprate did not affect the bounding CUFs. Therefore, no new CUFs were calculated for the SPU project.

The analyses performed for the RVI components are based upon the subset of the RCS design transients used in the fatigue analyses for the reactor vessel shown in Table 4.3.1-2.

As shown in Table 4.3.1-2, these transient cycle projections demonstrate these design transient cycles limits will not be exceeded for 60 years of operation. Therefore, the analyses will remain valid through the PEO and the cumulative usage factors (CUFs) will remain within the allowable limit of 1.0.

TLAA Disposition

Aging Management, 10 CFR 54.21 (c)(1)(iii) – The RVI analyses remain valid for the PEO. The Fatigue Monitoring (B.2.2.1) Program will monitor transient cycles and severities and require action prior to exceeding design limits that would invalidate these conclusions.

Flow-Induced Vibration in the Reactor Vessel Internals (Not a TLAA)

Analyses associated with flow-induced vibration of the RVI are not based on time-dependent assumptions to be considered a TLAA in accordance with 10 CFR 54.3(a) criterion 3. Flow-induced vibrations of PWR internals have been studied in the industry for a number of years. The objective of these studies is to show the structural integrity and reliability of reactor internal components. These efforts have included in-plant tests, scale-model tests, as well as tests in fabricators' shops and bench tests of components, and various analytical investigations. The results of these scale-model and in-plant tests indicate that the vibrational behavior of two-, three-, and four-loop plants is essentially similar, and the results obtained from each of the tests complement one another and allow a better understanding of the flow-induced vibration (FIV) phenomena. Based on the analysis performed for

CPNPP Units 1 and 2, reactor internals response due to FIV is extremely small and well within the allowable based on the high cycle endurance limit for the material.

The latest CPNPP Units 1 and 2 flow-induced vibration analysis concluded that the component stress ranges remained below the endurance limit of 10^{11} cycles on the applicable ASME fatigue curves. The endurance limit is the stress range below which the material will not experience fatigue failure. Since the stress ranges remain below the endurance limit, the number of these stress range cycles is not limited over the current operating life. Therefore, the analysis is not based on time-dependent assumptions defined by the current operating term and is not classified as a TLAA in accordance with 10 CFR 54.3(a) criterion 3.

4.3.6. High-Energy Line Break Analyses

TLAA Description

FSAR Subsection 3.6B.2, indicates that high-energy systems requiring analysis for the consequences of pipe break were identified based on the fluid in the pipe, the pressure, and the temperature during normal operation. The lines that were both high-temperature and high-pressure were postulated to experience a longitudinal or circumferential break, and were analyzed for pipe whip, jet impingement, and environmental effects. For these evaluations, the time limited portion of the analysis is related to the screening criterion of a CUF value 0.1, derived from the ASME Section III rules (i.e., NB-3222.4(e)). This screening criterion, as specified in Section 3.6B.2 of the FSAR, is used in part to determine the intermediate locations of postulated breaks within a given piping system for the HELB analyses. HELB analyses are based on a set of anticipated design transients and must be evaluated for the PEO; therefore, HELB analyses are considered TLAAs.

TLAA Evaluation

Existing TLAAs for the Class 1 piping locations were reviewed to compare the applicable transients and CLB cycles with the 60-year transient cycle projections in Section 4.3.1. The 60-year transient cycle projection methodology details used for each of the transients applicable to the Class 1 piping components under investigation was consistent with the methodology presented in Section 4.3.1.

The projected 60-year transient cycles are bounded by the 40-year design transients, except for the Unit 1 Letdown Flow Shutoff with Prompt Return to Service transient, which is applied to components in the letdown and charging lines. Based on a review of the applicable CUF values for the letdown and charging lines, the nozzle connecting the charging line to the RCS has the largest CUF value. For this location, the CUF value was re-evaluated and summarized by reducing conservatism in the fatigue analysis and applying 60-year projected cycles, including those for the letdown with prompt return transient. The results of this evaluation remain within the allowable CUF limit of 1.0 and reduces the CUF value, which implies that if 60-year projected cycles and similar conservatism refinements were applied to the remaining locations in the charging and letdown lines, it is expected that a similar reduction in reported CUF values would be possible. Furthermore, during the PEO, given the projected cycles, the CUF values remain at or below the screening criteria of 0.1.

Therefore, the original locations identified through the HELB screening process are expected to remain unchanged and applicable during the PEO.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – The HELB analyses remain valid for the PEO. The Fatigue Monitoring (B.2.2.1) Program will monitor transient cycles and severities and require action prior to exceeding design limits that would invalidate these conclusions. If a limit is approached, corrective action will be required prior to exceeding design limits.

4.4. ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

TLAA Description

Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The NRC has established EQ requirements in 10 CFR 50.49 and 10 CFR Part 50, Appendix A, Criterion 4. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of in-service aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a DBA such as a LOCA, HELB, or post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification. Aging evaluations for electrical components in the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP that specify a qualification of at least 40 years, but less than 60 years, have been identified as TLAAs for LR because the criteria contained in 10 CFR 54.3 are met.

TLAA Evaluation

The CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP described in B.2.2.2 meets the requirements of 10 CFR 50.49 for the applicable electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of components within the scope of the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics, and the environmental conditions to which the components could be subjected to during their service life.

10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e)(5) also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life unless additional life is established through ongoing qualification. 10 CFR 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49(k) permits different qualification criteria to apply based on plant and component vintage and 10 CFR 50.49(l) requires replacement equipment to be qualified in accordance with the provisions of 10 CFR 50.49. Supplemental environmental qualification regulatory guidance for compliance with these different qualification criteria is provided in NUREG-0588, Revision 1, “Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment”, and RG 1.89, Revision 1, “Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants”.

Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of in-service aging. The CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods.

As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

The CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP, which implements the requirements of 10 CFR 50.49, as further defined, and clarified by NUREG-0588 and RG 1.89, is viewed as an AMP for LR under 10 CFR 54.21(c)(1)(iii). Reanalysis of an aging evaluation to extend the qualifications of components is performed on a routine basis as part of the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). The disposition of the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), which states that the effects of aging will be adequately managed for the PEO, is chosen based on the fact the Environmental Qualification of Electric Equipment Program will manage the aging effects of the electrical and instrumentation components associated with the EQ TLAAs.

NUREG-1800 states that the staff evaluated the EQ program (10 CFR 50.49) and determined that it is an acceptable AMP to address environmental qualification according to 10 CFR 54.21(c)(1)(iii). The evaluation referred to in the SRP for LR contains sections on “EQ Component Reanalysis Attributes, Evaluation, and Technical Basis” is the basis of the description provided below.

Component Reanalysis Attributes

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP. While a component life-limiting condition may be due to thermal, radiation, or cyclical aging, the majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to QA program requirements, which require the verification of assumptions and conclusions. As previously noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods

The CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP uses the same analytical models in the reanalysis of an aging evaluation as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (TID), which is the normal radiation dose for the projected installed life plus accident radiation dose. For LR, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the accident radiation dose to obtain the TID for the component. For cyclical aging, a similar approach may be used.

Data Collection and Reduction Methods

Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a reanalysis per the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP. Temperature data used in an aging evaluation should be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways including monitors used for technical specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation.

Any changes to material activation energy values as part of a reanalysis must be justified. Similar methods of reducing excess conservatism in the component service conditions applied in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions

The CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Action

Consistent with the CPNPP Environmental Qualification of Electric Components (B.2.2.2) AMP, the reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is refurbished, replaced, or re-qualified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner such that sufficient time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful. If a component's qualified life is exceeded, the affected EQ component is evaluated and entered into CPNPP CAP.

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) - The effects of aging on the intended function(s) will be adequately managed for the PEO. The CPNPP Program has been demonstrated to be capable of programmatically managing the qualified lives of the electrical and instrumentation components falling within the scope of the program for LR. The continued implementation of the Environmental Qualification of Electric Equipment AMP provides reasonable assurance that the aging effects will be managed and that EQ components will continue to perform their intended functions for the PEO. This result meets the requirements of 10 CFR 54.21(c)(1)(iii).

4.5. CONCRETE CONTAINMENT TENDON PRESTRESS ANALYSIS

The Reactor Containment structure is a fully continuous, steel-lined, reinforced concrete structure. It consists of a vertical cylinder and a hemispherical dome and is supported on an essentially flat foundation mat with a reactor cavity pit projection (FSAR Section 3.8.1.1.1). Since a conventionally reinforced concrete containment is essentially a passive structure, as compared to a prestressed structure which relies on active prestress forces to meet its design function requirements, the margins of safety against all loading conditions are essentially the same throughout the life of this structure (FSAR Section 3.8.1.5.7). Furthermore, the following Regulatory Guides are not applicable to CPNPP (FSAR Appendix 1A(N)):

- RG 1.35,
- RG 1.90,
- RG 1.103, and
- RG 1.107.

As such, concrete containment tendon prestress TLAA, which include predicted lower limits (PLLs) for comparison to measured prestress force loss of prestressed concrete containments, is not applicable to CPNPP Units 1 and 2, which do not have prestressed tendons in their containment structures.

4.6. CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSES

4.6.1. Containment Liner Plate

TLAA Description

The entire inside face of each CPNPP Containment (mat, walls, and dome) is lined with a continuous welded steel liner plate, attached with anchors to the reinforced concrete, to ensure a high degree of leak tightness. The liner is designed to meet the effects of repeated reactor shutdowns and startups during the life of the plant –

1. The number of reactor shutdowns and startups during the life of the plant is assumed to be 200 cycles over a period of 40 years.

2. The cycled stresses and strains in the reinforced concrete sections caused by reactor shutdowns and startups are minor compared to the stresses caused by the critical design loading based on the abnormal (accident pressure and temperature) and extreme environmental (SSE) conditions. Therefore, the cycled stresses and strains caused by reactor shutdowns and startups do not degrade the margin of safety in the reinforced concrete.

3. The effect of cycled stresses and strains in the liner is considered by performing a fatigue analysis using the methods and limits established by ASME B&PV Code, Section III, Division I, Subsection NE.

The containment liner material meets the requirements of the ASME B&PV Code, Section III, Division 2, Subgroup on CC. Piping penetrating the containment and forming part of the containment pressure boundary meets the requirements of ASME B&PV Code, Section III, Division 1, particularly paragraph NE 1131 and sub article NE 2300. The design limits and loading combinations utilized for the CPNPP metal Containment system components conform to the requirements of RG 1.57.

TLAA Evaluation

The CPNPP containment liner was designed, fabricated, erected, and tested to quality standards commensurate with their nuclear safety related functions. The containment liner and penetrations are classified as ANSI Safety Class 2. The liner is designed in accordance with ASME Section III, Division 2 / ACI 359 Draft Code.

The liner is designed to meet the effects of repeated reactor shutdowns and startups during the life of the plant using a minimum of 600 load cycles for the Operational Basis Earthquake (OBE) (F_{eqo}), 120 load cycles for the SSE (F_{eqs}) and 200 load cycles for plant startup and shutdown.

The liners were investigated for fatigue to limits of ASME III Division I and it was concluded that the analysis for cyclic operation was not required as all the conditions of ASME III NB-3222.4 (d) were met in accordance with exemption (waiver) criteria of NE-3131 (d) and NB-3222.4. The six criteria address the following design inputs:

1. Atmospheric-to-Operating Pressure Cycles
2. Normal Operation Pressure Fluctuations
3. Temperature Difference – Startup and Shutdown
4. Temperature Difference – Normal Operation
5. Temperature Difference – Dissimilar Materials
6. Mechanical Loads

In order to evaluate the TLAA of the CPNPP containment liner for the PEO, a re-evaluation of the design inputs was performed relative to the six criteria stated in ASME III NB-3222.4(d) and it was determined that the original inputs remain valid, which is consistent with the determination in Section 4.3.1. The containment liner at CPNPP is designed to withstand 200 heat-up and cooldown cycles. This number of maximum RCS heat-up and cooldown design cycles is conservative enough to envelop the projected cycles for the PEO. The temperature differences have not changed because the design transients have not been redefined. The 600 cycles for OBE and 120 cycles for SSE is conservative, as no OBEs or SSEs have occurred at CPNPP. As described in Table 4.3.1-2 one SSE transient is considered for the RCS. Therefore, the original containment liner plate fatigue waiver for 200 heat-up and cooldown cycles, with 600 OBE and 120 SSE load cycles, for the steel Containment liner remains valid for the PEO in accordance with 10 CFR 54.21(c)(1)(i). In addition, the Fatigue Monitoring (B.2.2.1) AMP monitors the RCS heat-up and cooldown cycles and will ensure that the transient limits will not be exceeded during the PEO.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - The fatigue waiver associated with the containment liner plate has been evaluated and determined to remain valid for the PEO.

4.6.2. <u>Containment Penetrations</u>

TLAA Description:

Access to the Containment structure is provided by a personnel air lock, an emergency air lock, and an equipment hatch. Other smaller penetrations through the Containment include the MS and feedwater lines, hot and cold process piping, instrumentation, the fuel transfer tube, and electrical conductors. All penetration sleeves are welded to the liner and anchored into the reinforced concrete Containment wall.

Certain components in the Containment system are classified in accordance with ASME B&PV Code, Section III, as Class MC (Metal Containment) components. These are the personnel air lock, the equipment hatch, the emergency air lock, and other penetrations subject to pressure-induced stresses. As described in FSAR Section 3.8.2.5, item 4, “The requirements for an analysis for cyclic operation is investigated in accordance with NE-3131(d) and the referenced portions therein.” The design allowables for the penetration nozzles are the same as those used for metal containments (ASME B&PV Code, Section III, Division I). Process piping, valves, and Containment penetrations are designed, constructed, and installed in accordance with the requirements of ASME B&PV Code, Section III, Code Class MC, and Class 2.

Class MC components (primarily steel process piping penetration assemblies) were investigated for fatigue to limits of ASME III Division I and it was concluded that the analysis for cyclic operation was not required as all the condition of ASME III NB-3222.4(d) were met in accordance with NE-3131(d) and NB-3222.4.

TLAA Evaluation

The MS, feedwater, and steam generator blowdown penetrations are the only piping systems considered for the fatigue evaluations for Class MC components. The high-temperature MS, feedwater, steam generator blowdown piping systems penetrating the containment liner contribute significant thermal loading on the liner plate. These penetrations were considered in the fatigue evaluation as they enveloped the overall operating and design, as well as the geometric requirements of the remaining penetrations.

In order to evaluate the fatigue waiver of the steel CPNPP containment liner penetrations for the PEO, a re-evaluation of the design inputs was performed relative to the six criteria stated in ASME III NB-3222.4(d) and it was determined that the original inputs remain valid. The six criteria address the following design inputs:

1. Atmospheric-to-Operating Pressure Cycles
2. Normal Operation Pressure Fluctuations
3. Temperature Difference – Startup and Shutdown
4. Temperature Difference – Normal Operation
5. Temperature Difference – Dissimilar Materials
6. Mechanical Loads

As described in Table 4.3.1-2, the CPNPP projected heat-up and cooldown cycles through the PEO are less than the CLB design 200 heat-up and cooldown cycles. The temperature differences have not changed because the design transients have not been redefined. The 600 cycles for OBE and 120 cycles for SSE is conservative for containment penetrations, as no OBEs or SSEs have occurred at CPNPP. Dissimilar Materials condition was not checked since the penetrations considered in the Finite Element Analysis are composed of only one material (carbon steel). Also, steel process piping penetrations are not considered to be representative of the air locks and hatch even though both process piping penetrations and the air locks/hatch are steel. Therefore, the original containment liner penetration fatigue waiver for 200 heat-up and cooldown cycles, with 600 OBE and 120 SSE load cycles, for steel Containment piping penetrations remains valid for the PEO. In addition, the Fatigue Monitoring (B.2.2.1) AMP monitors the RCS heat-up and cooldown cycles and will ensure that the transient limits will not be exceeded during the PEO.

No fatigue waiver was identified for the Containment personnel air locks, equipment hatch, electrical penetrations, or fuel transfer tube/expansions joints. In addition, dissimilar metals were not considered in the fatigue waiver. As such, the fatigue waiver does not apply to the penetration for any stainless steel piping (e.g., containment spray, SI or RHR) since those penetrations innately involve DMWs between the stainless steel piping/forging (flued head) and the steel sleeve and were not considered in the fatigue waiver, as described in Section 3.5.2.2.1.5.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) – The fatigue waiver associated with the steel Containment piping penetrations have been evaluated and determined to remain valid for the PEO.

4.7. OTHER PLANT-SPECIFIC TLAAS

4.7.1. Leak-Before-Break

TLAA Description

Title 10 Part 50 Appendix A, General Design, "Criteria for Nuclear Power Plants," Criterion 4 of the Code of Federal Regulations (CFR) allows for the use of leak-before-break (LBB) methodology for excluding dynamic effects of postulated ruptures in nuclear power plant piping. The fundamental premise of the LBB methodology is that the materials used in nuclear power plant piping are sufficiently tough, that even a large through-wall crack would remain stable and would not result in a double-ended pipe rupture. Application of the LBB methodology is limited to those high energy fluid systems not considered to be overly susceptible to failure from such mechanisms as corrosion, water hammer, fatigue, thermal aging or indirectly from such causes as missile damage or the failure of nearby components. LBB analyses have been performed for CPNPP to demonstrate that postulated breaks can be eliminated from the structural design basis in the reactor coolant primary loop piping, accumulator injection lines, RHR lines, and pressurizer surge lines piping. The analyses involved with LBB are based on transients and projected 40-year cycles and are considered TLAAs that require evaluation for the PEO.

TLAA Evaluation

Reactor Coolant Primary Loop Piping

A LBB analysis was initially performed for CPNPP Units 1 and 2 primary loop piping by Westinghouse in 1984 in WCAP-10527 (Reference 4.8.12). The NRC has documented its review of LBB for CPNPP in Supplemental Safety Evaluation Reports (SSERs) 23 and 26 (References 4.8.13 and 4.8.14). To demonstrate the elimination of pipe breaks in these lines, the following objectives had to be achieved:

- Demonstrate that margin exists between the critical crack size and a postulated crack that yields a detectable leak rate.
- Demonstrate that there is sufficient margin between the leakage through a postulated crack and the leak detection capability.
- Demonstrate margin on the applied load.
- Demonstrate that fatigue crack growth is negligible.

These analyses were subsequently reviewed to demonstrate compliance with LBB technology for CPNPP. This review considered input from the Reactor Pressure Vessel Head Replacement, Steam Generator replacement and Snubber Elimination Programs, SPU, Nozzle Weld Overlay Program, and MSIP. Unit 2 has completed a partial implementation of MSIP, where loop 4 cold leg and loop 2 hot leg nozzles have achieved the required compressive residual stresses on the inner surface to mitigate PWSCC concerns for the alloy 82/182 welds. However, the remaining nozzle locations for Unit 2 have not yet applied the full MSIP process and thus are not yet credited for mitigation.

The CPNPP Units 1 and 2 LBB evaluations were updated to account for implementation and partial implementation of MSIP, respectively. DMW locations at RPV nozzles that have Alloy 82/182 nickel-base materials, which are susceptible to PWSCC, were evaluated to confirm that those locations have been appropriately mitigated by the application of MSIP and evaluated for LBB. In addition to RPV nozzles, other locations susceptible to PWSCC such as the pressurizer safety and relief, spray, and surge nozzles were repaired with the application of Structural Weld Overlay. Due to partial implementation of MSIP for Unit 2, there is a difference for the LBB analyses.

Plant-specific geometry, operating parameters, loading, and material properties were used in the fracture mechanics evaluation. The mechanical properties were determined at operating temperatures. Since the primary loop piping are made of CASS that is susceptible to thermal aging at the reactor operating temperature, the analyses also consider the associated reductions in fracture toughness.

The governing or critical locations for the LBB evaluation are established based on the fracture toughness properties of the metal-base at the weld points and also on the basis of pipe geometry, welding process, operating temperature, operating pressure, and the highest faulted stresses at the welds. A margin of 10 is demonstrated between the calculated leak rate and the leak detection capability and a margin of 2 between the leakage flaw size and the critical flaw size. Fatigue crack growth was shown not to be an issue for the RCS primary loop piping. The thermal transients used in the fatigue crack growth analysis were CPNPP design transients and projected cycles, which are reported in Table 4.3.1-1. The corresponding 60-year projected cycles, also shown in Table 4.3.1-1, are lower than the 40-year design values. Therefore, the numbers of design cycles assumed in the analysis bound the numbers of design cycles projected for 60 years of operation and the intended LBB margins have been met.

TLAA Disposition

Revision, 10 CFR 54.21(c)(1)(ii) – The reactor coolant primary loop piping LBB analyses for CPNPP Units 1 and 2 has been projected to the end of the PEO.

<u>Accumulator Injection Lines, Residual Heat Removal Lines, and Pressurizer Surge Lines Piping</u>

LBB analyses of CPNPP accumulator injection lines, RHR lines and pressurizer surge lines were completed between 1988 and 1992 (References 4.8.15, 4.8.16, 4.8.17, 4.8.18, and 4.8.19). The NRC has documented its review of LBB for CPNPP in SSERs 23 and 26. To demonstrate the elimination of pipe breaks in these lines, the following objectives had to be achieved:

- Demonstrate that margin exists between the critical crack size and a postulated crack that yields a detectable leak rate.

- Demonstrate that there is sufficient margin between the leakage through a postulated crack and the leak detection capability.
- Demonstrate margin on the applied load.
- Demonstrate that fatigue crack growth is negligible.

These analyses were subsequently reviewed to demonstrate compliance with LBB technology for CPNPP. This review considered input from the Reactor Pressure Vessel Head Replacement, Steam Generator replacement and Snubber Elimination Programs, SPU, Nozzle Weld Overlay Program, and MSIP. Review for the PEO was based on the same set of design transients as the original analyses; therefore, the conclusions of the original evaluation remain valid for the 60-year period and the intended LBB margins continue to be met.

For auxiliary piping in the Accumulator Injection Lines, RHR (RHR) Lines, and Pressurizer Surge Lines, thermal aging is not an issue because there is no cast material in any of these lines.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the PEO. The LBB review demonstrates that the previous LBB conclusion still remains valid, and the dynamic effects of the pipe rupture resulting from postulated breaks in the accumulator injection lines, RHR lines, and pressurizer surge lines piping need not be considered in the CPNPP Units 1 and 2 design basis for the PEO.

4.7.2. Reactor Coolant Pump Casings ASME Code Case N-481

TLAA Description

ASME B&PV Code, Section XI, specifies that a volumetric inspection of the RCP casing welds and a visual inspection of pump casing internal surfaces be performed on a RCP within each 10-year inspection period. These 10-year volumetric inspections are significant because the RCPs have already been welded to the piping and the pumps must be disassembled in order to gain access to the inside surface of the cast stainless steel casings. In recognition of these difficulties, ASME Code Case N-481, “Alternative Examination Requirements for Cast Austenitic Pump Casings”, was developed to allow for the replacement of volumetric examinations with a fracture mechanics based evaluation and supplemented by specific visual inspections. The analyses involved with Code Case N-481 are considered TLAAs.

TLAA Evaluation

Following the approval of Code Case N-481, the Westinghouse Owners Group (WOG) performed a generic fracture mechanics analysis per Code Case N-481 for the various primary loop pump casing models found in Westinghouse-designed NSSS in WCAP-13045 (Reference 4.8.20). A plant-specific flaw tolerance evaluation of the CPNPP Unit 1 RCP casings was completed for 40 years of service life to demonstrate compliance to ASME Code Case N-481 based on the generic evaluation completed by the WOG. A similar evaluation was not completed for

CPNPP Unit 2 since the RCP casings are single piece casting and the Code Case N-481 evaluation was not required. ASME Code Case N-481 evaluation was used to support visual examination in lieu of volumetric examinations of welds, which are not present in CPNPP Unit 2 RCP casings.

For the 60-year LR program, loss-of-fracture toughness due to thermal aging embrittlement of CASS RCP casings is identified as an aging mechanism in NUREG-1801, Volume 2, AMP XI.M12. Specifically, NUREG-1801 provides an allowance for continued use of flaw tolerance evaluations performed as part of implementation of Code Case N-481 to address thermal aging embrittlement.

A reconciliation analysis was performed for CPNPP Units 1 and 2 RCP casings to the generic fracture mechanics evaluation and the Unit 1 plant-specific evaluation. The analysis includes a review of the crack stability and fatigue crack growth analyses. The latest plant-specific piping loads and 60-year design transients and cycles are considered in the evaluation. Furthermore, RCP casing evaluation, PWROG-17033-NP-A, provided additional conditions on the plant-specific applicability of the generic analysis in terms of assessing the plant-specific loadings, material fracture toughness and transients for long-term operation (Reference 4.8.21) and was approved by the NRC in Reference 4.8.22.

The reconciliation analysis provided an assessment for the CPNPP Units 1 and 2 RCP casings for the thermal aging embrittlement concern on long-term operation (60-years). The effects of the primary loop piping Steam Generator snubber optimization, revised concrete and support stiffness, the SPU program and MSIP implementation were included in this letter report for CPNPP Units 1 and 2, as well as the replacement Steam Generator (RSG) and uprating and SG snubber elimination programs for Unit 1.

The results demonstrate the plant-specific applicability of the WOG generic analysis for CPNPP Units 1 and 2 RCP casings and sufficient crack stability margins for 60 years of life. No other mechanism is known to degrade the properties of the pump casings during the remaining service. Thus, it is concluded that the CPNPPs Units 1 and 2 RCP casings are in compliance with ASME Code Case N-481 for the LR program to 60-years of operation.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the PEO. The Code Case N-481 review demonstrates that the previous Code Case N-481 conclusions remain valid, and sufficient crack stability margins exist for the CPNPP Units 1 and 2 for the PEO.

4.7.3. Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

TLAA Description

RCP flywheel fatigue growth is identified as a potential TLAA for LR associated with failure of the RCP flywheel due to vibration or an overspeed event resulting in high energy missiles that could impact other structures, systems, and components.

As described in the CPNPP Units 1 and 2 TS 5.5.7, inspection of flywheels is to be conducted per the recommendations of RG 1.14 (Reference 4.8.23). However, in lieu of Position C.4.b(1) and C.4.b(2) of the Regulatory Guide, a qualified in-place ultrasonic testing examination over the volume from the inner bore of the flywheel to the circle one-half of the outer radius or a surface examination (magnetic particle testing and/or penetrant testing) of exposed surfaces of the removed flywheels may be conducted at a 20-year interval. The basis for the 20-year inspection interval is supported by the fatigue crack growth analysis contained in WCAP-15666-A (Reference 4.8.24). The fatigue crack growth analysis assumes 6000 starts and stops during the 60-year life of the flywheel.

Since the flaw tolerance evaluation completed in WCAP-15666-A supports the current 20-year inspection interval and is cycle-dependent, RCP flywheel fatigue crack growth is considered a TLAA for CPNPP Units 1 and 2.

TLAA Evaluation

Westinghouse and the Pressurizer Water Reactor Owners Group (PWROG) have analyzed this TLAA generically for Westinghouse plants for 40-year, 60-year, and 80-year lifetimes in WCAP-14535-A, WCAP-15666-A, and PWROG-17011-NP-A, respectively (References 4.8.24, 4.8.25, and 4.8.26). Each of these reports has received generic NRC review and approval.

The deterministic fracture mechanics methodology and evaluations remain applicable up to 80 years of operation. CPNPP Units 1 and 2 are seeking a 60-year license period, and the TLAA methodology in WCAP-15666-A for RCP flywheel FCG was re-evaluated and re-approved by the NRC in PWROG-17011-NP-A (References 4.8.24 and 4.8.26). It was shown that the RCP motor flywheels have a very high tolerance for the presence of flaws, especially with the 1500 rpm overspeed.

The stress and fracture evaluation performed in PWROG-17011-NP-A included the following failure modes and degradation mechanisms: Ductile Failure Analysis, Nonductile Failure Analysis, Fatigue Crack Growth, and Excessive Deformation Analysis. This evaluation is applicable to the 80-year TLAA, but the results are also valid for 60 years (Reference 4.8.26).

There are no significant mechanisms for in-service degradation of the flywheels since they are isolated from the primary coolant environment. The evaluations have shown there is no significant deformation of the flywheels, even at maximum overspeed conditions. Fatigue crack growth calculations have shown that even with a large assumed flaw, the crack growth for 80 years of operation is negligible. Therefore, based on these deterministic evaluations, the flywheel inspections completed prior to service are sufficient to ensure their integrity during service for the PEO.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - The stress and fracture evaluation re-validated the conclusions of the WOG evaluation, and the FCG analyses continue to apply to

CPNPP Units 1 and 2 through the PEO. Thus, theses analyses remain valid for the PEO.

4.7.4. Crane Load Cycle Limits

TLAA Description

Crane Manufacturers Association of America (CMAA) Specification 70 (CMAA-70), 1975, provides considerations for crane members and fasteners that are subjected to repeated (cyclic) loads, based on frequency of operation relative to their maximum load capacity. Based upon these considerations, cranes are designated a maximum number of design load cycles over their life based on a given service classification. These maximum loading cycles and the associated crane service classifications are listed in Table 3.3.3.1.3-1 of CMAA-70, a load cycle limit of 100,000 for the highest allowable stress range for each service class. Since the maximum number of design load cycles over the 40-year life of the crane provides the basis for acceptability of the design of the cranes for cyclic operations (loads), these cyclic analyses are TLAAs for LR. Therefore, the load cycles experienced through the PEO (60 years) need to be evaluated.

CPNPP FSAR Table 17A-1, a DBD and the associated design specifications for cranes within the scope of LR were reviewed to identify the cranes that are designed in accordance with CMAA-70, 1975, or considered equivalent to CMAA-70 and therefore include load cycle limits.

TLAA Evaluation

The projected frequency of lifts (load cycles) associated with the cranes that are governed by the CMAA-70, 1975, specification, or ASME NOG-1/NUM-1 that are considered equivalent to CMAA-70, are estimated through the PEO (60 years). All loads lifted by the cranes including the infrequent loads associated with initial construction and major maintenance are considered for the load cycle evaluation. The frequency of lifts (or load cycles) per year (or for each operating cycle) for each of these cranes including the initial lifts performed during construction phase are estimated. This data is then extrapolated to include the PEO (60 years). The frequency of lifts of the individual cranes through the PEO is then compared with load cycle limits listed in Table 3.3.3.1.3-1 of CMAA-70, 1975 in accordance with the service class of the cranes/hoists. The evaluation summary of the cranes/hoists is listed in Table 4.7.4-1 below.

<u>Auxiliary Filter Hoist</u>

The Auxiliary Filter Hoists are designed in accordance with CMAA-70 for Class D service. The Auxiliary Filter Hoists have an 8-ton capacity and are used for removal and transfer of radioactive filter elements, spent filter casks, and concrete floor plug.

This removal and transfer typically involves 30 lifts per year per hoist. The number of anticipated lifts for each Auxiliary Filter Hoist is estimated to be 1,800 through the PEO, which is less than the 500,000 cycles specified for Class D cranes (maximum allowable stress range) in CMAA-70.

Containment Access Rotating Platform

The Containment Access Rotating Platform Hoist was designed in accordance with CMAA-70 for Class A standby service. The crane has a 0.6-ton (1,200 lb) capacity. This hoist is used for lifting miscellaneous tools and welding equipment up to the Containment Access Rotating Platform and to the Polar Crane.

There are approximately 10 lifts per outage for the Containment Access Rotating Platform Hoist. With 40 planned refueling outages (one every 18 months) over 60 years and assuming 10 additional unplanned outages over the same time-period, the cumulative lifts for the Containment Access Rotating Platform Hoist is estimated to be 500 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Containment Fuel Handling Bridge Crane

The Containment Fuel Handling Bridge Crane was designed in accordance with CMAA-70 for Class A service. This crane has a 1-ton capacity and is primarily designed for lifting a fuel assembly, its insert component, and the associated handling tool during refueling operations.

With 193 fuel assemblies loaded and unloaded each refueling outage and 40 planned refueling outages in 60 years, the number of anticipated lifts for the Containment Fuel Handling Bridge Crane is conservatively estimated to be 19,300 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70. This conservative estimate also includes 10 unplanned outages to account for fuel movements during initial loading and early operation or unplanned outages involving fuel movement. Unplanned outages rarely involve fuel movement/transfer.

Containment Polar Crane

The Containment Polar Crane was designed in accordance with CMAA-70 for Class A service. The main hook rated capacity is 175 tons (per set of ropes), for a 475-ton total, and the auxiliary hook rated capacity is 20 tons. The crane is used to lift the reactor vessel head assembly, reactor upper internals, reactor lower internals, RCP components and fuel storage area stop gate as needed.

The Containment Polar Crane is a single trolley traveling bridge rotating on a single rail circular track. The number of lifts performed by the main and auxiliary hoists of this crane are estimated based on a review of the outage schedule report for the Fall 2021 Unit 2 outage (as representative of other outages due to the amount of work scheduled). It is estimated that this crane performs 500 lifts per outage with 40 planned outages in 60 years and assuming 10 unplanned outages in the same time period. An additional 100 lifts are also included for the lifts performed during construction. The number of lifts for the Containment Polar Crane is estimated to be 25,100 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Containment Telescopic Jib Crane

The Containment Telescopic Jib Crane was designed in accordance with CMAA-70 (equivalent ASME NOG-1) for Class C service. The telescopic jib crane has a 5½ ton capacity and is used for lifting miscellaneous tools, equipment, and building materials in support of outage activities.

Conservatively, this light service crane is assumed to have the same number of lifts per outage as the Containment Polar Crane, which is based on review of the most recent outage schedule, minus the 100 construction lift assumption. As such, the number of lifts for the Containment Telescopic Jib Crane is estimated to be 25,000 through the PEO, which is less than the 500,000 cycles specified for Class C cranes in CMAA-70.

Drumming Storage Area Crane

The Drumming Storage Area Crane was designed in accordance with CMAA-70 for Class A service. The crane has a 15-ton capacity and is used for handling and storage of the solid waste containers.

It is conservatively estimated that this crane performs 10 lifts/year. The number of lifts for the Drumming Storage Area Crane is estimated to be 600 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Fuel Building Overhead Crane

The FB Overhead Crane was designed in accordance with CMAA-70 for Class A service. The crane has a 130-ton single failure proof main hoist, 17-ton capacity non-single failure proof auxiliary hoist, and 5-ton cantilevered hoist reaching over the front bridge walkway. The crane is the primary means of transporting nuclear fuel in and out of the FB. Its range includes the spent fuel cask loading area, the new fuel storage pit, the cask handling area, the new fuel receiving area, and the railroad loading and unloading area. The crane is also used to move and maintain the lift gate in the FB.

With 40 outages planned plus 10 unplanned outages over the 60 years, 600 lifts per unit per cycle are a conservative estimate based on review of recent cycle data for the crane. The number of lifts for the FB Overhead Crane is estimated to be 60,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Fuel Handling Bridge Crane

The Fuel Handling Bridge Crane was designed in accordance with ASME NOG-1; the load cycle limits for cranes/hoists designed to ASME NOG-1 are considered equivalent to CMAA-70 Class A service, 100,000 cycles. This crane has a 2-ton rated capacity and is primarily designed for lifting a fuel assembly, its insert component, and the associated handling tool within the SFPs, refueling canal, and cask handling pit during refueling operations.

This crane was replaced in 2010 and, as such, will have only experienced 40 years of operation by the end of the PEO. Similar number of fuel assembly lifts as the Refueling machine are assumed with 193 fuel assemblies per unit loaded and unloaded each refueling outage plus 114 additional relocations of spent fuel in the pool or other miscellaneous insert shuffles (e.g., moving around wet annular burnable absorbers (WABAs), thimble plugs) during each cycle and approximately 27 planned refueling outages per unit plus assumed 10 non-scheduled forced outages per unit from the replacement crane installation to 60 years of plant operation, the number of anticipated lifts for the Fuel Handling Bridge Crane is conservatively estimated to be 37,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70. This conservative estimate includes 10 unplanned outages to account for any additional fuel movements. However, unplanned outages rarely involve fuel movement/transfer. Similar number of fuel assembly lifts as the Refueling machine are assumed with 114 additional relocations of spent fuel in the pool or other miscellaneous insert shuffles (e.g., moving around wet annular burnable absorbers (WABAs), thimble plugs) during each cycle.

Refueling Machine

The Containment refueling machine is designed for CMAA-70 class A service and has a 2-ton capacity. It is used for lifting a fuel assembly during refueling and transporting it between the reactor vessel (refueling cavity) and the containment fuel transfer area during outages. This hoist is also used during the inspection of a CRD shaft or for fuel assemblies.

There are 193 fuel assemblies loaded and unloaded each refueling outage and 40 planned refueling outages in 60 years with 10 unplanned outages assumed to account for any additional fuel movements during initial loading and early operation or unplanned outages involving fuel movement. Unplanned outages rarely involve fuel movement/transfer. In addition, 700 lifts are estimated to account for control rod/CRD adjustments and inspections. As such, the number of lifts for the refueling machine is conservatively estimated to be 20,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Safety Chiller Hoist

The safety chiller hoist is designed for CMAA-70 class A service and has a 3-ton capacity. It is used for lifting cooler and condenser tube bundles, chilled water pumps, pump motors, and potential transformers during maintenance activities.

Based on previously issued work orders for this hoist, it is estimated that the Safety Chilled Water maintenance activities involve 30 lifts per year. That is 1,800 lifts through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Service Water Intake Structure Crane

The SWIS Crane was designed in accordance with CMAA-70 for Class A service. It has a 7.5-ton capacity and is an overhead I-Beam crane used to install and maintain the service water pumps, fire pumps and associated piping and equipment.

Based on estimated past maintenance activities in the SWIS, 5 lifts per month are estimated or 60 lifts per year. The number of anticipated lifts for the SWIS Crane is estimated to be 3,600 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Vertical Cask Transporter (VCT)

The Vertical Cask Transporter was considered to be designed in accordance with CMAA-70 for Class A service. It has a 205-ton capacity and is used to transport a Dry Cask Storage HI-STORM between the FB and the ISFSI, and to reposition HI-STORMs.

It is estimated that there are 24 lifts per outage. With 40 planned plus assumed 10 unplanned outages in 60 years, the number of lifts for the VCT is estimated to be 1,200 lifts through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - Based on the above information the estimated number of load cycles associated with the Auxiliary Filter Hoists, Containment Access Rotating Platforms, Containment Fuel Handling Bridge Cranes, Containment Polar Cranes, Containment Telescopic Jib Cranes, Drumming Storage Area Crane, Fuel Building Overhead Crane, Fuel Handling Bridge Crane, Refueling Machines, Safety Chiller Hoists, SWIS Crane, and Vertical Cask Transporter are considerably less than the design load cycles used in the cyclic analyses, and therefore the TLAAs remain valid for the PEO.

Table 4.7.4-1: Summary of Crane Cyclic Operation

Crane Title	CMAA Service Class	Maximum Number of Design Load Cycles (CMAA-70 Table 3.3.3.1.3-1)	Projected Number of Load Cycles Including PEO (60 Years)	Valid for 60 Years?
Auxiliary Filter Hoist	D	500,000	1,800 per hoist	Yes
Containment Access Rotating Platform Hoist	A	100,000	500	Yes
Containment Fuel Handling Bridge Crane	A	100,000	19,300	Yes
Containment Polar Crane	A	100,000	25,100	Yes
Containment Telescopic Jib Crane	C	500,000	25,000	Yes

Table 4.7.4-1: Summary of Crane Cyclic Operation				
Crane Title	**CMAA Service Class**	**Maximum Number of Design Load Cycles (CMAA-70 Table 3.3.3.1.3-1)**	**Projected Number of Load Cycles Including PEO (60 Years)**	**Valid for 60 Years?**
Drumming Storage Area Crane	A	100,000	600	Yes
Fuel Building Overhead Crane	A	100,000	60,000	Yes
Fuel Handling Bridge Crane	A	100,000	37,000	Yes
Refueling Machine	A	100,000	20,000	Yes
Safety Chiller Hoist	A	100,000	1,800	Yes
SWIS Cane	A	100,000	3,600	Yes
Vertical Cask Transporter	A	100,000	1,200	Yes

4.7.5. Spent Fuel Pool Metal Corrosion Allowance

TLAA Description

Most pressure retaining components are constructed with a wall thickness in excess of minimum required wall thickness for that component. This excess wall thickness provides a metal corrosion allowance to ensure that minimum wall thickness requirements are maintained through the life of the component. If corrosion allowances are based on a degradation rate and will cover only the original 40-yr design life of the component, they could be considered TLAAs.

The CPNPP Safety Evaluation Report NUREG 0797, Section 9.1.2.1, Spent Fuel Storage Materials, includes the following statements about SFP corrosion:

“From its evaluation, the staff concludes that the corrosion that will occur in the spent fuel storage pool environment should be of little significance during the 40 yr life of the plant. Components in the spent fuel storage pool are constructed of alloys that have a low differential galvanic potential between them and have a high resistance to general corrosion, localized corrosion, and galvanic corrosion.”

Additionally:

“The pool liner, rack lattice structure, and fuel storage tubes are stainless steel, which is compatible with the storage pool environment. In this environment of oxygen saturated borated water, the corrosive deterioration of the type 304 stainless steel should not exceed a depth of 6.00 x 10^{-5} in. in 100 years, which is negligible relative to the initial thickness."

TLAA Evaluation

The SFP metal corrosion allowance is considered a TLAA because the assumptions about the corrosion rate of the pool liner, rock lattice structure, and fuel storage tubes are related to aging effects and draw a conclusion limited to the current 40-yearr period of operation. This corrosion rate is given for 100 years. Therefore, this analysis and conclusion remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - Based on the evaluation above, SFP metal corrosion allowance remains valid for the PEO.

4.7.6. Protective Coatings

TLAA Description

FSAR Section 6.1B.2, Organic Materials, contains the following requirements for coatings within Containment:

"ASTM D 3911-03, Standard Test Method for Evaluating Coatings Used in Light Water Nuclear Power Plants at Simulated DBA Conditions is followed in the evaluation of protective coating system test results. Testing of each coating system to a minimum of 3.0E+08 Rads gamma is adequate for a Service Level I system to be qualified. However, testing of each coating system to a minimum of 2.0E+08 Rads gamma is also adequate for a Service Level I system to be qualified as long as the individual coatings have passed radiation tolerance testing equal to, or in excess of 3.0E+08 Rads."

and,

"The Containment building coating systems are applied over surfaces prepared in accordance with approved procedures and the coating manufacturers' instructions. The primary criteria for the selection of maintenance protective coatings used within the Containment building are:

1. Capability of being easily decontaminated
2. Capability of not reacting chemically with spray solutions
3. Capability of preventing the formation of gaseous or solid waste products
4. Capability of resisting the environmental radiation for the life of the plant
5. Capability of withstanding DBA conditions individually tested as described above in accordance with ASTM D 3911 03"

Criterion 4 above in FSAR Section 6.1B.2, for "qualified" coatings in Containment to withstand environmental radiation for the life of the plant, is considered a TLAA because it meets all six of the TLAA criteria.

TLAA Evaluation

As of December 31, 2007, protective coatings inside containment were classified as Service Level I coatings (FSAR Appendix 1A(B) relative to RG 1.54). A specifically structured QA program based on the guidance in EPRI Report 1003102 and ASTM D 5144 is applicable to the Service Level I coatings programs (FSAR Section 6.1B.2 and Table 17A-1). This program is credited as the Protective Coating Monitoring and Maintenance AMP (Section B.2.3.36).

The calculated radiation exposures postulated to occur within the Containment Building at CPNPP during both normal operation and coating DBA events for environmental qualification of electrical equipment were used to establish a threshold (3.0E+08 rads) for irradiation of qualified coatings over the life of the plant. The calculated doses for electrical equipment qualification significantly exceed any anticipated accident doses because gross fuel failures are assumed as required by regulations. There are no regulations which require this assumption be applied to coatings. With due consideration to this fact, a bounding TID “screening” value for both Gamma and Beta radiation exposure of 3.0E+08 rads is considered conservative and appropriate for use when assessing protective coating DBA test data for use at CPNPP.

The greatest calculated radiation exposure within Containment is predicted to occur within the “Reactor Cavity” area. While this area does provide the limiting calculated radiation exposure inside both CPNPP Containment Buildings, it is judged not to be an appropriate value to use when assessing radiation tolerance of protective coatings. Coatings in Room 153, which is the “Reactor Cavity” area, are in a location that would prevent them from communicating with the ECCS sumps. Therefore, the protective coatings applied within the reactor cavity do not meet the definition of nuclear Service Level I coatings (i.e., the failure of which could adversely affect post-accident fluid system). The next highest calculated radiation exposure region(s) within the Containment consists of several rooms and open quadrant areas throughout the structure.

The conservative 40-yr normal dose plus accident dose for environmental qualification of electrical equipment inside Containment was updated to reflect the impacts of the SPU. Accident dose values postulated for environmental qualification of electrical equipment include inherent conservatisms. To account for these inherent conservatisms that are not necessary for Service Level 1 coating irradiation, the accident doses, both gamma and beta, have been refined. Furthermore, postulated accident dose values are the most significant contributor to the TID. The refined accident dose (gamma and beta) values for non-reactor cavity coatings inside Containment are those with both contributions to an unpressurized accident condition to be more representative of the expected post-accident dose.

For the 60-yr TID these refined accident doses will be the new quantities applied for the PEO. The refined analysis includes both 40-yr and 60-yr normal operation gamma/beta radiation. The calculated 60-yr TID is below the 3.0E+08 Rads threshold for continued qualification of non-reactor cavity protective coatings inside containment (Service Level I coatings) through the life of the plant. Therefore, this analysis and conclusion remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

Aging effects other than irradiation on the intended function of Service Level I coatings inside containment will continue to be monitored during the PEO by the Protective Coating Monitoring and Maintenance AMP in Section B.2.3.36.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) – Based on the evaluation above, the calculated gamma and beta dose during normal operation plus accident dose will not exceed the irradiation threshold through the PEO.

In addition, separate from this TLAA, Service Level 1 coatings will continue to be monitored for aging effects, other than irradiation, by the Protective Coating Monitoring and Maintenance (B.2.3.36) AMP.

4.7.7. Steam Generator Tubes Metal Corrosion Allowance

TLAA Description

Most pressure retaining components are constructed with a wall thickness in excess of minimum required wall thickness for that component. This excess wall thickness provides a metal corrosion allowance to ensure that minimum wall thickness requirements are maintained through the life of the component. If corrosion allowances are based on a degradation rate and will cover only the original 40-yr design life of the component, they could be considered TLAAs.

The FSAR Section 5.4.2B.5.4 Allowable Tube Wall Thinning Under Accident Conditions, which covers Unit 2, contains the following discussion of the corrosion of steam generator tubing:

"The corrosion rate is based on a conservative weight loss rate for mill annealed Inconel tubing in flowing 650°F primary side reactor coolant fluid. The weight loss, when equated to a thinning rate and projected over a 40-yr plant life with appropriate reduction after initial hours, is equivalent to 0.080 mils thinning. The assumed corrosion rate of 3 mils leaves a conservative 2.2 mils for general corrosion thinning on the secondary side."

TLAA Evaluation

Because these assumptions about the corrosion rate of the Unit 2 steam generator tubes are related to aging effects and limited to the current 40-yr period of operation, as well as meeting the other criteria, this is considered a TLAA. Extrapolating this corrosion rate over 60 years equates to 0.12 mils thinning, which is less than the assumed corrosion rate of 3 mils. Therefore, this analysis and conclusion remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - Based on the evaluation above, steam generator tubes metal corrosion allowance remains valid through the PEO.

4.7.8. Steam Generator Flow-Induced Vibration and Tube Wear Evaluations

TLAA Description

The CPNPP Unit 1 RSGs and the CPNPP Unit 2 SGs were evaluated for FIV and tube wear considering the updated thermal-hydraulic characteristics of the secondary side of the SGs reflecting the proposed uprate to 3628 MWt NSSS. The aging effects and mechanisms of the SG nickel alloy tubes include "cumulative fatigue damage due to fatigue" and the "loss of material due to fretting and wear" which can be caused by flow-induced excitation of the SG tubes and mechanical tube wear. Therefore, the evaluations are considered TLAAs that must be evaluated for the PEO.

TLAA Evaluation

The CPNPP Unit 1 Delta 76 RSG FIV and tube wear evaluations, specifically the uprate evaluation, is based on and references the original FIV and tube wear evaluation. This evaluation was completed using a cumulative operating service of 45 calendar years of the RSG Design Specification. The Unit 1 RSGs were replaced during 1RF12 (Spring 2007), and the Unit 1 initial license expires February 8, 2030. Therefore, the 45-year evaluation considers the PEO.

The CPNPP Unit 2 Model D5 SG FIV and tube wear evaluation includes fluidelastic instability, turbulence, tube wear, vortex shedding, and fatigue (due to stresses below the endurance limit). These mechanisms, with the exception of tube wear, are solely based on the geometry of the steam generator, configuration of the steam generator tubing and supports, and the thermal-hydraulic fluid forces in the SGs. These parameters are constant, and their conclusions will not be affected by an additional period of operation; thus, the existing results are unchanged and are acceptable for the PEO. Tube wear evaluations must be updated to consider the PEO.

Tube wear evaluations are further broken down into expected wear due to FIV on the general tube population and active wear on specific tubes due to active degradation mechanism. In both cases, the uprate of the CPNPP Unit 2 SGs in the fall of 2009 resulted in an increase in tube wear over the remaining life of the SGs (originally based on a 40-year design life). The conclusions of the uprate analyses change based on the PEO and consideration of 60-year design life.

The evaluation of general tube wear accounts for the uprated conditions and the limiting level of tube wear when considering 60 years of operation increasing linearly by a factor of 60/40 (150 percent). The limiting updated tube wear for the PEO remains well below the tube wall margin of through-wall wear depth and thus it can be concluded that the uprated conditions will result in acceptable rates of tube wear and will not challenge current acceptance criteria when considering the PEO.

The evaluation of active tube wear does not represent the large majority of tubes that are reflected in an "as-designed" calculation of tube wear. The SG tubes are monitored through periodic inspections during refueling outages. Therefore, active tube wear will be identified and addressed on an ongoing basis during the PEO via periodic inspections and tube wear reporting as part of the CPNPP Steam Generators AMP described in B.2.3.10.

A review of recent wear trends shows that the 95th percentile growth rate for tube wear due to anti-vibration bars bounds the tube wear data from CPNPP Unit 2 refueling outages 2RF12, 2RF14, and 2RF16. For tube support plate wear, conservative through-wall tube rates were calculated using data taken at the current uprated conditions for CPNPP Unit 2 and were found to be less that the predicted maximum growth rate calculated in the uprate flow induced vibration tubing effects evaluation.

Wear Rates and Wear Projections for Antivibration Bar (AVB) and Tube Support Plate (TSP) Wear

The CPNPP Unit 2 Model D5 SG analysis tube wear methodology for plugging and stabilizing decisions is based on wear projections for AVB and TSP wear. The aging effects/mechanisms of the SG nickel alloy tubes include the loss of material due to fretting and wear which can be caused by mechanical tube wear. 60 years was considered for AVB and TSP wear calculations. The end of plant life is calculated as 60 years from February 1993 to account for a 20-year plant life extension resulting in a date of February 2053. The analysis has been evaluated and it has been shown that the wear projection analyses within it are currently applicable to 60 years of operation.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) – The CPNPP Unit 1 Delta 76 RSG design is based on a cumulative operating service of 45 calendar years and were installed in Spring of 2007. Therefore, the FIV and tube wear evaluations adequately consider the PEO. The tube wear methodology for plugging and stabilizing decisions based on wear projections for AVB and TSP wear considered 60 years of operation and therefore are adequately addressed through the PEO.

Revision, 10 CFR 54.21(c)(1)(ii) - The CPNPP Unit 2 D5 SG FIV and tube wear evaluations were updated using recent trend data to conservatively assess the expected corrosion and found to remain acceptable through the PEO.

4.7.9. Steam Generator U-Bend Tube Vibration and Fatigue Assessment

TLAA Description

In some models of SGs, particular consideration is given to the potential for high cycle fatigue of U-bend tubes. This mechanism has been observed in tubes with carbon steel support plates where denting or a fixed tube support condition has been observed in the uppermost plate and anomalous conditions existed in the AVB insertion depths or AVB support structure that could lead to unsupported tubes. The aging effects and mechanisms of the SG nickel alloy tubes include “cumulative fatigue damage due to fatigue” and the “loss of material due to fretting and wear” which can be caused by the FIV of U-bend tubes with anomalous support conditions leading to high cycle fatigue and subsequent tube failure.

TLAA Evaluation

Due to fabrication advancements and controls used to ensure proper anti-vibration bar insertion depths for the CPNPP Unit 1 Delta 76 replacement SGs, the SG tubing is not affected by the U-bend FIV and fatigue mechanism.

For CPNPP Unit 2, the U-bend tube vibration and fatigue assessment already considers 60 years of operation. The assessment assumes SG operating life is from the time of initial plant start-up to the anticipated 60-year plant operating license expiration date. Since the CPNPP Unit 2 SG tube support plates are manufactured from stainless steel, there is no potential for the necessary boundary conditions (that is, denting) to occur at the uppermost support plate. High cycle fatigue of U-bend tubes will not be an issue with the CPNPP Unit 2 Model D5 SGs because none of the unsupported tubes identified in the CPNPP Unit 2 SGs were concluded to be at risk of fatigue failure during the 60-year plant lifetime evaluated. Furthermore, the tubes were deemed acceptable, without remediation, from a FIV and fatigue perspective through the end of the anticipated 60-year plant operating life. The conclusions of the assessment are applicable through the PEO, so no further evaluation is required.

Disposition

Validation, 10 CFR 54.21(c)(1)(i) – The evaluation of U-bend tube vibration and fatigue is either not applicable (Unit 1) or the current assessment adequately considers the PEO (Unit 2).

4.7.10. Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components

TLAA Description

The RCL static cast elbow components and centrifugally cast pipe components in CPNPP Units 1 and 2 are constructed from CASS ASME SA-351 Grade CF8A material. The CASS material may be susceptible to thermal aging at the reactor operating temperature. Thermal aging of CASS material results in embrittlement, that is, a decrease in the ductility, impact strength, and fracture toughness of the material. Depending on the material composition, the Charpy impact energy of a component made of CASS material could decrease after prolonged exposure to reactor coolant temperatures during service.

A flaw tolerance evaluation was performed to demonstrate that even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service.

TLAA Evaluation

The susceptibility of CASS piping components to thermal aging is determined according to molybdenum content, casting methods, and delta ferrite content per NUREG-1801, Chapter XI.M12 and the Grimes's Letter (Reference 4.8.27). Flaw tolerance evaluation of the susceptible CASS piping components in CPNPP Units 1 and 2 RCLs were performed in accordance with paragraph IWB-3640 and Appendix C of ASME Section XI to demonstrate that even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service. In determining susceptibility of the CASS elbow components to thermal aging, the delta ferrite content is estimated using Hull's Equivalent Factor in NUREG/CR-4513 Revision 1 (Reference 4.8.28).

In accordance with guidelines given in the Grimes's Letter and NUREG-1801, the CPNPP Units 1 and 2 susceptible CASS elbow components were evaluated using the evaluation procedures and acceptance criteria in paragraph IWB-3640 of the ASME Section XI Code for submerged arc welds. Flaw tolerance charts were generated for the susceptible CASS elbow components in the crossover leg for Unit 1 for both axial and circumferential flaws that represent the limiting results for inside surface, outside surface and embedded flaws. The purpose of these flaw tolerance charts was to identify the maximum acceptable initial flaw size for a service life of 60 years. Any flaw which falls below the allowable flaw size curve is acceptable in accordance with the IWB-3640 acceptance criteria for 60 years.

Based on the results tabulated in Table 4.7.10-1, for a hypothetical postulated axial flaw with an aspect ratio of 6, the maximum acceptable initial flaw in the susceptible CASS 40° elbow on the crossover leg, is 39 percent of the wall thickness. For all other flaw configurations and susceptible CASS elbow component locations tabulated in Table 4.7.10-1 for the CPNPP Units 1 and 2 RCLs, the maximum acceptable initial flaw depths are even larger. The flaw tolerance charts demonstrated that the RCL components are highly flaw tolerant, since a significantly large flaw size is necessary to cause structural integrity concerns for the CASS components. These large flaw sizes would have been originally detected during fabrication of the components and subsequently repaired. Furthermore, operational experience has demonstrated that these types of large flaw sizes are not present in the CASS components for PWRs.

TLAA Disposition

Validation, 10 CFR 54.21(c)(1)(i) - The RCL elbow components at CPNPP Units 1 and 2 have adequate fracture toughness and are flaw tolerant for 60 years of service life.

Table 4.7.10-1 CPNPP Units 1 and 2 Acceptable Initial Flaw Sizes (% Through-Wall Thickness) for Susceptible CASS Crossover Leg Elbow Components (Aspect Ratio = 6, for a Service Life of 60 Years)

Crossover Leg Elbow	Axial Flaw		Circumferential Flaw	
	Acceptable Initial Flaw Size	Maximum Allowable End-of-Evaluation Period Flaw Size	Acceptable Initial Flaw Size	Maximum Allowable End-of-Evaluation Period Flaw Size
40° Elbow	39%	48%	46%	75%
90° Elbow	43%	53%	49%	75%
90° Elbow with Plenum	40%	50%	44%	75%

4.7.11. Safe Shutdown Impoundment Sedimentation

TLAA Description

CPNPP FSAR Section 9.2.5.3, discusses the CPNPP SSI as part of the UHS Safety Evaluation. An equalization channel allows each body of water to adjust to a common level above the minimum water level. In the event the SCR dam fails, this channel limits the low water level in the SSI to 769-ft 6-in., at which point the volume of water contained is approximately 284 acre-feet, allowing for 40 years of sedimentation [FSAR Section 9.2.5.2].

From FSAR Section 2.4.11.6, the minimum water level of both the SCR and the SSI during normal plant operation is 770-ft. This water level is adequate for both CW pump and SSW pump operation. During postulated 100-year drought conditions, and after 40 years of sedimentation, the SSI is determined to have 284 acre-ft of water.

In addition, FSAR Section 2.4.8.2.2 discusses the sediment accumulation and capacity in the SSI. Estimated sediment production from the Panther Branch watershed above the SSI during the 40-yr projected service life of CPNPP was derived based on analytical procedures for small watersheds. The anticipated reduction in storage capacity of the SSI during that period due to accumulation of sediment was found to be 91 acre-feet, of which 85 acre-feet would be below elevation 770-ft and the remaining 6 acre-feet between elevations 770-ft and 775-ft. Comparative plots of area and capacity characteristics before and after sedimentation are shown in Figure 2.4-22. Table 2.4-19 outlines the predicted area and capacity values at the end of the 40-year period.

Inspections of the service water intake channel for sedimentation buildup are currently performed at the frequencies stated in RG 1.127 at CPNPP. This inspection consists of a direct measurement of sediment depth at the bottom of the intake channel at a minimum of five locations along its length. Measurements are taken at approximately the same location each time the inspection is performed.

If it is determined that, as a result of these inspections, the sediment has accumulated enough to increase the bottom elevation one and one-half (1.5) feet over the entire length of the inspection area, then measures will be employed to remove the sediment from the intake channel.

The minimum water level in the SSI is dictated by the Technical Specifications in order to maintain adequate cooling capacity for the plant, as required by RG 1.27. The buildup of sedimentation, over the life of the plant, is considered to be relevant in making a safety determination of the low water level (approximately 284 acre-ft of water) in the SSI that is maintained by the equalization channel. Additionally, sedimentation buildup is one of the mechanisms for a “loss of form” in earthen water-control structures effect which will be managed by the guidance in RG 1.127, as defined in NUREG-1801.

The anticipated reduction in SSI storage capacity due to sedimentation for a 40-year projected service life conservatively meets the six criteria for TLAA.

TLAA Evaluation

FSAR Section 9.2.5.2, describes that in the event the SCR dam fails, the channel limits the low water level in the SSI to 769 ft 6 in that corresponds to the remaining volume (284 acre-feet) following 40 years of sedimentation. Conservatively the sediment reduction (91 acre-feet), from FSAR Section 2.4.8.2.2, is considered a TLAA. CPNPP committed to a program for monitoring sediment buildup in the service water intake channel for the SSI with frequencies described in RG 1.127 for original plant operation in 1981 [NUREG-0797 Supplement 1, Section 2.4.8]. The CPNPP Technical Requirements Manual (TRM) and TRM Bases Sections 13.7.33 implements FSAR Section 2.4.8.2.2 by providing surveillance requirements which verify the average sediment depth is less than or equal to 1.5-ft with a 12-month frequency. If sediment accumulation is found to exceed this depth limit, then the TRM requires immediate action for removal of the sediment. The limitations on the SSI Dam ensure that sufficient cooling capacity is available in the event of a safety shutdown event (SSE). The limitation on average sediment depth is based on the possible excessive sediment buildup in the service water intake channel as discussed in FSAR Section 2.4.8.2.2 and the TRM Bases.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP and TRM requirements also help maintain the potential channel low level water limit which could be affected by sedimentation. FSAR Table 2.4-19, containing the predicted area and capacity of the SSI after 40 years of sedimentation, shows that there is sufficient capacity in the SSI at 40 years for the limit. Since the TRM requirements measure the sedimentation depth on a 12-month frequency and require immediate action for removal if 1.5-ft of sediment accumulation is found, sufficient capacity in the SSI for 60 years is assured. Therefore, this aging effect will continue to be managed for the PEO, in accordance with 10 CFR 54.21(c)(1)(iii).

TLAA Disposition

Aging Management, 10 CFR 54.21(c)(1)(iii) – the effects of aging on the intended function(s) of the SSI Sedimentation will be adequately managed for the PEO. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35) AMP will manage this aging effect of loss of form due to sedimentation.

4.8. References

4.8.1. ASTM E-185, Standard Practice for Design of Surveillance Programs for Light Water Moderated Nuclear Power Reactor Vessels, December 2016.

4.8.2. Westinghouse Report, WCAP-14040-A, Revision 4, Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves, May 2004.

4.8.3. Westinghouse Report, WCAP-18124-NP-A, Revision 0, Fluence Determination with RAPTOR-M3G and FERRET, July 2018.

4.8.4. Regulatory Guide 1.99, Revision 2, Radiation Embrittlement of Reactor Vessel Materials, May 1988.

4.8.5. ASME/BPVC SEC XI-1, Rules for Inspections and Testing of Components of Light-Water-Cooled Plants – Rules for Inservice Inspection of Nuclear Power Plant Components, July 2019.

4.8.6. ASME/BPVC SEC III-1, Class 1 Components – Rules for Construction of Nuclear Facility Components, July 2019.

4.8.7. PWROG Report, PWROG-15109-NP-A, Revision 0, “PWR Pressure Vessel Nozzle Appendix G Evaluation,” January 2020. (ADAMS Accession No. ML20024E573).

4.8.8. NRC Document, NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” February 1995 (ADAMS Accession No. ML031480219).

4.8.9. NRC Document, NUREG/CR-6909, Revision 1, “Effect of LWR Water Environments on the Fatigue Life of Reactor Materials,” May 2018 (ADAMS Accession No. ML16319A004).

4.8.10. NRC Regulatory Guide, 1.207, Revision 1, “Guidelines for Evaluating the Effects of Light Water Reactor Water Environments in Fatigue Analyses of Metal Components,” June 2018 (ADAMS Accession No. ML16315A130).

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4.8.12. Westinghouse Report, WCAP-10527, Revision 0, “Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Comanche Peaks Units 1 and 2,” April 1984.

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4.8.17. Westinghouse Report WCAP-12258 Supplement 2, Revision 0, “Evaluation of Thermal Stratification for the Comanche Peak Unit 1 Residual Heat Removal Lines,” August 1989.

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4.8.21. PWROG Report, PWROG-17033-NP-A, Revision 1, “Update for Subsequent License Renewal: WCAP-13045, “Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems,” November 2019.

4.8.22. NRC Document, NRC Letter Final Safety Evaluation for PWROG-17033-P (&NP), Revision 1, "Update for Subsequent License Renewal: WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems" PA-MSC-1498, September 26, 2019 (ADAMS Accession No. ML19266A666).

4.8.23. Regulatory Guide 1.14, Revision 1, Reactor Coolant Pump Flywheel Integrity, Revision 1 August 1975.

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4.8.26. PWROG Report, PWROG-17011-NP-A, Revision 2, “Update for Subsequent License Renewal: WCAP-14535A, ‘Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination’ and WCAP-15666-A, ‘Extension of Reactor Coolant Pump Motor Flywheel Examination’,” October 2019. (ADAMS Accession No. ML19318D194).

4.8.27. Letter from Christopher I. Grimes, U.S. Nuclear Regulatory Commission License Renewal and Standardization Branch, to Douglas J. Walters, Nuclear Energy Institute, License Renewal Issue No. 98-0030, “Thermal Aging Embrittlement of Cast Austenitic Stainless-Steel Components,” May 19, 2000. NRC ADAMS ML003717179.

4.8.28. K. Chopra, “Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR Systems,” NUREG/CR-4513, Rev. 1, U.S. Nuclear Regulatory Commission, Washington D.C., August 1994.

APPENDIX A

FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

COMANCHE PEAK NUCLEAR POWER PLANT UNITS 1 & 2

LICENSE RENEWAL APPLICATION

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A. Aging Management Programs and Time-Limited Aging Analysis Activities

A.1. Introduction

The application for a renewed operating license is required by 10 CFR 54.21(d) to include a Final Safety Analysis Report (FSAR) supplement. The CPNPP FSAR, currently at Amendment 111, includes seventeen (17) chapters. This chapter comprises the FSAR supplement of the CPNPP License Renewal Application (LRA) and includes the following sections:

Section A.1.1 contains a listing of the CPNPP AMPs for license renewal (LR) in the order of NUREG-1801 programs, that is NUREG-1801 Chapter X and NUREG-1801 Chapter XI, including the status of the programs at the time the LRA was submitted. There are no plant-specific AMPs for CPNPP.

Section A.1.2 contains a listing of the time-limited aging analyses (TLAAs).

Section A.1.3 contains a discussion stating the relationship between the Quality Assurance (QA) Program at CPNPP and the AMPs' corrective actions, confirmation process, and administrative controls elements.

Section A.1.4 contains a summary of the CPNPP Operating Experience (OE) Program.

Section A.2 contains a summary of the CPNPP programs used for managing the effects of aging. These AMPs are associated with either NUREG-1801 Chapter X or Chapter XI.

Section A.3 contains a summary of the TLAAs applicable to the period of extended operation (PEO).

Section A.4 contains the CPNPP LR Commitment List and the AMPs' planned implementation schedule.

The integrated plant assessment (IPA) for LR identified new and existing AMPs necessary to provide reasonable assurance that SSCs within the scope of LR will continue to perform their intended functions consistent with the CLB for the PEO. The PEO is defined as 20 years from the current operating license expiration date.

A.1.1. Aging Management Programs

AMPs for CPNPP LR are listed in Table A-1 and described in Section A.2. The AMPs are listed chronologically as they appear in NUREG-1801, with the Chapter X AMPs first, followed by the Chapter XI AMPs. The AMPs are categorized as either existing AMPs or new AMPs for LR. The existing CPNPP AMPs are renamed and enhanced as necessary to more closely align with AMPs described in NUREG-1801.

Table A-1 reflects the status of the AMPs at the time of the LRA submittal. Regulatory commitments, which include AMP enhancements and implementation schedules for AMPs are identified in the CPNPP LR Commitment List within Section A.4.

Table A-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Aging Management Program	Existing AMP or New AMP
X.M1	Fatigue Monitoring (A.2.1.1)	Existing
X.S1	Concrete Containment Tendon Prestress Not Applicable (CPNPP U1 and U2 have steel-lined, reinforced concrete containment structure without tendons)	N/A
X.E1	Environmental Qualification of Electric Components (A.2.1.2)	Existing
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.2.2.1)	Existing
XI.M2	Water Chemistry (A.2.2.2)	Existing
XI.M3	Reactor Head Closure Stud Bolting (A.2.2.3)	Existing
XI.M4	BWR Vessel ID Attachment Welds Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M5	BWR Feedwater Nozzle Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M6	BWR Control Rod Drive Return Line Nozzle Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M7	BWR Stress Corrosion Cracking Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M8	BWR Penetrations Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M9	BWR Vessel Internals Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M10	Boric Acid Corrosion (A.2.2.4)	Existing
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (A.2.2.5)	Existing
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (A.2.2.6)	New

Table A-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Aging Management Program	Existing AMP or New AMP
XI.M16A	PWR Vessel Internals (A.2.2.7)	New
XI.M17	Flow-Accelerated Corrosion (A.2.2.8)	Existing
XI.M18	Bolting Integrity (A.2.2.9)	Existing
XI.M19	Steam Generators (A.2.2.10)	Existing
XI.M20	Open-Cycle Cooling Water System (A.2.2.11)	Existing
XI.M21A	Closed Treated Water Systems (A.2.2.12)	Existing
XI.M22	Boraflex Monitoring Not Applicable (CPNPP credits neutron absorbers other than Boraflex.)	N/A
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.2.13)	Existing
XI.M24	Compressed Air Monitoring (A.2.2.14)	Existing
XI.M25	BWR Reactor Water Cleanup System Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M26	Fire Protection (A.2.2.15)	Existing
XI.M27	Fire Water System (A.2.2.16)	Existing
XI.M29	Aboveground Metallic Tanks Not Applicable (CPNPP U1 and U2 do not have any tanks in the scope of this AMP)	N/A
XI.M30	Fuel Oil Chemistry (A.2.2.17)	Existing
XI.M31	Reactor Vessel Surveillance (A.2.2.18)	Existing
XI.M32	One-Time Inspection (A.2.2.19)	New
XI.M33	Selective Leaching (A.2.2.20)	New
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (A.2.2.21)	New
XI.M36	External Surfaces Monitoring of Mechanical Components (A.2.2.22)	Existing
XI.M37	Flux Thimble Tube Inspection (A.2.2.23)	Existing
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (A.2.2.24)	New
XI.M39	Lubricating Oil Analysis (A.2.2.5)	Existing
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex (A.2.2.26)	Existing
XI.M41	Buried and Underground Piping and Tanks (A.2.2.27)	Existing
XI.M42	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (A.2.2.28)	Existing
XI.S1	ASME Section XI, Subsection IWE (A.2.2.29)	Existing
XI.S2	ASME Section XI, Subsection IWL (A.2.2.30)	Existing

Table A-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Aging Management Program	Existing AMP or New AMP
XI.S3	ASME Section XI, Subsection IWF (A.2.2.31)	Existing
XI.S4	10 CFR Part 50, Appendix J (A.2.2.32)	Existing
XI.S5	Masonry Walls (A.2.2.33)	Existing
XI.S6	Structures Monitoring (A.2.2.34)	Existing
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (A.2.2.35)	Existing
XI.S8	Protective Coating Monitoring and Maintenance Program (A.2.2.36)	Existing
XI.E1	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.37)	New
XI.E2	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (A.2.2.38)	New
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.39)	New
XI.E4	Metal Enclosed Bus (A.2.2.40)	New
XI.E5	Fuse Holders Not Applicable (CPNPP U1 and U2 do not have any components within this program scope.)	N/A
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.41)	New
CPNPP Plant-Specific Program	Not Applicable (CPNPP U1 and U2 do not have any unique plant-specific AMPs beyond those described in NUREG-1801)	N/A

A.1.2. Time-Limited Aging Analyses

The TLAA summaries applicable to CPNPP during the PEO are identified in the table below and described in the sections subordinate to Section A.3:

Table A-2
List of Time-Limited Aging Analyses

Category (Section)	Time-Limited Aging Analyses Name	Section
Reactor Vessel Neutron Embrittlement Analysis (A.3.2)	Neutron Fluence Analysis	A.3.2.1
	Pressurized Thermal Shock	A.3.2.2
	Upper-Shelf Energy	A.3.2.3
	Adjusted Reference Temperature	A.3.2.4
	Pressure Temperature Limits Including Low Temperature Over Pressure Protection Analysis	A.3.2.5

Table A-2
List of Time-Limited Aging Analyses

Category (Section)	Time-Limited Aging Analyses Name	Section
Metal Fatigue (A.3.3)	Transient Cycle Projections for 60 Years	A.3.3.1
	ASME Section III, Class 1 Fatigue Analysis of Piping and Components	A.3.3.2
	ASME Section III, Class 2 and 3 and ANSI B31.1 Allowable Stress Analyses	A.3.3.3
	Environmentally Assisted Fatigue	A.3.3.4
	Reactor Vessel Internals Fatigue Analyses	A.3.3.5
	High-Energy Line Break Analyses	A.3.3.6
Environmental Qualification of Electric Equipment (A.3.4)	Environmental Qualification of Electric Equipment	A.3.4
Concrete Containment Tendon Prestress	Not Applicable (CPNPP U1 and U2 have steel-lined, reinforced concrete containment structure without tendons)	N/A
Containment Liner Plate, Metal Containments, and Penetrations Fatigue (A.3.5)	Containment Liner Plate Fatigue	A.3.5.1
	Containment Penetrations Fatigue	A.3.5.2
Other Plant-Specific TLAAs (A.3.6)	Leak-Before-Break	A.3.6.1
	Reactor Coolant Pump Casings ASME Code Case N-481	A.3.6.2
	Reactor Coolant Pump Flywheel Fatigue Crack	A.3.6.3
	Crane Load Cycle Limits	A.3.6.4
	Spent Fuel Pool Metal Corrosion Allowance	A.3.6.5
	Protective Coatings	A.3.6.6
	Steam Generator Tubes Metal Corrosion Allowance	A.3.6.7
	Steam Generator Flow-Induced Vibration and Tube Wear Evaluations	A.3.6.8
	Steam Generator U-Bend Tube Vibration and Fatigue Assessment	A.3.6.9
	Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components	A.3.6.10
	Safe Shutdown Impoundment Sedimentation	A.3.6.11

A.1.3. Quality Assurance Program and Administrative Controls

The QA Program for CPNPP implements the requirements of 10 CFR 50, Appendix B, and will be consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)," of NUREG-1800. The QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to nuclear safety related SSCs. CPNPP will enhance the QA Program to include NNS SSCs that are subject to AMR for LR.

A.1.4. Operating Experience Program

The CPNPP OE Program captures the OE from site-specific and industry sources and is systematically reviewed on an ongoing basis in accordance with the CPNPP QA Program. This OE program also meets the provisions of NUREG-0737, “Clarification of TMI Action Plan Requirements,” Item I.C.5, “Procedures for Feedback of Operating Experience to Plant Staff.” The CPNPP OE Program interfaces with and relies on active participation in the Institute of Nuclear Power Operations (INPO) OE program, as endorsed by the NRC. Incoming external OE items are reviewed with items identified to need additional review assigned for further evaluation (FE).

In order to provide additional assurance that internal and external OE related to aging management is used effectively during the PEO, CPNPP will enhance its OE program to clarify that incoming OE items be reviewed to determine whether they may involve age-related degradation or aging management impacts. Research and development from appropriate sources (i.e., EPRI, INPO, and ASME) will also be reviewed. Items identified to need additional review are assigned for FE, and, as a result, the pertinent AMPs will be either enhanced, or new AMPs will be developed, as appropriate, when it is determined through these evaluations that the effects of aging may not be adequately managed. Training on age-related degradation and aging management will be provided to those personnel responsible for implementing the AMPs and to those who may review, screen, assign, evaluate, or otherwise process site-specific and industry OE, such as the department Corrective Action Program (CAP) coordinators. Plant-specific OE associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the CPNPP OE Program.

A.2. Aging Management Programs

A.2.1. NUREG-1801 Chapter X Aging Management Programs

This section provides FSAR summaries of the LR AMPs associated with TLAAs.

A.2.1.1. Fatigue Monitoring

The Fatigue Monitoring AMP is an existing AMP that ensures that fatigue usage remains within allowable limits for components identified to have a fatigue TLAA by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients is bounded by the design transient definitions for which they are classified, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components including those from NUREG/CR-6260 and those components identified to be more limiting than the components specified in NUREG/CR-6260. Tracking the number of critical thermal and pressure transients for the selected components ensures a cumulative usage factor (CUF) for fatigue within allowable limits, including environmental effects where applicable.

A.2.1.2. Environmental Qualification of Electric Components

The Environmental Qualification of Electric Components AMP is an existing AMP that manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49 qualification methods. The NRC has established nuclear station EQ requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants.”

The Environmental Qualification of Electric Components AMP provides the requirements for the environmental qualification of electrical equipment important to safety that could be exposed to harsh environment accident conditions as required by 10 CFR 50.49 and RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants." The Environmental Qualification of Electric Components AMP is established per the requirements of 10 CFR 50.49 to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of inservice aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a (LOCA, high-energy line break (HELB), or post-LOCA radiation.

The Environmental Qualification of Electrical Equipment provides EQ-related surveillance and maintenance requirements for EQ equipment. Monitoring of certain environmental conditions or component parameters may be used to ensure that the component is within the bounds of its qualification basis, or as a means to modify the qualified life. Aging evaluations for EQ equipment that specify a qualification of 60 years or less are TLAAs for LR. The Environmental Qualification of Electrical Equipment AMP is implemented in accordance with 10 CFR 50.49 and 10 CFR 54.21(c)(1)(iii).

As required by 10 CFR 50.49, EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. Requalification of equipment is controlled and documented in a process consistent with the CLB.

A.2.2. NUREG-1801 Chapter XI Aging Management Programs

This section provides FSAR summaries of NUREG-1801 Chapter XI AMPs credited for managing the effects of aging.

A.2.2.1. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

The American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is an existing condition monitoring AMP and consists of periodic volumetric, surface, and/or visual examination of ASME Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting for assessment, signs of degradation, and corrective actions. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is implemented in accordance with the ASME Code Section XI edition and addenda approved in accordance with provisions of 10 CFR 50.55a during the PEO.

A.2.2.2. Water Chemistry

The Water Chemistry AMP is an existing mitigation AMP that manages the aging effects of loss of material due to corrosion, cracking due to SCC and related mechanisms, and reduction of heat transfer due to fouling in components exposed to a treated water environment. The Water Chemistry AMP controls water chemistry for impurities such as chloride, fluoride, and sulfate that accelerate corrosion. The Water Chemistry AMP relies on monitoring and control of water chemistry to keep peak levels of various contaminants below the system specific limits, based on EPRI water chemistry guidelines EPRI 3002000505 “PWR Primary Water Chemistry Guidelines,” Revision 7 and EPRI 3002010645 “PWR Secondary Water Chemistry Guidelines,” Revision 8, and internal and industry OE. The One-Time Inspection (A.2.2.19) AMP verifies the effectiveness of the Water Chemistry AMP.

A.2.2.3. Reactor Head Closure Stud Bolting

The Reactor Head Closure Stud Bolting AMP is an existing preventive and condition monitoring AMP that provides for preventive and condition monitoring activities to manage reactor head closure studs and associated reactor pressure vessel (RPV) head flange threads, nuts, and washers for cracking and loss of material. The Reactor Head Closure Stud Bolting AMP is implemented through station procedures based on the examination and inspection requirements specified in ASME Code, Section XI, Table IWB-2500-1 and preventive measures to mitigate cracking. The Reactor Head Closure Stud Bolting AMP also relies on recommendations to address reactor head stud bolting age-related degradation delineated in NUREG-1339 and NRC RG 1.65.

A.2.2.4. Boric Acid Corrosion

The Boric Acid Corrosion AMP is an existing condition monitoring AMP that manages loss of material for components on which borated water may leak. The Boric Acid Corrosion AMP consists of (a) visual inspection of external surfaces that are potentially in an environment of borated water leakage, including mechanical, electrical, and structural components; (b) timely identification of leak path and removal of boric acid residues; (c) assessment of degradation due to corrosion, if any; and (d) follow-up inspection for adequacy. The Boric Acid Corrosion AMP was implemented in response to NRC GL 88-05 and industry OE.

The Boric Acid Corrosion AMP also includes provisions to initiate evaluations and assessments when leakage is discovered by activities not associated with the program. The Boric Acid Corrosion AMP follows the guidance described in Section 7 of WCAP-15988-NP, Revision 2, “Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors.”

A.2.2.5. Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP is an existing condition monitoring AMP that manages the aging effects of primary water stress corrosion cracking (PWSCC) of nickel alloy-based components and associated welds, as well as loss of material due to boric acid-induced corrosion in susceptible components in the vicinity of nickel alloy reactor coolant pressure boundary (RCPB) components. This condition monitoring AMP includes periodic bare-metal visual and volumetric examinations of nickel alloy-based components, associated welds, and components in the vicinity of nickel alloy-based RCPB components that are susceptible to loss of material due to boric acid-induced corrosion, such as RPV components, pressurizer components, and RCS pressure boundary piping and welds. The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP also includes inspection requirements for RPV upper heads and steam generator drain stubs. Inspection methods, schedules and frequencies for susceptible components are implemented in accordance with 10 CFR 50.55a. Reactor coolant leakage is calculated and trended on a routine basis in accordance with technical specifications. The acceptance criteria for identified flaws and the methodology for evaluating the flaws are prescribed in 10 CFR 50.55a. Unacceptable indications of flaws are corrected through implementation of appropriate repair or replacement as dictated in 10 CFR 50.55a.

A.2.2.6. Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP is a new monitoring program that provides assurance that RCPB CASS components susceptible to thermal aging embrittlement meet their intended functions. The ASME Code Class 1 CASS components are maintained by inspecting and evaluating the extent of thermal aging embrittlement in accordance with the requirements of the ASME Boiler and Pressure Vessel (B&PV) Code, Section XI. The CPNPP ASME Section XI Inservice Inspection program is augmented by the implementation of the Thermal Aging Embrittlement of CASS AMP, which monitors the aging effect of loss of fracture toughness due to thermal aging embrittlement of ASME Code Class 1 CASS components.

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP includes a screening methodology to determine component susceptibility to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For “potentially susceptible” components, thermal aging embrittlement management is accomplished through plant-specific flaw tolerance evaluations. Inspections or evaluations are not required for components that are determined not to be susceptible to thermal aging embrittlement. Screening for ASME Code Class 1 CASS components susceptible to thermal aging embrittlement is not required for pump casings and valve bodies. The existing ASME Section XI inspection requirements are adequate for managing the aging effects of Class 1 pump casings and valve bodies.

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP determined that three CPNPP reactor coolant loop (RCL) CASS components are susceptible to thermal aging embrittlement via a screening process in accordance with NUREG-1801. The three components are all from CPNPP Unit 1 and include a crossover leg 40-degree elbow, a crossover leg 90-degree elbow, and a crossover 90-degree elbow with plenum. A plant-specific flaw evaluation using plant-specific geometry and stress information was completed for all three of the components and it was determined that even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service.

A.2.2.7. PWR Vessel Internals

The PWR Vessel Internals AMP is a new condition monitoring AMP. The PWR Vessel Internals AMP, in accordance with the requirements of NEI 03-08, will be based on the inspection and evaluation guidelines of EPRI Technical Report No. 3002017168 (MRP-227, Revision 1-A), or the latest NRC-approved revision of MRP-227, and applied through the use of EPRI Technical Report No. 3002010399 (MRP-228, Revision 3), or the latest NRC-approved revision of MRP-228. The inspection and evaluation guidelines in MRP-227, Revision 1-A were written for an operating period of 60 years; therefore, a gap analysis to identify AMP enhancements that are needed to address an 80-year operating period are non-relevant to CPNPP at this time. CPNPP currently evaluates and will continue to evaluate and implement interim guidance updates released under the NEI 03-08 initiative and by the PWROG to manage the aging of RVI.

The new AMP is used to manage the effects of age-related degradation mechanisms that are applicable to RVI components. These degradation mechanisms, as identified in MRP-227, Revision 1-A, include:

- Cracking, including SCC, IASCC, PWSCC, and cracking due to fatigue/cyclic loading;
- Loss of material induced by wear;
- Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement;
- Change in dimension due to void swelling or distortion; and
- Loss of preload due to thermal and irradiation-enhanced stress relaxation and creep.

A.2.2.8. Flow-Accelerated Corrosion

The Flow-Accelerated Corrosion (FAC) AMP is an existing condition monitoring AMP that manages loss of material due to wall thinning caused by FAC for carbon steel piping and components through (a) performing an analysis to determine systems susceptible to FAC, (b) conducting appropriate analysis to predict wall thinning, (c) performing wall thickness measurements based on wall thinning predictions and OE, and (d) evaluating measurement results to determine the remaining service life and the need for replacement or repair of components. The AMP relies on implementation of guidelines published by EPRI in NSAC-202L Revision 4 and on internal and external OE.

The Flow-Accelerated Corrosion AMP will also manage wall thinning due to various erosion mechanisms for all components that are susceptible to erosion wall-thinning mechanisms, such as cavitation, flashing, droplet impingement, or solid particle impingement, that may be identified through industry or plant-specific OE.

A.2.2.9. Bolting Integrity

The Bolting Integrity AMP is an existing condition monitoring AMP that manages loss of preload, cracking, and loss of material for pressure-retaining closure bolting using preventive measures and inspection activities. The Bolting Integrity AMP incorporates applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213.

Preventive measures include material selection (e.g., minimized use of materials with an actual measured yield strength greater than 150 kilo pounds per square inch [ksi]) and lubricant selection (e.g., restricting the use of molybdenum disulfide). Preventative measures also include applying the appropriate preload (torque) and checking for uniformity of gasket compression where appropriate to preclude loss of preload, loss of material, and cracking. The preventive measures of the Bolting Integrity AMP also manage loss of preload for buried fire water, station service water (SSW), and emergency diesel generator system bolting, which is inspected under the Buried and Underground Piping and Tanks (A.2.2.27) AMP. There is no CPNPP closure bolting in the scope of LR with an actual measured yield strength > 150 ksi.

The ASME Section XI Inservice Inspection (ISI) Subsections IWB, IWC, and IWD (A.2.2.1) AMP includes inspections of safety related and non-safety related closure bolting and supplements this Bolting Integrity AMP. Other related AMPs manage the reactor head closure studs and nuclear safety related and NNS structural bolting including the Reactor Head Closure Stud Bolting (A.2.2.3) AMP, ASME Section XI, Subsection IWE (A.2.2.29) AMP, ASME Section XI, Subsection IWF (A.2.2.31) AMP, Structures Monitoring (A.2.2.34) AMP, and Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.2.13) AMP.

A.2.2.10. Steam Generators

The Steam Generators AMP is an existing preventive, mitigative, condition monitoring, and performance monitoring AMP that manages the aging of steam generator (SG) tubes, plugs, sleeves, divider plate assemblies, head (interior surfaces of channel or lower heads), tubesheets (primary side), tube-to-tubesheet welds, and secondary side components that are contained within the SG (i.e., secondary side internals). However, tube-to-tubesheet welds in the CPNPP Unit 2 SGs are exempt from inspection and monitoring per Amendment No. 158 to the Facility Operating License (Comanche Peak Steam Electric Station, Units 1 and 2 - Issuance of Amendments Re: License Amendment Request for Changes to TSs 5.5.9 and 5.6.9 Regarding Alternate Steam Generator Repair Criteria, (Reference ML12263A036) for permanent Alternate Repair Criteria (H*) for steam generator tubes.

The aging of SG pressure vessel welds is managed by other AMPs, such as the ASME Section XI inservice Inspection, Subsections IWB, IWC, and IWD (A.2.2.1) AMP, Water Chemistry (A.2.2.2) AMP, and One-Time Inspection (A.2.2.19) AMP.

The establishment of a Steam Generator AMP for ensuring SG tube integrity is required by the CPNPP TSs. Additionally, administrative controls require tube integrity to be maintained to specific performance criteria, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, and leakage monitoring requirements. The nondestructive examination (NDE) techniques used to inspect SG components covered by the Steam Generators AMP are intended to identify components (e.g., tubes, plugs) with degradation that may need to be removed from service, repaired, or replaced, as appropriate.

The Steam Generators AMP is modeled after NEI 97-06, "Steam Generator Program Guidelines" and incorporates the referenced EPRI Guidelines of NEI 97-06.

Volumetric inspections are performed on steam generators to identify degradation such as PWSCC, outer diameter stress corrosion cracking (ODSCC), and loss of material due to foreign objects and tube support structures. General visual inspections are also performed to identify any evidence of cracking, loss of material, or corrosion, where accessible. The Steam Generators AMP includes a degradation assessment (DA) to determine the type and location of flaws to which the tube may be susceptible, and implementation of inspection methods capable of detecting those forms of degradation are addressed.

The Steam Generators AMP also performs general visual inspections of the steam generator heads (internal surfaces) looking for evidence of cracking or loss of material (e.g., rust stains). Additionally, the Steam Generators AMP includes foreign material exclusion as a means to inhibit wear degradation, and secondary side maintenance activities, such as sludge lancing, for removing deposits that may contribute to component degradation.

A.2.2.11. <u>Open-Cycle Cooling Water System</u>

The Open-Cycle Cooling Water System AMP is an existing preventive, mitigative, condition monitoring, and performance monitoring AMP based on the implementation of NRC GL 89-13, which includes:

- Surveillance and control of biofouling
- Verification of heat transfer
- Routine inspection and maintenance program
- System walkdown inspection
- Review of maintenance, operating, and training practices and procedures

The Open-Cycle Cooling Water System AMP applies to components constructed of various materials including steel, stainless steel, copper alloys, and nickel alloys. Coatings and linings will be managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (A.2.2.28) AMP.

The Open-Cycle Cooling Water System AMP manages heat exchangers, piping, and piping components in in-scope nuclear safety related water systems that are exposed to a raw water environment for loss of material, flow blockage, and reduction of heat transfer. The guidelines of GL 89-13 are implemented through the site GL 89-13 activities and the Open-Cycle Cooling Water System AMP. System and component testing, visual inspections, non-destructive examination (i.e., ultrasonic testing and eddy current testing), and chemical injection are conducted to ensure that identified aging effects are managed such that system and component intended functions and integrity are maintained.

A.2.2.12. Closed Treated Water Systems

The Closed Treated Water Systems AMP is an existing mitigation AMP that also includes condition monitoring to verify the effectiveness of the mitigation activities. The Closed Treated Water Systems AMP manages loss of material, cracking, and reduction of heat transfer for components that are exposed to the closed cooling water systems in which water chemistry is controlled and heat is not directly rejected to the ultimate heat sink. The Closed Treated Water Systems AMP includes (a) water treatment, including the use of corrosion inhibitors, to modify the chemical composition of the water such that function of the equipment is maintained and the effects of corrosion and microbiological activity are minimized; (b) chemical testing of the water so that the water treatment program maintains the water chemistry within acceptable guidelines; and (c) inspections to determine the presence or extent of corrosion and/or cracking.

A.2.2.13. Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP is an existing condition monitoring AMP that evaluates the effectiveness of maintenance monitoring activities for cranes and hoists that are within the scope of LR. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP consists of periodic and on-demand visual inspections for loss of material due to general corrosion on the bridge rails, bridge, and trolley structural components for those cranes that are within the scope of 10 CFR 54.4, and the effects of wear on rails. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP also manages loss of preload of associated bolted connections. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP relies on the guidance in NUREG-0612, ASME B30.2, and other appropriate standards in the ASME B30 series

A.2.2.14. Compressed Air Monitoring

The Compressed Air Monitoring AMP is an existing condition and performance monitoring AMP that manages the loss of material on piping, piping components, and valve bodies in the Instrument Air (CI) System. The Compressed Air Monitoring AMP includes monitoring of moisture content and contaminants such that specified limits are maintained and inspection of components for indications of loss of material.

The Compressed Air Monitoring AMP is based on CPNPP's response to NRC GL 88-14, "Instrument Air Supply Problems" and utilizes guidance and standards provided by ANSI/ISAS7.0.01-1996; INPO SOER 88-01, "Instrument Air System Failures"; and International Organization for Standardization (ISO) 8573, "Compressed Air". The Compressed Air Monitoring AMP activities implement the moisture content and contaminant criteria of ANSI/ISA-S7.0.01-1996. AMP activities include air quality checks at various locations to ensure that dew point and particulates are maintained within the specified limits and periodic inspections of select Instrument Air System component internal surfaces for signs of loss of material due to corrosion.

A.2.2.15. Fire Protection

The Fire Protection AMP is an existing condition and performance monitoring AMP that manages cracking, loss of material, separation, delamination, and change in material properties (e.g., shrinkage, loss of strength) through periodic visual inspection of components and structures with a fire barrier intended function (i.e., seals, fire barrier walls, ceilings, floors, and other fire-resistant materials). The Fire Protection AMP also performs periodic visual and functional testing of fire doors to ensure their operability as well as periodic visual and functional testing of the halon fire suppression system.

The Fire Protection AMP includes visual inspections of 100 percent of each type of penetration fire seal every 15 years in accordance with the plant's NRC-approved fire protection program. Visual inspections of the fire barrier walls, ceilings, and floors in structures within the scope of LR are performed at a frequency in accordance with the plant's NRC-approved fire protection program. The frequency of visual inspections of the fire door surfaces and functional testing of fire door closing mechanisms and latches is in accordance with the plant's NRC-approved fire protection program.

A.2.2.16. Fire Water System

The Fire Water System AMP is an existing condition and performance monitoring AMP that manages loss of material and flow blockage due to fouling for in-scope long-lived passive water-based fire suppression system components using periodic flow testing and visual inspections. The Fire Water System AMP will also manage loss of coating integrity for the fire water storage tanks (FWSTs), via periodic internal tank inspections. When visual inspections are used to detect loss of material and fouling, the inspection technique will be capable of detecting surface irregularities that could indicate wall loss due to corrosion, corrosion product deposition, and flow blockage due to fouling. There are no fire pump suction strainers for the main fire protection pumps, or foam water sprinkler systems within the scope of LR.

Testing or replacement of sprinkler heads that have been in service for 50 years will be performed in accordance with the 2011 Edition of NFPA 25. Portions of the water-based fire water system that (a) are normally dry, but periodically subject to flow (e.g., dry-pipe or downstream of the deluge valve in a deluge system); and (b) cannot be drained or allow water to collect are subject to augmented examination beyond that specified in NFPA 25. The augmented examinations for the portions of normally dry piping that are periodically wetted or experience recurring internal corrosion include (a) periodic full flow tests at the design pressure and flow rate, or internal inspections; and (b) volumetric wall thickness evaluations.

Water system pressure is continuously monitored such that loss of pressure is detected and corrective action initiated.

The training and qualification of individuals involved in FWST coating inspections is conducted in accordance with ASTM International standards endorsed in RG 1.54, including limitations (if any) identified in RG 1.54 on a particular standard.

A.2.2.17. Fuel Oil Chemistry

The Fuel Oil Chemistry AMP is an existing mitigation and condition monitoring AMP that manages loss of material in tanks, components, and piping exposed to an environment of diesel fuel oil. The Fuel Oil Chemistry AMP includes surveillance and maintenance procedures to mitigate corrosion. The Fuel Oil Chemistry AMP includes periodic removal of accumulated water found in tanks; periodic draining, cleaning and inspection of the Emergency Diesel Generator Fuel Oil Storage Tanks, Emergency Diesel Generator Fuel Oil Day Tanks, and Diesel Driven Fire Pump Fuel Oil Storage Tanks. Volumetric examinations are used to assess identified degradation where internal visual inspection is not possible.

Fuel oil quality is maintained by monitoring and controlling fuel oil contamination. TSs provide limits for both new and stored fuel oil for use in the emergency diesel generators. Fuel oil quality requirements for the diesel driven fire pumps are from industry standards and the equipment manufacturer. Guidelines of ASTM Standards are used where applicable. Exposure to fuel oil contaminants, such as water and microbiological organisms, is minimized by periodic cleaning/draining of tanks and by verifying the quality of new fuel oil before its introduction into the storage tanks.

The effectiveness of the fuel oil chemistry controls is verified through one-time inspections of a representative sample of components in systems that contain fuel oil in accordance with the One-Time Inspection (A.2.2.19) AMP.

A.2.2.18. Reactor Vessel Surveillance

The Reactor Vessel Surveillance AMP is an existing condition monitoring AMP that manages loss of fracture toughness for reactor vessels as a consequence of neutron irradiated embrittlement. The program includes all reactor vessel beltline materials as defined by 10 CFR 50 Appendix G, Section II.F, and complies with 10 CFR 50, Appendix H for vessel material surveillance. The program consists of the periodic withdrawal of surveillance capsules from the reactor vessel. These surveillance capsules contain reactor vessel material specimens and dosimetry. The capsule withdrawal schedule is approved consistent with 10 CFR 50, Appendix H and controlled by the P-T limit reports (PTLR). As required by 10 CFR 50, Appendix H, the testing of the capsules meet ASTM E185-82, in order to measure the shift in the nil-ductility transition temperature (NDTT), the drop in the upper-shelf energy (USE) and neutron fluence exposure of the surveillance capsule.

The data from specimen testing are used to validate the embrittlement projections, performed using NRC RG 1.99, Revision 2, which demonstrate compliance with 10 CFR Part 50, Appendix G, requirements and 10 CFR 50.61 limits, i.e., USE, P-T limit curves, and PTS. The data from specimen testing validate the neutron fluence projection for the reactor vessel and determine operating restrictions.

A.2.2.19. One-Time Inspection

The One-Time Inspection AMP is a new condition monitoring AMP that will verify the system-wide effectiveness of the Water Chemistry (A.2.2.2), Fuel Oil Chemistry (A.2.2.17), and Lubricating Oil Analysis (A.2.2.25) AMPs which are designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the PEO. A representative sample is 20 percent of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. The sample population will consist of, where practical, those components that are considered bounding or lead components most susceptible to aging due to time in service or severity of operating conditions.

The elements of the One-Time Inspection AMP include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and OE, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the PEO.

Periodic inspections will be used instead of the One-Time Inspection AMP for structures or components with known age-related degradation mechanisms or when the environment in the PEO is not expected to be equivalent to that in the prior operating period. Inspections not conducted in accordance with ASME Code Section XI requirements will be conducted in accordance with plant-specific procedures, including inspection parameters such as lighting, distance, offset, and surface conditions.

A.2.2.20. Selective Leaching

The Selective Leaching AMP is a new condition monitoring AMP that performs one-time inspections to demonstrate the absence of selective leaching of a representative sample of susceptible components within the scope of LR. Susceptible components include piping, valve bodies, pump casings, heat exchanger components, and bolting. The materials of construction for these components that are susceptible to selective leaching are gray cast iron, ductile iron, and copper alloy with greater that 15 percent zinc or greater than 8 percent aluminum. A sample size of 20 percent of susceptible components will be subject to a one-time inspection with a maximum of 25 inspections for each of the susceptible material and environment combination groups.

The one-time inspections for loss of material due to selective leaching will include visual examinations, supplemented by hardness tests or other mechanical examination techniques such as destructive testing, scraping, or chipping of selected components that are susceptible to selective leaching. These inspections will determine whether loss of material due to selective leaching is occurring and whether the process will affect the ability of the components to perform their intended function during the PEO. If loss of material due to selective leaching is identified, FE of the extent of selective leaching will be performed under the CAP, which may include an expansion of the inspection sample size and locations.

A.2.2.21. One-Time Inspection of ASME Code Class 1 Small Bore-Piping

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP is a new condition monitoring AMP that will augment the existing ASME Code, Section XI requirements. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP is applicable to small-bore ASME Code Class 1 piping and systems less than NPS 4 and greater than or equal to NPS 1. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will perform one-time volumetric inspections of a sample of this Class 1 piping focused on full (butt) and partial penetration (socket) welds. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will include measures to verify that degradation is not occurring, thereby either confirming that there is no need to manage age-related degradation or validating the effectiveness of any existing AMP for the PEO. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will include locations that are susceptible to cracking and will be applicable to systems that have not experienced cracking of ASME Code Class 1 small-bore piping. The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will also be applicable to systems that have experienced cracking but then implemented design changes to effectively mitigate cracking (if any exist). Should evidence of cracking be revealed by a one-time inspection, a periodic inspection will be addressed by the CAP and a new plant-specific AMP developed, as warranted.

A.2.2.22. External Surfaces Monitoring of Mechanical Components

The External Surfaces Monitoring of Mechanical Components AMP is an existing condition monitoring AMP that directs visual inspections of external surfaces of components that are performed during system inspections and walkdowns. The External Surfaces Monitoring of Mechanical Components AMP consists of periodic visual inspections of metallic and elastomeric components such as piping, piping components, ducting, and other components within the scope of LR. The External Surfaces Monitoring of Mechanical Components AMP manages aging effects of components fabricated of metallic and elastomeric components through visual inspection of external surfaces for evidence of loss of material, cracking, and change in material properties, and reduction of heat transfer due to fouling (cooling coils). Visual inspections are augmented by physical manipulation as necessary to detect hardening and loss of strength of elastomers.

A.2.2.23. Flux Thimble Tube Inspection

The Flux Thimble Tube Inspection AMP is an existing condition monitoring AMP that manages the loss of material in flux thimble tubes due to wear (i.e., wall thinning). Flux thimble tubes, which provide a path for the in-core neutron flux monitoring system detectors, establish part of the RCPB and are subject to flow-induced fretting which causes wear. The Flux Thimble Tube Inspection AMP uses the non-destructive examination methodology of eddy current testing to periodically inspect the flux thimble tubes. The results of the periodic eddy current testing are evaluated and trended to determine if corrective actions are required or if the inspection frequency needs to be changed to ensure RCPB integrity is maintained. Corrective actions include flux thimble tube limited repositioning, replacement, or isolation (removal from service).

The Flux Thimble Tube Inspection AMP implements the recommendations of NRC IEB 88-09, "Thimble Tube Thinning in Westinghouse Reactors," in regard to nondestructive examinations such as eddy current testing or other justified and NRC-approved method used to monitor flux thimble tube wear. The Flux Thimble Tube Inspection AMP will continue to be implemented during the PEO.

A.2.2.24. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is a new condition monitoring AMP that will manage loss of material, cracking, hardening and loss of strength, and reduction of heat transfer using representative sampling and opportunistic visual inspections of the internal surfaces of metallic and elastomeric (including polymeric) components. Internal inspections will be performed during periodic system and component surveillances or during the performance of maintenance activities when the surfaces are accessible for visual inspection.

Where practical, the inspections will focus on the components most susceptible to aging because of time in service and severity of operating conditions. At a minimum, in each 10-year period during the PEO, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) up to maximum of 25 components per population will be inspected per Unit. Opportunistic inspections will continue in each period even if the minimum sample size has been inspected.

For metallic components, visual inspection will be used to detect evidence of loss of material and reduction of heat transfer due to fouling. Surface examinations or visual inspections methods shown to be capable of detecting cracking, such as VT-1 examinations, will be conducted to detect cracking of stainless steel components. For non-metallic components, visual inspections and physical manipulation or pressurization will be used to detect evidence of surface irregularities. Visual examinations of elastomeric components will be accompanied by physical manipulation such that changes in material properties are readily observable. The sample size for physical manipulation will be at least 10 percent of accessible surface area.

Specific acceptance criteria are as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Elastomers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.

Conditions that do not meet the acceptance criteria are entered into the CAP for evaluation. Any indications of relevant degradation will be evaluated using design standards, procedural requirements, CLB, and industry codes or standards.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components does not manage components in which recurring internal corrosion is a known issue. OE has not identified instances of recurring internal corrosion.

A.2.2.25. Lubricating Oil Analysis

The Lubricating Oil Analysis AMP is an existing mitigative and condition monitoring AMP. The purpose of the Lubricating Oil Analysis AMP is to provide reasonable assurance that the oil environment in mechanical systems is maintained to the required quality to prevent or mitigate age-related degradation of components within the scope of the Lubricating Oil Analysis AMP. The Lubricating Oil Analysis AMP maintains lubricating oil system contaminants (water and particulates) within acceptable limits, thereby preserving an environment that is not conductive to loss of material or reduction of heat transfer. Testing activities include sampling and analysis of lubricating oil and hydraulic oil for contaminants which could be indicative of in-leakage and corrosion product buildup.

The effectiveness of the Lubricating Oil Analysis AMP will be validated by the results of inspection completed under the One-Time Inspection (A.2.2.19) AMP.

A.2.2.26. Monitoring of Neutron-Absorbing Materials Other than Boraflex

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP is an existing condition monitoring AMP that periodically inspects and analyzes test coupons of the BORAL material in the spent fuel storage racks to determine if the neutron-absorbing capability of the material has degraded over time. The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP ensures that a five (5) percent sub-criticality margin in the spent fuel pool (SFP) is maintained during the PEO by monitoring for loss of material, changes in dimension, and loss of neutron-absorption capacity of the BORAL material.

The existing coupon inspection frequency ensures at least one (1) coupon is examined every 10 years, regardless of OE.

A.2.2.27. Buried and Underground Piping and Tanks

The Buried and Underground Piping and Tanks AMP is an existing preventive, mitigative, and condition monitoring AMP that manages the aging effects associated with the external surfaces of buried and underground piping and tanks for loss of material and loss of coating integrity. It addresses piping and tanks composed of metallic (carbon steel, cast iron, and cement lined ductile iron) materials that are within the scope of LR in the SSW, emergency diesel generator (fuel oil), and fire protection systems. Loss of material is monitored by visual inspection of the exterior or wall thickness measurements of piping and tanks. Wall thickness is determined by an NDE technique such as ultrasonic testing.

The Buried and Underground Piping and Tanks AMP also manages aging through preventive and mitigative actions (i.e., coatings, backfill quality, and cathodic protection). The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components, the acceptance criteria for the effectiveness of the cathodic protection is less than or equal to -850 mV.

Visual inspections of external surfaces of buried components are performed to check for evidence of coating/wrapping damage and loss of material. The periodicity of these inspections will be based on plant OE and opportunities for inspection such as scheduled maintenance work but will be performed at a minimum of within 10 years prior to PEO as well as once every 10 years during the PEO. Inspections are conducted by qualified individuals. Where the coatings, backfill or the condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is extrapolated to the end of the PEO, an increase in the sample size is conducted.

The number of inspections for each 10-year inspection period, commencing 10 years prior to the PEO, is based on the guidance provide in LR-ISG-2015-01 Table XI.M41-2 (adjusted for a 2-unit plant site) with the exception of the diesel generator fuel oil storage tanks, which are on a 20 year inspection frequency and will be performed no later than the first 10 years of PEO.

A.2.2.28. <u>Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks</u>

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is an existing condition monitoring AMP that consists of periodic visual inspections of coatings/linings applied to the internal surfaces of in-scope components exposed to raw water, treated water, and air for loss of material and where loss of coating or lining integrity could impact the components or downstream component's CLB intended function(s). For coated/lined surfaces determined to not meet the acceptance criteria, physical testing may be performed in conjunction with repair or replacement of the coating/lining. The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in RG 1.54 including guidance from the staff associated with a particular standard.

A.2.2.29. <u>ASME Section XI, Subsection IWE</u>

The ASME Section XI, Subsection IWE AMP is an existing condition monitoring AMP that is part of the CPNPP Containment Inservice Inspection Program. The ASME Section XI, Subsection IWE AMP is in accordance with ASME Section XI, Subsection IWE, and complies with the provisions of 10 CFR 50.55a.

The ASME Section XI, Subsection IWE AMP consists of periodic visual, surface, and volumetric examinations, where applicable, of the steel liner of each concrete containment and their integral attachments for signs of degradation, assessment of damage, irregularities including discernable liner plate bulges, and for coated areas distress of the underlying metal shell or liner, and corrective actions. The ASME Section XI, Subsection IWE AMP includes an evaluation of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate degradation could also exist or could have extended into the inaccessible areas. In addition, the ASME Section XI, Subsection IWE AMP includes supplemental surface exams to detect cracking due to cyclic loading of non-piping penetrations and dissimilar metal welds (DMWs) between the stainless steel piping and the steel sleeve/forging.

A.2.2.30. <u>ASME Section XI, Subsection IWL</u>

The ASME Section XI, Subsection IWL AMP is an existing condition monitoring AMP that is part of the CPNPP Containment Inservice Inspection program. The ASME Section XI, Subsection IWL AMP is in accordance with ASME Section XI, Subsection IWL, and complies with the provisions of 10 CFR 50.55a.

The ASME Section XI, Subsection IWL AMP consists of a periodic visual inspection of accessible concrete surfaces for concrete containments for signs of material degradation (deterioration or distress), including loss of bond, loss of material, cracking, and increase in porosity and permeability; the assessment of damage; and corrective actions. The ASME Section XI, Subsection IWL AMP also includes an evaluation of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate degradation could also exist or could have extended into the inaccessible areas.

Examination results that do not meet the acceptance standards or requirements of IWL-3000 are evaluated in accordance with IWL-3300 and the repair procedures, if required, are detailed in accordance with IWL-4000.

A.2.2.31. <u>ASME Section XI, Subsection IWF</u>

The ASME Section XI, Subsection IWF AMP is an existing condition monitoring AMP that manages aging effects for Class 1, 2, and 3 component supports. This condition monitoring AMP provides for inspection and examination of accessible surface areas of the component supports in accordance with the requirements of ASME Section XI, Subsection IWF. Inspections identify and correct degradation of ASME Class 1, 2, and 3 component supports. The primary inspection method employed is visual examination.

The ASME Section XI, Subsection IWF AMP consists of a periodic visual examination of piping and component supports for signs of degradation, evaluation, and corrective actions. Support bolting for ASME Class 1, 2, and 3 piping and components is also included and inspected for corrosion, loss of integrity of bolted connections due to self-loosening, and material conditions that can affect structural integrity. The ASME Section XI Subsection IWF AMP provides inspection and acceptance criteria and meets the requirements of the ASME B&PV Code, Section XI and 10 CFR 50.55a(b)(2) for Class 1, 2, and 3 piping and components and their associated supports. Alternatives to these requirements that are aging management related will be submitted to the NRC in accordance with 10 CFR 50.55a prior to implementation. Examinations that reveal flaws or relevant conditions that exceed the referenced acceptance standard and require corrective measures or repair/replacement are expanded to include additional examinations.

A.2.2.32. 10 CFR Part 50, Appendix J

The 10 CFR Part 50, Appendix J AMP is an existing performance monitoring AMP that consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B; RG 1.163, "Performance-Based Containment Leak-Testing Program"; NEI 94-01, "Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J"; and ANSI/ANS 56.8, "Containment System Leakage Testing Requirements."

Three types of tests are performed under Option B. Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident (LOCA) peak containment pressure. Performance of the integrated leakage rate test (ILRT) per 10 CFR Part 50, Appendix J, Option B, demonstrates the leak-tightness and structural integrity of the containment. Type B and Type C containment local leakage rate tests (LLRTs), as defined in 10 CFR Part 50, Appendix J, are intended to detect local leaks and to measure leakage across pressure-containing or leakage-limiting boundary of containment penetrations.

Containment leakage rate tests are performed at frequencies in accordance with the provisions of 10 CFR Part 50, Appendix J.

Corrective actions are taken in accordance with 10 CFR Part 50, Appendix J, and NEI 94-01.

A.2.2.33. Masonry Walls

The Masonry Walls AMP is an existing condition monitoring AMP consisting of inspection activities to detect aging and age-related degradation including shrinkage, separation, gaps, loss of material, and cracking for masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection (A.2.2.15) AMP.

The Masonry Walls AMP is implemented as part of the Structures Monitoring (A.2.2.34) AMP conducted for the Maintenance Rule.

Aging effects identified within the scope of the Masonry Walls AMP are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function(s). Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections and that the evaluation basis established for each masonry wall within the scope of LR remains valid through the PEO.

A.2.2.34. Structures Monitoring

The Structures Monitoring AMP is an existing condition monitoring AMP that consists of periodic visual inspection and monitoring of the condition of concrete and steel structures, structural components, component supports, and structural commodities to ensure that aging degradation (such as those described in ACI 349.3R, ACI 201.1R, SEI/ASCE 11, and other documents) will be detected, the extent of degradation determined and evaluated, and corrective actions taken prior to loss of intended functions. Structures are monitored on an interval not to exceed 5 years. Opportunistic inspections are performed for the condition of below grade concrete. Inspection results are trended to ensure corrective actions are taken prior to a loss of intended function. The acceptance criteria are derived from applicable consensus codes and standards. For concrete structures, the Structures Monitoring AMP includes personnel qualifications and quantitative evaluation criteria of ACI 349.3R.

A.2.2.35. RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing condition monitoring AMP that is implemented as part of the Structures Monitoring (A.2.2.34) AMP. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP addresses age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control structures.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP consists of inspection and surveillance of raw-water control structures. The structures within the scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP include the Safe Shutdown Impoundment (SSI) and Dam, Service Water Intake Channel, debris and fish barrier system, the discharge canal, and the SWIS interior concrete exposed to water-flowing. The foundation and the above ground structure associated with SWIS will be managed by the Structures Monitoring (A.2.2.34) AMP. The SSI, Dam, and SWIS are inspected at least once every 5 years. Evaluation of groundwater chemistry is performed under the scope of the Structures Monitoring (A.2.2.34) AMP.

A.2.2.36. Protective Coating Monitoring and Maintenance Program

The Protective Coating Monitoring and Maintenance AMP is an existing condition monitoring AMP that provides for aging management of Service Level I coatings inside of the CPNPP Units 1 and 2 containments. CPNPP is not committed to NRC RG 1.54; however, the Protective Coating Monitoring and Maintenance AMP satisfies the requirements of RG 1.54, Section C4, regarding maintenance of coatings. The Protective Coating Monitoring and Maintenance AMP will remain committed to using ASTM D 5144 and EPRI Guide 1003102 as guides for the Protective Coating Monitoring and Maintenance AMP. Failure of the Service Level I coatings could adversely affect the operation of the Emergency Core Cooling Systems (ECCS) suction strainers; however, proper maintenance of the Service Level I coatings ensures that coating degradation will not impact the operability of the ECCS. The Protective Coating Monitoring and Maintenance AMP includes visual examination of accessible Service Level I coatings inside of containment during every refueling outage and includes assessments and repair for conditions identified that adversely affect the intended function of Service Level I coatings. The Protective Coating Monitoring and Maintenance AMP also provides controls over the amount of unqualified coatings inside containment to ensure that the amount of unqualified coatings is kept within acceptable limits.

A.2.2.37. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a new condition monitoring AMP. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will provide reasonable assurance that the intended functions of insulation material for electrical cables and connections that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments (ALEs) are maintained consistent with the CLB through the PEO. An ALE is an environment that exceeds the most limiting environment (e.g., temperature, radiation, or moisture) for the electrical insulation of cables and connectors. The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP applies to non-EQ accessible electrical cable and connection electrical insulation material within the scope of LR and subject to ALEs. ALEs will be identified through the use of an integrated approach. This approach may include, but is not limited to, a review of relevant plant-specific and industry OE, a review of EQ zone maps, real-time infrared thermographic inspections, conversations with plant personnel cognizant of specific area and room environmental conditions, etc. Accessible non-EQ insulated cable and connections within the scope of LR and installed in ALEs will be visually inspected for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination that could indicate electrical insulation degradation. The first inspection for LR is to be completed prior to the PEO with recurring inspections performed at least once every 10 years thereafter.

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP requires that accessible cables and connections exposed to ALEs be free from unacceptable, visual indications of jacket surface anomalies, that could indicate that conductor insulation or connection degradation exists. Corrective actions may include, but are not limited to, testing, shielding, or otherwise changing the environment or relocation or replacement of the affected cables or connections. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to inaccessible cables or connections.

A.2.2.38. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP is a new performance monitoring AMP. The Insulation Material for

Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP manages the aging effects of the applicable cables and connections in the Radiation Monitoring System (RM).

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP provides reasonable assurance that non-EQ cables and connections used in high-voltage, low-level current signal applications that are sensitive to reduction in electrical insulation resistance will perform their intended function consistent with the CLB throughout the PEO.

In the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP, either of two methods can be used to identify the existence of electrical insulation aging effects for cables and connections. In the first method, calibration results or findings of surveillance testing programs are evaluated to identify the existence of aging effects based on acceptance criteria related to instrumentation circuit performance. By reviewing the results obtained during normal calibration or surveillance, severe aging degradation prior to the loss of the cable and connection intended function may be detected.

In the second method, direct testing of the cable system is performed. Cable system testing is conducted when the calibration or surveillance test does not include the cabling system in the testing circuit, or as an alternative to the review of calibration results or findings of surveillance testing AMPs. The test frequency of the cable system is determined based on engineering evaluation, with the first tests completed no later than 6 months prior to the PEO and at least once every 10 years thereafter.

A.2.2.39. Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP is a new condition monitoring AMP. The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP will provide reasonable assurance that the intended functions of inaccessible or underground power cables that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to wetting or submergence are maintained consistent with the CLB through the PEO. The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP applies to all inaccessible or underground (e.g., in conduit, duct bank, or direct buried) power cables (greater than or equal to 400 volts) within the scope of LR exposed to adverse environments, primarily significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water).

This is a condition monitoring AMP; however, periodic actions will be taken to prevent inaccessible cables from being exposed to significant moisture, such as identifying and inspecting in-scope accessible cable conduit ends and cable manholes for water collection, and draining the water, as needed. The inspection will also include direct observation or indication that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and, if installed, dewatering/drainage systems (i.e., sump pumps) and associated alarms operate properly. The inspection for water collection will be performed based on plant-specific OE with water accumulation in the manhole. The first inspection for LR will be completed prior to the PEO and at least annually thereafter. In addition, operation of dewatering devices (if installed) will be inspected, and their operation verified, prior to any known or predicted heavy rain or flooding events. If manholes are not equipped with dewatering devices, an inspection for water accumulation and pump out following heavy rain or flooding will be performed.

Inaccessible or underground power (greater than or equal to 400 volts) cables within the scope of LR exposed to significant moisture will be tested to provide an indication of the condition of the conductor insulation. The first tests for LR will be completed prior to the PEO with subsequent tests performed at least every 6 years thereafter. Test frequencies will be adjusted based on test results (including trending of degradation where applicable) and OE but will not exceed 6 years. The specific type of test performed will be determined prior to the initial test and is to be a proven test for detecting deterioration of the insulation system due to wetting or submergence, such as Dielectric Loss (Dissipation Factor/Power Factor), AC Voltage Withstand, Partial Discharge, Step Voltage, Time Domain Reflectometry, Insulation Resistance and Polarization Index, Line Resonance Analysis, or other testing that is state-of-the-art at the time the tests are performed. One or more tests may be used to determine the condition of the cables so they will continue to meet their intended function during the PEO.

A.2.2.40. <u>Metal Enclosed Bus</u>

The Metal Enclosed Bus AMP is a new condition monitoring AMP. The Metal Enclosed Bus AMP will provide reasonable assurance that the effects of aging on metal enclosed bus within the scope of LR are adequately managed so that component intended function(s) are maintained consistent with the CLB for the PEO.

The Metal Enclosed Bus AMP will provide for the inspection of the internal and external portions of the MEB to be completed prior to the PEO and conducted every 10 years thereafter. Internal portions (bus enclosure assemblies) of the MEB will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus electrical insulation material will be inspected for signs of reduced insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, discoloration, or swelling, which may indicate overheating or aging degradation. The internal bus insulating supports will be inspected for structural integrity and signs of cracks. The external MEB surfaces and structural supports will be inspected prior to the PEO and conducted every 10 years thereafter under the Structures Monitoring (A.2.2.34) AMP. The external portions of the MEB, including accessible gaskets, boots, and sealants, are also inspected for hardening or loss of strength due to elastomer degradation that could permit water or foreign debris to enter the bus.

A sample of accessible MEB bolted bus connections are inspected to ensure the connections are not experiencing increased resistance due to loosening of bolted bus duct connections caused by repeated thermal cycling of connected loads by using thermography or by measuring connection resistance using a micro ohmmeter. A sample of 20 percent with a maximum sample of 25 constitutes a representative bolted bus connection sample size. The first inspections of the internal bus connections will be completed prior to the PEO and every 10 years thereafter.

As an alternative to thermography or measuring connection resistance of bolted connections, for accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., CPNPP may use visual inspection of insulation material to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. If the alternative visual inspection is used to check MEB bolted connections, the first inspection will be completed prior to the PEO and every 5 years thereafter.

A.2.2.41. Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a new condition monitoring AMP. This AMP provides reasonable assurance that the intended functions of the metallic parts of electrical cable connections that are not subject to the EQ requirements of 10 CFR 50.49 and susceptible to age-related degradation resulting in increased resistance of connections will be maintained consistent with the CLB through the PEO. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP applies to electrical connections within the scope of LR and manages increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation of the metallic portions of electrical cable connections. The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP does not apply to the high-voltage (> 35 kV) switchyard connections.

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a condition monitoring AMP that consists of a one-time test on a representative sample of each type of non-EQ electrical connections prior to the PEO to confirm the absence of age-related degradation. Testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation. The findings of the initial one-time test will be evaluated to determine whether periodic testing of cable connections is warranted. The one-time test provides additional confirmation to support industry OE that shows that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective. The following factors are considered for sampling: voltage level (medium- and low-voltage), circuit loading (high load), connection type, and location (high temperature, high humidity, vibration, etc.). Twenty percent of a connector type population with a maximum sample of 25 constitutes a representative connector sample size. Otherwise, a technical justification of the methodology and sample size used for selecting the components subject to testing is documented.

As an alternative to measurement testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of the insulation materials may be used to detect aging effects and surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling or surface contamination. The basis for performing only the alternative periodic visual inspection to monitor age-related degradation of cable connections is documented. If this alternative visual inspection is used to check cable connections, the first inspection is completed prior to the PEO with subsequent inspections performed at least once every 5 years thereafter.

A.3. Time-Limited Aging Analyses

A.3.1. Identification of Time-Limited Aging Analyses

10 CFR 54.21(c)(2) requires that the application for a renewed license include a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based upon TLAAs as defined in 10 CFR 54.3. It also requires an evaluation that justifies the continuation of these exemptions for the PEO. No exemptions were identified pursuant to 10 CFR 50.12 that are based upon a TLAA.

As part of the application for a renewed license, 10 CFR 54.21(c) requires that an evaluation of TLAAs for the PEO be provided. The following TLAAs have been identified and evaluated to meet 10 CFR 54.21(c) requirements.

A.3.2. Reactor Vessel Neutron Embrittlement Analysis

The current license period reactor vessel embrittlement analyses that evaluate reduction of fracture toughness of the CPNPP Units 1 and 2 reactor vessel beltline materials are based on 40-year End-of-License Extension (EOLE) fluence values. The analyses associated with neutron embrittlement of reactor vessel materials due to neutron irradiation are Time-Limited Aging Analyses (TLAAs) as defined by 10 CFR 54.21(c) and must be evaluated for the increased neutron fluence associated with 60 years of operation.

The following CPNPP Units 1 and 2 analyses are TLAAs that address the effects of neutron irradiation on the reactor vessel:

- Neutron Fluence Analyses
- Pressurized Thermal Shock (PTS)
- USE
- Adjusted Reference Temperature (ART)
- Pressure Temperature Limits Including Low Temperature Over Pressure Protection Analysis

A.3.2.1. Neutron Fluence Analysis

The neutron fluence analysis is a TLAA as defined by 10 CFR 54.21(c) and must be evaluated for the increased neutron fluence associated with 60 years of operation. These neutron fluence projections are used as input to the analyses for fracture toughness, or USE, PTS, Reference Temperature – Nil Ductility Transition (RT_{NDT}), ART, Low-Temperature Overpressure Protection (LTOP) limits, and Reactor Vessel Pressure-Temperature Curves. The fluence analyses have been projected to the end of the PEO for CPNPP Units 1 and 2 in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.2.2. Pressurized Thermal Shock

10 CFR 50.61(b)(1) provides rules for the protection of pressurized water reactors against PTS. Licensees are required to assess the projected values of RT_{NDT} whenever a significant change occurs in the projected values of Reference Temperature – Pressurized Thermal Shock (RT_{PTS}), or upon request for a change in the expiration date for the facility operating license. The current RT_{PTS} analyses use fluence values predicted for 40 years of operation and therefore are TLAAs requiring evaluation for 60 years.

The screening criteria for the limiting reactor vessel materials are 270°F for beltline plates, forgings, and axial weld materials, and 300°F for beltline circumferential weld materials. If the calculated value reference temperature is less than the specified screening criterion, then the vessel is acceptable with respect to postulated transients during the PEO. This is the difference between the maximum nil-ductility RT_{PTS} in the limiting beltline material and the screening criteria established in accordance with 10 CFR 50.61(b)(2).

The RT_{PTS} analyses have been projected to the end of the PEO and are shown to be within the maximum allowable PTS screening criteria limits in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.2.3. Upper-Shelf Energy

The current Charpy USE analyses were prepared for the reactor vessel beltline materials for CPNPP Units 1 and 2 based upon projected neutron fluence values for 40 years of service. These are TLAAs requiring evaluation using the projected 60-year fluence values.

The CPNPP Units 1 and 2 analyses have been projected to the end of the PEO for reactor vessel materials with projected fluence exceeding $1X10^{17}$ n/cm^2 (MeV > 1.0). The USE values for the beltline and extended beltline materials are projected to remain above the 50-ft-lb requirement through the PEO for CPNPP Units 1 and 2 in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.2.4. Adjusted Reference Temperature

The ART of the limiting beltline material is used to determine the beltline P-T limit curves to account for irradiation effects. RG 1.99, Revision 2, provides the methodology for determining the ART of the limiting material. The initial nil-ductility reference temperature, RT_{NDT}, is the temperature at which a non-irradiated metal (ferritic steel) changes its fracture characteristics from ductile to brittle behavior. RT_{NDT} is evaluated according to the procedures in the ASME B&PV Code, Section III, Paragraph NB-2331. Neutron embrittlement increases the RT_{NDT} beyond its initial value.

10 CFR 50, Appendix G, defines the fracture toughness requirements for the life of the vessel. The shift in the initial RT_{NDT} (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to behave in a ductile manner. The ART is defined as: Initial

RT_{NDT} + (ΔRT_{NDT}) + Margin. Since the ΔRT_{NDT} value is a function of 36 EFPY fluence, associated with the 40-year licensed operating period, these ART calculations meet the criteria of 10 CFR 54.3(a) and have been identified as TLAAs requiring evaluation for 60 years.

The 56 EFPY quarter thickness (1/4T) and three-quarter thickness (3/4T) fluence values associated with the 60-year operating period were used to compute the ART values of CPNPP Units 1 and 2, in accordance with RG 1.99, Revision 2. The ART has been projected to the end of the PEO in accordance with 10 CFR54.21(c)(1)(ii).

A.3.2.5. Pressure-Temperature Limits Including Low Temperature Over Pressure Protection Analysis

10 CFR Part 50, Appendix G requires that the RPV be maintained with established P-T limits, including heatup and cooldown operations. The P-T limits must account for anticipated reactor vessel fluence.

The current CPNPP Units 1 and 2 P-T and LTOP limit calculations are effective through 36 EFPY. Heatup and cooldown P-T limit curves for 56 EFPY will be prepared using the most limiting value of RT_{NDT} (reference nil-ductility transition temperature) corresponding to the limiting material in the beltline region of the reactor vessel. This is determined by using the unirradiated reactor vessel material fracture toughness properties adjusted to account for the estimated irradiation-induced shift in the ΔRT_{NDT}.

The effects of aging on the intended function(s) will be adequately managed for the PEO in accordance with 10 CFR 54.21(c)(1)(iii). CPNPP Units 1 and 2 will submit updates to the P-T curves and LTOP limits to the NRC at the appropriate time to comply with 10 CFR Part 50, Appendix G.

A.3.3. Metal Fatigue

Metal fatigue was evaluated in the design process for CPNPP Units 1 and 2 pressure boundary components, including the reactor vessel, reactor coolant pumps (RCPs), steam generators, pressurizer, CRDMs, piping, and valves of primary and auxiliary systems. The current design analyses for these components are based on anticipated cycles associated with 40-year design transients and have been determined to be TLAAs requiring evaluation for the PEO. Fatigue TLAAs for CPNPP Units 1 and 2 pressure boundary components are characterized by determining the applicable design code and design specifications that specify the fatigue design requirements. Fatigue analyses are required for components designed to ASME, Section III, Class 1. In addition, certain other codes such as ASME Section III, Class 2 and 3, and ANSI B31.1 may require a fatigue analysis or assume a stated number of full-range thermal and displacement cycles. Each of these have been reviewed and the applicable TLAAs are evaluated in the following sections, as appropriate.

A.3.3.1. Transient Cycle Projections for 60 Years

ASME Section III, Class 1, 2, and 3 fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients described in the design specifications for 40-year plant operation. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature, pressure, and flow. Since the fatigue analyses and exemptions from fatigue analysis are based upon a number of cycles postulated to bound 40 years of service, projection of the transients' cycles through the PEO is required as an input to demonstrate that the analyses and exemptions remain valid.

The 40-year design transients bound the number of cycles projected to occur during 60 years of plant operations except for Unit 1 Letdown Flow Shutoff with Prompt Return to Service. Additional evaluation of the critical locations defined in NUREG/CR-6260 of the Unit 1 Letdown Flow Shutoff with Prompt Return to Service transient were evaluated for environmentally assisted fatigue (EAF) for 60 years of operation, which included the charging nozzles. This EAF screening evaluation was performed to determine if any locations within the charging line are potentially more limiting than the charging nozzles. As a result of the screening evaluation, any locations that are potentially more limiting were also evaluated for EAF utilizing the 60-year cycles. The EAF analyses were projected to the end of the PEO and demonstrated that the CUF will remain below the ASME Code allowable of 1.0 in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.3.2. <u>ASME Section III, Class 1 Fatigue Analysis of Piping, Piping Components, and Equipment</u>

The CPNPP RCPB piping, equipment, components, and auxiliary lines were designed in accordance with ASME Section III, Class 1 requirements. Fatigue analyses were prepared for these components to determine the effects of cyclic loadings resulting from changes in system temperature, pressure, and seismic loading cycles. These ASME Section III, Class 1 fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients described in the design specifications. If equipment or components conform to the waiver of fatigue requirements of ASME Section III, a detailed fatigue evaluation is not required. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature, pressure, and flow. The fatigue analyses were required to demonstrate that the CUF will not exceed the design allowable limit of 1.0 when the equipment is exposed to the postulated transients. Since the calculation of fatigue usage factors is part of the CLB and is used to support safety determinations and the number of occurrences of each transient type was based upon 40-year assumptions, these Class 1 fatigue analyses have been identified as TLAAs requiring evaluation for the PEO.

The 40-year transient cycle numbers and severity remain bounding for 60 years of plant operation, except for Unit 1 Letdown Flow Shutoff with Prompt Return to Service which is not projected to exceed the 40-year design limit of cycles until entering the PEO. The Unit 1 Letdown Flow Shutoff with Prompt Return to Service limiting components were evaluated for EAF for 60 years of operation, which includes the charging nozzles.

The 40-year design transients bound the numbers of cycles projected to occur during 60 years of plant operations except for Unit 1 Letdown Flow Shutoff with Prompt Return to Service. Therefore, the ASME Section III Class 1 fatigue analyses that are based upon the 40-year design transients remain valid for the PEO except for those associated with the Unit 1 Letdown Flow Shutoff with Prompt Return to Service. The Unit 1 Letdown Flow Shutoff with Prompt Return to Service limiting components were evaluated for EAF for 60 years of operation, which includes the charging nozzles. As a result of the screening evaluation, any locations that are potentially more limiting were also evaluated for EAF utilizing the 60-year cycles. The EAF analyses are projected to the end of the PEO and demonstrate that the CUF will remain below the ASME Code allowable of 1.0. Therefore, the fatigue analyses for CPNPP Units 1 and 2 vessels, piping, and components associated with the Unit 1 Letdown Flow Shutoff with Prompt Return to Service remain valid for the PEO. The RCPs conform to the waiver of fatigue requirements of ASME Code, Section III, and therefore do not require a detailed fatigue evaluation. The projected transient cycles associated with the RCP waiver of fatigue are bounded by the CLB cycles for each transient and therefore the waiver remains valid through the PEO.

The Fatigue Monitoring (A.2.1.1) AMP will be used to monitor transient cycles and ensure the number of transients analyzed in the ASME Section III, Class 1 fatigue analyses will not be exceeded during the PEO in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.3. ASME Section III, Class 2 and 3 and ANSI B31.1 Allowable Stress Analyses

Piping designed in accordance with ASME Section III Class 2 and 3 design rules is not required to have an explicit analysis of cumulative fatigue usage, but cyclic loading is considered in a simplified manner in the design process. These codes first require prediction of the overall number of full thermal range transient cycles expected during the lifetime of these components. Then a stress range reduction factor is determined for that number of cycles using a table from the applicable design code. If the total number of cycles is 7,000 or less, the stress range reduction factor of 1.0 is applied that would not reduce the allowable stress value. For high numbers of cycles, a stress range reduction factor of less than 1.0 is applied that limits the allowable stresses applied to the piping, which reduces the likelihood of failure due to cyclic loading.

The ASME Section III 7,000 cycle limit bounds the 60-year projected cycles for the ASME Section III Class 2 and 3 lines within the scope of this application. Therefore, the allowable stress calculations for ASME Section III Class 2 and 3 lines within the scope of this application remain valid for the PEO. The Fatigue Monitoring (A.2.1.1) AMP will be used to monitor transient cycles and ensure the number of transients analyzed in the ASME Section III, Class 2 and Class 3 fatigue analyses will not be exceeded during the PEO in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.4. Environmentally Assisted Fatigue

NUREG-1800, Revision 2 provides a recommendation for evaluating the effects of the reactor water environment on the fatigue life of ASME Section III Class 1 components that contact reactor coolant. One method acceptable to the NRC for satisfying this recommendation is to assess the impact of the reactor coolant environment on a sample of critical components. These critical components should include those selected in NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components”. The components that are applicable to CPNPP Units 1 and 2 are the ones listed for a newer vintage

Westinghouse plant. CPNPP evaluated additional component locations if they were considered to be more limiting than those considered in NUREG/CR-6260.

The environmental fatigue analyses prepared for the CPNPP Units 1 and 2 limiting components, equivalent to the locations evaluated in NUREG/CR-6260 for newer vintage Westinghouse plants, demonstrate that cumulative environmental fatigue usage values do not exceed the ASME allowable cumulative fatigue usage value of 1.0. Since the analyses are based on design cycles and 60-year cycle projections, monitoring of usage through the PEO is required to ensure these conclusions remain valid. Where reduced numbers of cycles were used in the environmental fatigue analyses, they will be considered the new CLB cycle limits in the Fatigue Monitoring Program during the PEO. The reduced numbers of cycles are equal to or greater than the 60-year projected cycles. Therefore, analyses have been projected to the end of the PEO and found that the CUF will remain below the ASME Code allowable of 1.0 in accordance with 10 CFR 54.21(c)(1)(ii).

The Fatigue Monitoring (A.2.1.1) AMP will be used to perform EAF analyses for the plant-specific sentinel locations identified in addition to those identified in NUREG/CR-6260 and the metal fatigue, and corresponding integrity, of SG tubes is managed as part of the CPNPP Steam Generators AMP described in A.2.2.10.

A.3.3.5. Reactor Vessel Internals Fatigue Analyses

CPNPP Units 1 and 2 reactor internals were designed and built prior to the implementation of ASME Section III, Subsection NG. The structural integrity of the Units 1 and 2 reactor internals design has been ensured by analysis performed on both generic and plant-specific bases to meet the intent of the ASME Code. A plant-specific stress report of the reactor internals was not required. Using the RVI stress reports, CUFs less than 1.0 were determined for the maximum alternating stresses using the design transient cycles from each transient and the design ASME Code fatigue curve. Since the calculation of CUF is based on the number of occurrences of each transient type and 40-year assumptions, these analyses have been identified as TLAAs requiring evaluation for the PEO.

The analyses performed for the RVI components are based upon the subset of the RCS design transients used in the fatigue analyses for the reactor vessel. As stated in Section A.3.3.1, the transient cycle projections demonstrated that the transient cycle limits applicable to the RVI will not be exceeded for 60 years of operation. Therefore, the analyses will remain valid through the PEO and the CUF will remain withing the allowable limit of 1.0. The RVI analyses remain valid for the PEO. The Fatigue Monitoring (A.2.1.1) AMP will monitor transient cycles and severities and require action prior to exceeding design limits that would invalidate these conclusions.

A.3.3.6. High-Energy Line Break Analyses

High-energy systems requiring analysis for the consequences of pipe break were identified based on the fluid in the pipe, the pressure, and the temperature during normal operation. The lines that were both high-temperature and high-pressure were postulated to experience a longitudinal or circumferential break, and were analyzed for pipe whip, jet impingement, and environmental effects. For these evaluations, the time limited portion of the analysis is related to the screening criterion of a CUF value 0.1, derived from the ASME Section III rules (i.e., NB-3222.4(e)). This screening criterion, as specified in Section 3.6B.2 of the FSAR, is used in part to determine the intermediate locations of postulated breaks within a given piping system for the HELB analyses.

The HELB evaluation uses CUF values greater than 0.1 for screening potential pipe break locations. The projected 60-year transients are bounded by the 40-year design transients, except for the Unit 1 Letdown Flow Shutoff with Prompt Return to Service transient. Therefore, the original locations with CUF values equal to or less than 0.1 will remain the same for the fatigue analysis of record during subsequent PEO, except for those associated with the Letdown Flow Shutoff with Prompt Return to Service transient, in accordance with 10 CFR 54.21(c)(1)(i). The most limiting component of the Unit 1 Letdown Flow Shutoff with Prompt Return to Service transient was re-evaluated and the CUF value remains less than the CUF limit of 1.0. The HELB analyses remain valid for the PEO. The Fatigue Monitoring (A.2.1.1) AMP will monitor transient cycles and severities and require action prior to exceeding design limits that would invalidate these conclusions. If a limit is approached, corrective action will be required prior to exceeding design limits.

A.3.4. Environmental Qualification of Electric Components

Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The NRC has established environmental qualification (EQ) requirements in 10 CFR 50.49 and 10 CFR Part 50, Appendix A, Criterion 4. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of in- service aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a design basis accident (DBA) such as a LOCA, HELB, or post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification. Aging evaluations for electrical components in the CPNPP Environmental Qualification of Electric Components AMP that specify a qualification of at least 40 years, but less than 60 years, have been identified as TLAAs for LR because the criteria contained in 10 CFR 54.3 are met.

The CPNPP Environmental Qualification of Electric Components AMP described in Section A.2.1.2 meets the requirements of 10 CFR 50.49 for the applicable electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of components within the scope of the CPNPP Environmental Qualification of Electric Components AMP, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics, and the environmental conditions to which the components could be subjected to during their service life.

10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e)(5) also requires replacement or refurbishment of

components not qualified for the current license term prior to the end of designated life unless additional life is established through ongoing qualification.
10 CFR 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49(k) permits different qualification criteria to apply based on plant and component vintage and 10 CFR 50.49(l) requires replacement equipment to be qualified in accordance with the provisions of 10 CFR 50.49. Supplemental environmental qualification regulatory guidance for compliance with these different qualification criteria is provided in NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment", and RG 1.89, Revision 1, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants".

The CPNPP Environmental Qualification of Electric Equipment Program will manage the aging effects of the electrical and instrumentation components associated with the EQ TLAAs. This program implements the requirements of 10 CFR 50.49 (as further defined and clarified by NUREG-0588 and RG 1.89, Rev. 1). Component aging evaluations are reanalyzed on a routine basis to extend the qualifications of components. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component must be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. If a components qualified life is exceeded, the affected EQ component is evaluated and entered into CPNPP CAP.

The CPNPP Environmental Qualification of Electric Equipment AMP has been demonstrated to be capable of programmatically managing the aging of the electrical and instrumentation components in the scope of the program. Therefore, aging will be adequately managed for the PEO in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.5. Containment Liner Plate, Metal Containments, and Containment Penetrations Fatigue

The CPNPP concrete Containments are designed to contain the radioactive material released that would be in the unlikely event of DBAs. The entire inside face of the Containment (mat, walls, and dome) is lined with a continuous welded steel liner plate, attached with anchors to the reinforced concrete, to ensure a high degree of leak tightness. The Containment liner material meets the requirements of the ASME B&PV Code, Section III, Division 2, Subgroup on Concrete Components (CC). The Containment design also includes components that are not backed by concrete, including emergency personnel airlocks, equipment access hatches and integral personnel airlocks, piping and electrical penetrations, and bellows. These features are defined as Class Metal Containment (MC) components, which are designed in accordance with ASME B&PV Code, Section III, Division 1 requirements to withstand DBA pressures corresponding to DBAs.

A.3.5.1. Containment Liner Plate Fatigue

The CPNPP Containment liner was designed, fabricated, erected, and tested to quality standards commensurate with their nuclear safety related functions with no dissimilar materials. The containment liner and penetrations are classified as ANSI Safety Class 2. The liner is designed in accordance with ASME Section III, Division 2 / ACI 359 Draft Code. The liners were investigated for fatigue to the limits of ASME III Division I and it was concluded that the analysis for cyclic operation was not required as all the conditions of ASME III NB-3222.4 (d), with design inputs including RCS heat up and cooldown transients and seismic transients were met in accordance with the exemption criteria of NE-3131 (d) and NB-3222.4. A re-evaluation confirmed that these exemption criteria remain satisfied through the PEO, since the original design transients bound the 60-year projections for these transients through the PEO.

The containment liner at CPNPP is designed to withstand 200 heat-up and cooldown cycles. This number of maximum RCS heat-up and cooldown design cycles is conservative enough to envelop the projected cycles for the PEO. The temperature differences have not changed because the design transients have not been redefined. Therefore, the Containment liner plate fatigue waiver remains valid through the PEO in accordance with 10 CFR 54.21(c)(1)(i). The Fatigue Monitoring (A.2.1.1) AMP monitors the heat-up and cooldown cycles and ensure that the transient limits will not be exceeded during the PEO.

A.3.5.2. <u>Containment Penetrations Fatigue</u>

Access to the Containment structure is provided by a personnel airlock, an emergency airlock, and an equipment hatch. Other smaller penetrations through the Containment include the MS and feedwater lines, hot and cold process piping, the fuel transfer tube, and electrical conductors. All penetration sleeves are welded to the liner and anchored into the reinforced concrete Containment wall.

The MS, feedwater, Steam Generator blowdown penetrations are the only piping systems considered for the fatigue evaluations for class MC components. The MS, feedwater, Steam Generator blowdown piping systems penetrating the containment liner contributes significant thermal loading on the liner plate. These penetrations were considered in the fatigue evaluation as they enveloped the overall operating and design, as well as the geometric requirements of the remaining penetrations. Dissimilar Materials condition was not checked since the penetrations considered in the Finite Element Analysis are composed of only one material (steel).

A re-evaluation confirmed that these exemption criteria remain satisfied through the PEO, since the original design transients bound the 60-year projections for these transients through the PEO. The containment penetrations at CPNPP are designed to withstand 200 heat-up and cooldown cycles. This number of maximum RCS heat-up and cooldown design cycles is conservative enough to envelop the projected cycles for the PEO. The temperature differences have not changed because the design transients have not been redefined. The 600 cycles for OBE and 120 cycles for SSE are conservative, as no earthquake (OBE/SSE) has occurred to date at CPNPP. One SSE transient is considered for the RCS.

The fatigue waiver associated with the steel Containment piping penetrations has been evaluated and determined to remain valid for the PEO in accordance with 10 CFR 54.21(c)(1)(i). The Fatigue Monitoring AMP (A.2.1.1) monitors the heat-up and cooldown cycles and ensure that the transient limits will not be exceeded during the PEO.

A.3.6. Other Plant-Specific Time-Limited Aging Analyses

A.3.6.1. Leak-Before-Break

Title 10 Part 50 Appendix A, General Design, “Criteria for Nuclear Power Plants,” Criterion 4 of the Code of Federal Regulations (CFR) allows for the use of leak-before-break (LBB) methodology for excluding dynamic effects of postulated ruptures in nuclear power plant piping. The fundamental premise of the LBB methodology is that the materials used in nuclear power plant piping are sufficiently tough, that even a large through-wall crack would remain stable and would not result in a double-ended pipe rupture. Application of the LBB methodology is limited to those high energy fluid systems not considered to be overly susceptible to failure from such mechanisms as corrosion, water hammer, fatigue, thermal aging or indirectly from such causes as missile damage or the failure of nearby components. The analyses involved with LBB are considered TLAAs.

Original LBB analyses performed for CPNPP Units 1 and 2 demonstrated that postulated breaks can be eliminated from the structural design basis in the reactor coolant primary loop piping. The reactor coolant primary loop piping includes CASS. The LBB analysis for this system was updated for LR to consider the effects of additional thermal aging on the fracture toughness of the CASS materials through the PEO. The fracture toughness properties used were based on the fully-aged condition, which is applicable for the PEO. The updated LBB analyses demonstrate that the dynamic effects of the pipe rupture resulting from postulated breaks in the reactor coolant primary loop piping need not be considered in the structural design basis for CPNPP Units 1 and 2 for the LR period. The analyses have been projected to the end of the PEO in accordance with 10 CFR 54.21(c)(1)(ii).

The auxiliary piping in the accumulator injection lines, RHR lines, and pressurizer surge lines piping also have LBB analyses that were identified as TLAAs. However, these piping systems do not include CASS materials. A review was performed of the current analyses to obtain the latest piping loads on these systems. It was determined that the loads used in the original analyses are still governing. Therefore, the LBB analyses for the auxiliary piping in the accumulator injection lines, RHR lines, and pressurizer surge lines piping remain valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.2. Reactor Coolant Pump Casings ASME Code Case N-481

ASME B&PV Code, Section XI, specifies that a volumetric inspection of the RCP casing welds and a visual inspection of pump casing internal surfaces be performed on a RCP within each 10-year inspection period. These 10-year volumetric inspections are significant because the RCPs have already been welded to the piping and the pumps must be disassembled in order to gain access to the inside surface of the cast stainless steel casings. In recognition of these difficulties, ASME Code Case N-481, “Alternative Examination Requirements for Cast Austenitic Pump Casings”, was developed to allow for the replacement of volumetric examinations with a fracture mechanics based evaluation and supplemented by specific visual inspections. The analyses involved with Code Case N-481 are considered TLAAs.

Westinghouse Owners Group (WOG) performed a generic fracture mechanics analysis per Code Case N-481 for the various primary loop pump casing models found in Westinghouse-designed nuclear steam supply systems (NSSS) in WCAP-13045. A plant-specific flaw tolerance evaluation of the CPNPP Unit 1 RCP casings was completed for 40 years of service life to demonstrate compliance to ASME Code Case N-481 based on the generic evaluation completed by the WOG in WCAP-15288. A similar evaluation was not completed for CPNPP Unit 2 since the RCP casings are single piece casting and the Code Case N-481 evaluation was not required. ASME Code Case N-481 evaluation was used to support visual examination in lieu of volumetric examinations of welds, which are not present in CPNPP Unit 2 RCP casings.

The results demonstrate the plant-specific applicability of the WOG generic analysis for CPNPP Units 1 and 2 RCP casings and sufficient crack stability margins for 60 years of life. No other mechanism is known to degrade the properties of the pump casings during the remaining service. Thus, it is concluded that the CPNPPs Units 1 and 2 RCP casings are in compliance with ASME Code Case N-481 and sufficient crack stability margins exist for the PEO in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.3. Reactor Coolant Pump Flywheel Fatigue Crack

RCP flywheel fatigue growth is identified as a potential TLAA for LR associated with failure of the RCP flywheel due to vibration or an overspeed event resulting from high energy missiles that could impact other structures, systems, and components.

Pressurized Water Reactor Owners Group (PWROG) Report PWROG-17011-NP-A generically analyzed this TLAA. The evaluations presented in PWROG-17011-NP-A have shown there is no significant deformation of flywheels, even at maximum overspeed conditions. Fatigue crack growth calculations have shown that even with a large assumed flaw the crack growth for 80 years of operation is negligible. Therefore, based on these deterministic evaluations, the flywheel inspections completed prior to service are sufficient to ensure their integrity during service. The conclusions of PWROG-17011-NP-A were determined generically for Westinghouse plants based on 6000 cycles of RCP operation.

Based on the 60-year projections described in Section A.3.3.1, the maximum number of RCP operation cycles is significantly less than the number of analyzed cycles. The RCP flywheel fatigue analysis has been demonstrated to remain valid through the PEO in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.4. Crane Load Cycle Limits

The below cranes within the scope of LR were reviewed and found to be designed in accordance with the Crane Manufacturers Association of America (CMAA) Specification 70 or a specification considered equivalent relative to load cycle limits. Cranes designed in accordance with CMAA-70 include considerations for frequency of operation and expected size of lifts, relative to their maximum load capacity. Based upon these considerations, cranes are designated a given service classification with an expected number of lifts over their life, which also correlates to a number of cycles on structural members. These assumptions on the number of planned cycles over the life of the crane provide the basis for the TLAA evaluation.

Auxiliary Filter Hoist

The Auxiliary Filter Hoists were designed in accordance with CMAA-70 for Class D service. The number of anticipated lifts for the Auxiliary Filter Hoists is estimated to be 1,800 per hoist through the PEO, which is less than the 500,000 cycles specified for Class D cranes in CMAA-70.

Containment Access Rotating Platform Hoist

The Containment Access Rotating Platform Hoist was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Containment Access Rotating Platform Hoist is estimated to be 500 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Containment Fuel Handling Bridge Crane

The Containment Fuel Handling Bridge Crane was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Containment Fuel Handling Bridge Crane is estimated to be 19,300 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Containment Polar Crane

The Containment Polar Crane was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Containment Polar Crane is estimated to be 25,100 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Containment Telescopic Jib Crane

The Containment Telescopic Jib Crane was designed in accordance with CMAA-70 for Class C service, which includes consideration of 500,000 cycles over the life of the crane. The number of anticipated lifts for the Containment Telescopic Crane is estimated to be 25,000 through the PEO, which is less than the 500,000 cycles specified for Class C cranes in CMAA-70.

Drumming Storage Area Crane

The Drumming Storage Area Crane was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Drumming Storage Area Crane is estimated to be 600 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Fuel Building Overhead Crane

The Fuel Building Overhead Crane was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Fuel Building Overhead Crane is estimated to be 60,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Fuel Handling Bridge Crane

The Fuel Handling Bridge Crane was designed in accordance with ASME NOG-1, for which the load cycle limits are considered equivalent to CMAA-70 Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Fuel Handling Bridge Crane, which was replaced in 2010, is estimated to be 37,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Refueling Machine

The Refueling Machine was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Refueling Machine is estimated to be 20,000 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Safety Chiller Hoist

The Safety Chiller Hoists was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Safety Chiller Hoists is estimated to be 1,800 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Service Water Intake Structure Crane

The Service Water Intake Structure (SWIS) Crane was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the SWIS Crane is estimated to be 3,600 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

Vertical Cask Transporter

The Vertical Cask Transporter was designed in accordance with CMAA-70 for Class A service, which includes consideration of 100,000 cycles over the life of the crane. The number of anticipated lifts for the Vertical Cask Transporter is estimated to be 1,200 through the PEO, which is less than the 100,000 cycles specified for Class A cranes in CMAA-70.

These analyses remain valid for the PEO in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.5. Spent Fuel Pool Metal Corrosion Allowance

Most pressure retaining components are constructed with a wall thickness in excess of minimum required wall thickness for that component. This excess wall thickness provides a metal corrosion allowance to ensure that minimum wall thickness requirements are maintained through the life of the component. If corrosion allowances are based on a degradation rate and will cover only the original 40-yr design life of the component, they could be considered TLAAs.

The CPNPP Safety Evaluation Report NUREG 0797, Section 9.1.2.1, "Spent Fuel Storage Materials", includes the following statements about SFP corrosion:

> "From its evaluation, the staff concludes that the corrosion that will occur in the spent fuel storage pool environment should be of little significance during the 40 yr life of the plant. Components in the spent fuel storage pool are constructed of alloys that have a low differential galvanic potential between them and have a high resistance to general corrosion, localized corrosion, and galvanic corrosion."

Additionally:

> "The pool liner, rock lattice structure, and fuel storage tubes are stainless steel, which is compatible with the storage pool environment. In this environment of oxygen saturated borated water, the corrosive deterioration of the type 304 stainless steel should not exceed a depth of 6.00×10^{-5} in. in 100 yr., which is negligible relative to the initial thickness."

The SFP metal corrosion allowance is considered a TLAA because the assumptions about the corrosion rate of the pool liner, rock lattice structure, and fuel storage tubes are related to aging effects and draw a conclusion limited to the current 40-yr period of operation. This corrosion rate is given for 100 years. Therefore, this analysis and conclusion remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.6. Protective Coatings

The calculated radiation exposures postulated to occur within the Containment Building at CPNPP during both normal operation and DBA events for environmental qualification of electrical equipment were also used to establish a threshold (3.0E+08 rads) for irradiation of qualified coatings over the life of the plant. The calculated doses for electrical equipment qualification significantly exceed any anticipated accident doses because gross fuel failures are assumed as required by regulations. There are no regulations which require this assumption be applied to coatings. With due consideration to this fact, a bounding total integrated dose (TID) "screening" value for both Gamma and Beta radiation exposure of 3.0E+08 rads is considered conservative and appropriate for use when assessing protective coating DBA test data for use at CPNPP.

The greatest calculated radiation exposure within Containment is predicted to occur within the "Reactor Cavity" area. While this area does provide the limiting calculated radiation exposure inside both CPNPP Containment Buildings, it is judged not to be an appropriate value to use when assessing radiation tolerance of protective coatings. Coatings in Room 153, which is the "Reactor Cavity" area, are in a location that would prevent them from communicating with the ECCS sumps. Therefore, the protective coatings applied within the reactor cavity do not meet the definition of nuclear Service Level I coatings (i.e., the failure of which could adversely affect post-accident fluid system). The next highest calculated radiation exposure region(s) within the Containment consists of several rooms and open quadrant areas throughout the structure.

Accident dose values postulated for environmental qualification of electrical equipment include inherent conservatisms. For example, the pressurized and unpressurized LOCA scenarios. To account for these inherent conservatisms that are not necessary for Service Level 1 coating irradiation, the accident doses, both gamma and beta, have been refined. Furthermore, postulated accident dose values are the most significant contributor to the TID.

The calculated 60-yr TID is below the 3.0E+08 rads threshold for continued qualification of non-reactor cavity protective coatings inside Containment through the life of the plant. Therefore, the assumed protective coating screening threshold remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

Additionally, as of December 31, 2007, protective coatings inside Containment were classified as Service Level I coatings. The Service Level I coatings have been evaluated and classified as either “acceptable” or “unqualified” coatings in accordance with plant procedures. Aging effects other than irradiation on the intended function of Service Level I coatings inside containment will continue to be monitored during the PEO by the Protective Coating Monitoring and Maintenance (A.2.2.36) AMP.

A.3.6.7. Steam Generator Tubes Metal Corrosion Allowance

The FSAR Section 5.4.2B.5.4 Allowable Tube Wall Thinning Under Accident Conditions, which covers Unit 2, addresses a steam generator tubing corrosion rate based on a conservative weight loss rate for mill annealed Inconel tubing in flowing 650°F primary side reactor coolant fluid for the 40-yr life. The Unit 2 steam generator tubes are A600TT rather than mill annealed Alloy 600. However, as indicated in FSAR Section 5.4.2B.5.2, comparable data for thermally treated Inconel has not been developed. As such, the assumed corrosion rate, for mill annealed Inconel, is conservatively applicable to the thermally treated tubes at CPNPP Unit 2.

Because these assumptions about the corrosion rate of the Unit 2 steam generator tubes are related to aging effects and limited to the current 40-yr period of operation, as well as meeting the other criteria, this is considered a TLAA.

Extrapolating the 40-yr thinning to 60-yr equates to 0.12 mils thinning, which is less than the assumed corrosion rate of 3 mils. Therefore, this analysis and conclusion remains valid for the PEO, in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.8. Steam Generator Flow-Induced Vibration and Tube Wear Evaluations

The CPNPP Units 1 replacement steam generators (RSGs) and the CPNPP Unit 2 SGs were evaluated for flow-induced vibration (FIV) and tube wear considering the updated thermal-hydraulic characteristics of the secondary side of the SGs reflecting the proposed uprate to 3628 MWt NSSS Power. The aging effects/mechanisms of the SG nickel alloy tubes include "cumulative fatigue damage due to fatigue" and the "loss of material due to fretting and wear" which can be caused by flow-induced excitation of the SG tubes and mechanical tube wear. Therefore, the evaluations are considered TLAAs that must be evaluated for the PEO.

The CPNPP Unit 1 Delta 76 RSG FIV and tube wear evaluations, specifically the uprate evaluation, is based on and references the original FIV and tube wear evaluation. This evaluation was completed using a cumulative operating service of 45 calendar years of the RSG Design Specification. The Unit 1 RSGs were replaced during IRF12 (Spring 2007), and the Unit 1 initial license expires February 8, 2030. Therefore, the 45-year evaluation considers the PEO in accordance with 10 CFR 54.21(c)(1)(i).

The CPNPP Unit 2 Model D5 SG FIV and tube wear evaluation includes fluidelastic instability, turbulence, tube wear, vortex shedding, and fatigue (due to stresses below the endurance limit). These mechanisms, with the exception of tube wear, are solely based on the geometry of the steam generator, configuration of the steam generator tubing and supports, and the thermal-hydraulic fluid forces in the SGs. These parameters are constant, and their conclusions will not be affected by an additional period of operation; thus, the existing results are unchanged and are acceptable for the PEO. Tube wear evaluations must be updated to consider the PEO. The CPNPP Unit 2 D5 SG FIV and tube wear evaluations were updated using recent trend data to conservatively assess the expected corrosion and found to remain acceptable through the PEO in accordance with 10 CFR 54.21(c)(1)(ii).

The CPNPP Unit 2 Model D5 SG analysis tube wear methodology for plugging and stabilizing decisions are based on wear projections for antivibration bar (AVB) and tube support plate (TSP) wear. The aging effects/mechanisms of the SG nickel alloy tubes include the loss of material due to fretting and wear which can be caused by mechanical tube wear. 60 years was considered for AVB and TSP wear calculations. The end of plant life is calculated as 60 years from February 1993 to account for a 20-year plant life extension resulting in a date of February 2053. The analysis has been evaluated and it has been shown that the wear projection analyses within it are currently applicable to 60 years of operation. Therefore, the tube wear methodology for plugging and stabilizing decisions based on wear projections for AVB and TSP wear considers the PEO in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.9. <u>Steam Generator U-Bend Tube Variation and Fatigue Assessment</u>

In some models of steam generators, particular consideration is given to the potential for high cycle fatigue of U-bend tubes. This mechanism has been observed in tubes with carbon steel support plates where denting or a fixed tube support condition has been observed in the uppermost plate and anomalous conditions existed in the AVB insertion depths or AVB support structure that could lead to unsupported tubes. The aging effects/mechanisms of the SG nickel alloy tubes include "cumulative fatigue damage due to fatigue" and the "loss of material due to fretting and wear" which can be caused by the FIV of U-bend tubes with anomalous support conditions leading to high cycle fatigue and subsequent tube failure.

Due to fabrication advancements and controls used to ensure proper anti-vibration bar insertion depths for the CPNPP Unit 1 Delta 76 RSGs, the SG tubing is not affected by the U-bend FIV and fatigue mechanism.

For CPNPP Unit 2, the U-bend tube vibration and fatigue assessment already considers 60 years of operation. The assessment assumes SG operating life is from the time of initial plant start-up to the anticipated 60-year plant operating license expiration date. Therefore, the conclusions of the assessment are applicable through the PEO in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.10. Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components

The primary RCL static cast elbow components and centrifugally cast pipe components in CPNPP Units 1 and 2 are constructed from cast austenitic stainless steel (CASS) ASME SA-351 Grade CF8A material. The CASS material may be susceptible to thermal aging at the reactor operating temperature. Thermal aging of CASS material results in embrittlement, that is, a decrease in the ductility, impact strength, and fracture toughness of the material. Depending on the material composition, the Charpy impact energy of a component made of CASS material could decrease after prolonged exposure to reactor coolant temperatures during service.

A flaw tolerance evaluation of the susceptible CASS piping components in CPNPP Units 1 and 2 RCL was performed in accordance with paragraph IWB-3640 and Appendix C of ASME Section XI to demonstrate that even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service. The RCL elbow components at CPNPP Units 1 and 2 were found to have adequate fracture toughness and are flaw tolerant for 60 years of service life in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6.11 Safe Shutdown Impoundment Sedimentation

The anticipated reduction in SSI storage capacity due to sedimentation for a 40-year projected service life conservatively meets the six criteria for TLAA. FSAR Sections 2.4.8.2.2, 2.4.11.6, 9.2.5.2, and 9.2.5.3 describe the SSI and sedimentation accumulation over the life of the plant. The buildup of sedimentation, over the life of the plant, is considered to be relevant in making a safety determination of the low water level in the SSI that is maintained by the equalization channel. Additionally, sedimentation buildup is one of the mechanisms for a “loss of form” in earthen water-control structures effect which will be managed by the guidance in RG 1.127, as defined in NUREG-1801.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP (A.2.2.35) and TRM requirements also help maintain the potential channel low level water limit which could be affected by sedimentation. FSAR Table 2.4-19, containing the predicted area and capacity of the SSI after 40 years of sedimentation, shows that there is sufficient capacity in the SSI at 40 years for the limit. Since the TRM requirements measure the sedimentation depth on a 12-month frequency and require immediate action for removal if 1.5-ft of sediment accumulation is found, sufficient capacity in the SSI for 60 years is assured.

Therefore, this aging effect will continue to be managed for the PEO, in accordance with 10 CFR 54.21(c)(1)(iii).

A.4. License Renewal Commitments List

Table A-3
List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
1	Fatigue Monitoring (A.2.1.1)	X.M1	Continue the existing Fatigue Monitoring AMP, including enhancements to: a) Include EAF analysis calculations for the additional sentinel locations, not identified in NUREG/CR-6260, that are determined through the EAF screening evaluation. b) Monitor the environmental effects at the sentinel locations. c) Account for additional critical thermal and pressure transients for components that have been identified to have a fatigue TLAA. d) Include acceptance criteria based on the 60-year cycle projections used in the supporting analyses. e) Provide clarity on when to initiate corrective action.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
2	Environmental Qualification of Electric Components (A.2.1.2)	X.E1	Continue the existing Environmental Qualification of Electric Components AMP, including an enhancement to: a) Implement Revision 1 of RG 1.89 [June 1984], which provides additional guidance for the application of IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" that was not available in the original issuance of RG 1.89.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

Table A-3
List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
3	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.2.2.1)	XI.M1	Continue the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
4	Water Chemistry (A.2.2.2)	XI.M2	Continue the existing Water Chemistry AMP, including an enhancement to: a) Revise strategic plans to include evidence of aging effects as items to be evaluated, the cause identified, and the condition corrected.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
5	Reactor Head Closure Stud Bolting (A.2.2.3)	XI.M3	Continue the existing Reactor Head Closure Stud Bolting AMP, including enhancements to: a) Assure the maximum yield strength of replacement reactor head closure stud material purchased in the future is limited to a measured yield strength of <150 ksi. b) Explicitly prohibit the use of lubricants not meeting RG 1.65 guidance.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
6	Boric Acid Corrosion (A.2.2.4)	XI.M10	Continue the existing Boric Acid Corrosion AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
7	Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (A.2.2.5)	XI.M11B	Continue the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
8	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (A.2.2.6)	XI.M12	Implement the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
9	Reactor Vessel Internals (A.2.2.7)	XI.M16A	Implement the new PWR Vessel Internals AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
10	Flow-Accelerated Corrosion (A.2.2.8)	XI.M17	Continue the existing Flow-Accelerated Corrosion AMP, including enhancements to: a) Include erosion mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement for the components that contain treated water (including borated water) or steam. b) Address erosion as an aging mechanism for all components that are susceptible to erosion wall-thinning mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement. This will include guidelines for measuring wall thickness due to erosion. c) Ensure that identification of locations susceptible to erosion are based on the extent of condition reviews from corrective actions in response to plant-specific and industry OE. Components may be treated in a manner similar to “susceptible-not-modeled” lines discussed in NSAC-202L-R4. Additionally, include guidance from EPRI 1011231 for identifying potential damage locations and	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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			EPRI TR-112657 and/or NUREG/CR–6031 guidance for cavitation erosion. d) Include trending of wall thickness measurements at locations susceptible to erosion mechanisms to adjust the monitoring frequency and to predict the remaining service life of the component for scheduling repairs or replacements. Inspection results will be evaluated to determine if assumptions in the extent-of-condition review remain valid. If degradation is associated with infrequent operational alignments, such as surveillances or pump starts/stops, then trending activities may consider the number or duration of these occurrences. The program will be enhanced to consider periodic wall thickness measurements of replacement components, which would continue until the effectiveness of corrective actions has been confirmed. e) Ensure that updates to plant predictive models are controlled and independently reviewed by a second qualified flow-accelerated corrosion engineer, consistent with NSAC-202L recommendations. f) Update corrective action guidance for erosion issues to consider adjusting operating parameters or changing component designs to eliminate the cause of erosion mechanisms as part of long-term corrective actions and verify the effectiveness of these corrective actions. Continue periodic monitoring activities for any components (susceptible to erosion) replaced with an alternate material, since a material that is completely erosion resistant is not currently available.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
11	Bolting Integrity (A.2.2.9)	XI.M18	Continue the existing Bolting Integrity AMP, including enhancements to: a) Incorporate the applicable guidance from EPRI NP-5769, NUREG-1339, and EPRI TR-104213. b) Explicitly prohibit the use of molybdenum disulfide (MoS_2) as a lubricant for use on pressure retaining bolts. c) Ensure any future use of bolting material with an actual yield strength greater than or equal to 150 ksi in portions of systems within the scope of the Bolting Integrity program is minimized. Ensure that If bolting with an actual yield strength greater than or equal to 150 ksi is used, bolting is monitored for cracking, with volumetric examinations performed in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. d) Opportunistically inspect closure bolting for loss of preload during piping excavations. e) Inspect submerged bolting for signs of leakage, loss of material, cracking, and loss of preload during SSW pump and SGB sump pump inspections. f) Perform inspections of pressure-retaining closure bolting in locations that preclude detection of joint leakage, where the piping system contains air or gas for which leakage is difficult to detect. At a minimum, in each 10-year interval during the PEO, inspections shall be completed on a representative sample of at least 20% of the population of bolt heads and threads at each unit, up to a maximum of nineteen for each unit, for each	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			material/environment combination. Inspection methods will be capable of detecting leakage for systems containing air or gas. g) Ensure periodic system walkdowns inspecting closure bolting occur at least once per refueling cycle for the portions of systems that are within the scope of LR. h) Ensure that submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the PEO a representative sample of bolt heads and threads is inspected. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 19 bolt heads and threads per unit over a 10-year period, then it will be stated how integrity of the bolted joint will be demonstrated. For example: (a) periodic pump vibration measurements are taken and trended; or (b) sump pump operator walkdowns are performed demonstrating that the pumps are appropriately maintaining sump levels. i) Consider more frequent bolting inspections if identified leak rates are increasing.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
12	Steam Generators (A.2.2.10)	XI.M19	Continue the existing Steam Generators AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
13	Open-Cycle Cooling Water System (A.2.2.11)	XI.M20	Continue the existing Open-Cycle Cooling Water System AMP, including enhancements to: a) Ensure that if corrosion buildup or fouling is noted, the system also is evaluated for their impact on the heat transfer capability of the system. b) Ensure that evidence of corrosion in these systems is evaluated for its potential impact on the integrity of the piping. For relevant indications, inspections or nondestructive testing is used to determine the extent of biofouling, the condition of the surface coating, the magnitude of localized pitting, and the amount of MIC, if applicable. c) Ensure evaluations are performed for test or inspection results that do not satisfy established acceptance criteria, and a CR is initiated to document the concern in accordance with plant administrative procedures.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
14	Closed Treated Water Systems (A.2.2.12)	XI.M21A	Continue the existing Closed Treated Water Systems AMP, including enhancements to: a) Include visual inspection of surfaces exposed to the closed treated water (closed-cycle cooling water) environment for evidence of loss of material, cracking, or fouling whenever the system boundary is opened. At a minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 components) of piping and components will be inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The representative sample will be selected based on likelihood of corrosion or cracking. Inspections will be conducted in accordance with applicable ASME code requirements. If there are no ASME code requirements, inspections will be conducted in accordance with the EPRI Closed Cooling Water Chemistry Guideline. Guidance will be included to report and evaluate any detectable loss of material, cracking, or fouling associated with the surfaces exposed to the closed treated water (closed cooling water) environment per the CPNPP CAP. Components will meet system design requirements, such as minimum wall thickness. If visual examination identifies adverse conditions, additional examinations, including ultrasonic testing, are conducted. Inspection results will be trended so that the progression of any corrosion or cracking can be evaluated and predicted. b) Based on OE, loss of material due to recurring internal corrosion (RIC) has been identified as an aging effect in the TPCW System at weld locations. Implementing documents will be updated or new documents created to perform volumetric inspection of welds located within in-scope carbon steel TPCW piping (located within the Control Building and Auxiliary Building) to address RIC. At a	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 welds) of in scope TPCW welds will be inspected using techniques capable of detecting loss of material. Inspection results which indicate a reduction in wall thickness greater than 50 percent or below minimum wall thickness values will be entered into the corrective action program for evaluation.	
15	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.2.13)	XI.M23	Continue the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, including an enhancement to: a) Specifically inspect for signs of loss of material due to corrosion and wear. Any visual indication of loss of material due to corrosion or wear and any visual signs of loss of bolting pre-load will be evaluated according to ASME/ANSI B30.2 or ASME B30.16.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
16	Compressed Air Monitoring (A.2.2.14)	XI.M24	Continue the existing Compressed Air Monitoring AMP, including enhancements to: a) Ensure procedures performing periodic internal inspections specifically inspect components for signs of corrosion and abnormal corrosion products. Ensure visual inspection results are compared to previous inspection results to ascertain if adverse long-term trends exist. Ensure signs of corrosion are evaluated.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			b) Ensure procedures performing air quality analysis describe review of analysis results and comparison of previous results. c) Ensure procedures trend dewpoint temperature readings. d) Ensure air sampling procedures describe the corrective actions taken if air samples are unsatisfactory.	
17	Fire Protection (A.2.2.15)	XI.M26	Continue the existing Fire Protection AMP, including enhancements to: a) Expand the sample size of inspected fire penetration seals if any sign of degradation is found in the sample. b) Require qualified fire protection personnel perform inspections associated with the Fire Protection AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
18	Fire Water System (A.2.2.16	XI.M27	Continue the existing Fire Water System) AMP, including enhancements to: a) Inspect the fire water storage tank internal linings. The internal linings will be inspected for blistering, cracking, flaking, peeling, delamination, and rusting. The training and qualification of individuals involved in tank lining inspections and evaluation of degraded conditions will be conducted in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with a particular standard. The following coating/lining acceptance criteria will be applied:	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 5-year period prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			• Indications of peeling and delamination are not acceptable. • Blisters will be evaluated by a qualified coating specialist. • Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, "Standard Test Method for Evaluating Degree of Blistering of Paints"). • As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. For fire water storage tank linings inspected by the procedure that do not meet acceptance criteria, appropriate corrective measures will be taken, consistent with LR-ISG-2013-01 Appendix C Element 7, with the exception of adhesion tests. b) Ensure that visual inspections for loss of material use inspection techniques capable of detecting surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition. Where such irregularities are detected, follow-up volumetric wall thickness examinations will be performed. c) Perform augmented tests and inspections on piping segments that cannot be drained or piping segments that allow water to collect. In each 5-year interval, beginning 5 years prior to the PEO, either a flow test or flush sufficient to detect potential flow blockage will be conducted, or a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			or piping segments that allow water to collect will be performed. In each 5-year interval of the PEO, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect will be subject to volumetric wall thickness inspections. Measurement points will be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval will be in different locations than previously inspected piping. If the results of a 100-percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections will be necessary. For portions of the normally dry piping that are configured to drain, the above augmented tests and inspections are not required. d) Perform testing and visual inspections in accordance with Table 4a of LR-ISG-2012-02 Appendix L. This table is based on NFPA 25, 2011 edition. Unless recommended otherwise, external visual inspections are to be conducted on a refueling outage interval. e) Update procedures to state that minimum design wall thickness must be maintained for in-scope fire protection piping.	
19	Fuel Oil Chemistry (A.2.2.17)	XI.M30	Continue the existing Fuel Oil Chemistry AMP, including enhancements to: a) Test for levels of microbiological organisms in the new fuel oil prior to acceptance.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032,

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			b) Monitor and trend the following parameters quarterly: water content, sediment content, biological activity, and total particulate concentration for the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks. c) Drain, clean, and visually inspect the internal surfaces of the EDG Day Tanks and the DDFP Fuel Oil Storage Tanks. Volumetrically inspect the tanks, if evidence of degradation is observed during visual inspection, or if visual inspection is not possible. Perform the maintenance activities and the inspections at least once during the 10-year period prior to the PEO, then periodically on a 10-year frequency during the PEO. d) Provide acceptance criteria, consistent with industry standards, for the testing requirement and approach used to detect the microbiological activity in diesel fuel used in the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks.	or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 10-year period prior to the PEO.
20	Reactor Vessel Surveillance (A.2.2.18)	XI.M31	The Reactor Vessel Surveillance AMP will be enhanced as follows: a) A capsule in each unit will be re-inserted prior to 36 EFPY in order to achieve at least a vessel equivalent fluence of 80 EFPY. b) The capsule withdrawal schedule will be documented in the PTLR and note that changes require NRC approval per 10 CFR 50, Appendix H. c) The program documents will be modified to require that all pulled and tested specimens will be retained unless the NRC has approved the discard of the pulled and tested samples.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			d) The program documents will be modified to establish operating restrictions to ensure that the plant is operated within the material aging OE, i.e., the cold leg temperature during normal operation will be limited to 525°F (minimum) to 590°F (maximum).	
21	One-Time Inspection (A.2.2.19)	XI.M32	Implement the new One-Time Inspection AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 10-year period prior to the PEO.
22	Selective Leaching (A.2.2.20)	XI.M33	Implement the new Selective Leaching AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
				Perform the pre-PEO inspections within the 5-year period prior to the PEO.
23	ASME Code Class 1 Small-Bore Piping (A.2.2.21)	XI.M35	Implement the new One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 6-year period prior to the PEO.
24	External Surfaces Monitoring of Mechanical Components (A.2.2.22)	XI.M36	Continue the existing External Surfaces Monitoring of Mechanical Components AMP including enhancements to: a) Include elastomeric and polymeric components in the scope of the AMP. b) Include outdoor insulated components and indoor insulated components exposed to condensation in the scope of the AMP to monitor for degraded conditions under insulation.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			c) Clarify that below-grade components that are accessible during normal operations or refueling outages for which access is not restricted are managed by this AMP. d) Credit external examinations to manage the aging effects of the internal surfaces of components when external conditions are representative of internal conditions. e) Monitor for discoloration, surface cracking, crazing, scuffing, dimensional change and hardening for polymeric and elastomeric components as well as exposure of internal reinforcement for reinforced elastomers. f) Monitor metallic components for loss of material due to material wastage; leakage; worn, flaking or oxide coated surfaces; and corrective coating degradation; as well as corrosion stains on thermal insulation. g) Include examples of components inspected, such as piping, piping components, ducting, polymeric components, and insulation jacketing. h) Inspect unit coolers for reduction of heat transfer. The inspection will consist of the heat transfer surfaces of unit coolers that are exposed to external condensation and are credited with a heat transfer function i) Ensure inspections of surfaces readily visible during plant operations and refueling outages are performed once per refueling cycle. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			made accessible and at such intervals that would ensure the components' intended functions are maintained. j) Include the use of, when non ASME Code inspections and tests are required, site procedures that include inspection parameters for items such as lighting, distance, offset, surface coverage, and presence of protective coatings. k) Inspect elastomeric and polymeric components through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections will cover 100 percent of accessible component surfaces. Manual or physical manipulation of flexible polymeric material includes touching, pressing on, flexing, bending, or otherwise manually interacting with the material in order to reveal changes in material properties, such as hardness, and to make the visual examination process more effective in identifying aging effects such as cracking. The sample size for manipulation will be at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include the following: ○ Surface cracking, crazing, scuffing, and dimensional change (e.g., "ballooning" and "necking"); ○ Loss of thickness; ○ Discoloration (evidence of a potential change in material properties that could be indicative of polymeric degradation); ○ Exposure of internal reinforcement for reinforced elastomers; and ○ Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			l) Inspect insulated components in an outdoor environment or in an indoor environment that may be exposed to condensation, once every 10 years during the PEO. The population and sample sizes used for inspections will be determined based on the material type and environment combination. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank) will be inspected after the insulation is removed. Alternatively, any combination of a minimum of twenty-five 1-foot axial length sections and components from each material type is inspected, with a maximum of 25 inspections required for each material environment in each population. m) Include the following alternatives to removing insulation after the initial inspection: o Subsequent inspections may consist of examination of the exterior surface of the insulation with sufficient acuity to detect indications of damage to the jacketing or protective outer layer (if the protective outer layer is waterproof) of the insulation when the results of the initial inspections meet the following criteria: i. No loss of material due to general, pitting, or crevice corrosion beyond that which could have been present during initial construction is observed during the first set of inspections, and ii. No evidence of SCC is observed during the first set of inspections If: (a) the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or jacketing, (b) there is evidence of water intrusion through the insulation	

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			(e.g., water seepage through insulation seams/joints), or (c) the protective outer layer (where jacketing is not installed) is not waterproof, then periodic inspections under the insulation should continue as conducted for the initial inspection. ○ Removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. If the moisture barrier is intact, the likelihood of corrosion under insulation (CUI) is low for tightly adhering insulation. Tightly adhering insulation is considered to be a separate population from the remainder of insulation installed on in-scope components. The entire population of in-scope piping that has tightly adhering insulation is visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections are not credited towards the inspection quantities for other types of insulation. n) Select bounding or lead components most susceptible to CUI in an outdoor environment or in an indoor environment that may be exposed to condensation. This could be due to time in service, severity of operating conditions (e.g., amount of time that condensate would be present on the external surfaces of the component), and lowest design margin for inspection under insulation. o) Include the following acceptance criteria: ○ For metallic surfaces, any indications of degradation are evaluated. ○ For stainless steel surfaces, a clean, shiny surface is expected, and any deviation is evaluated.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			○ For flexible polymers, a uniform surface texture and uniform color with no dimension change is expected and any deviation is evaluated. ○ For flexible materials, changes in physical properties (e.g., the hardness, flexibility, physical dimensions, and color. of the material are unchanged from when the material was new) are evaluated. ○ For rigid polymers, surface changes affecting performance, such as erosion, cracking, crazing, and chalking, are evaluated.	
25	Flux Thimble Tube Inspection (A.2.2.23)	XI.M37	Continue the existing Flux Thimble Tube Inspection AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
26	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (A.2.2.24)	XI.M38	Implement the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
27	Lubricating Oil Analysis (A.2.2.25)	XI.M39	Continue the existing Lubricating Oil Analysis AMP, including an enhancement to: a) Clarify that phase-separated water in any amount is not acceptable for any component within the scope of LR.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
28	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (A.2.2.26)	XI.M40	Continue the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex AMP, including an enhancement to: a) Ensure the required corrective action to address failed acceptance criteria includes a comparison of current and future predicted parameters to the assumptions of the SFP criticality analysis.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
29	Buried and Underground Piping and Tanks (A.2.2.27)	XI.M41	Continue the existing Buried and Underground Piping and Tanks AMP, including enhancements to: a) Manage loss of material due to corrosion of piping system bolting within the scope of this program. b) Implement the requirements of NACE SP0169-2007 or NACE RP0285-2002 for cathodic protection. c) Ensure pit depth gages or calipers used for measuring wall thickness have been demonstrated to be effective for the	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			material, environment, and conditions (e.g., remote methods) during the examination, and they are capable of quantifying general wall thickness and the depth of pits. d) Perform inspections of buried and underground piping and tanks within the fire protection, SSW, and emergency diesel generator and auxiliary systems in accordance with LR-ISG-2015-01 Table XI.M41-2 for steel. The inspections will be distributed evenly among the units. Since CPNPP is a two-unit site, the inspection quantities are 50% greater than LR-ISG-2015-01 Table XI.M41-2 and are rounded up to the nearest whole inspection. When the inspections for a given material type is based on percentage of length and results in an inspection quantity of less than 10 feet, then 10 feet of piping is inspected. If the entire run of piping of that material type is less than 10 feet in total length, then the entire run of piping is inspected. e) Ensure a minimum of 25% of the internal surface of the diesel generator fuel oil storage tank, including the upper and lower portion of the tank and tank endbells, is inspected volumetrically. f) Trend potential difference and current measurements to identify changes in the effectiveness of the cathodic protection system and/or coatings. g) Trend the fire pump activity (or similar parameter) to identify concerns with buried fire water yard loop header leakage.	Perform the pre-PEO inspections within the 10-year period prior to the PEO.

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			h) Ensure type and extent of coating degradation is evaluated by evaluators who: (a) possess a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) who has completed the EPRI Comprehensive Coatings Course and completed the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training Course; or (c) a coatings specialist qualified in accordance with an ASTM standard endorsed in RG 1.54, Rev. 2, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." i) Where loss of material is identified, the measured wall thickness is projected to the end of the PEO such that minimum wall thickness requirements are maintained. j) Revise acceptance criteria to ensure there is no evidence that backfill caused damage to the respective component coatings or the surface of the component (if not coated), and changes in fire pump activity (or similar parameter) that cannot be attributed to causes other than leakage from buried piping are not occurring. k) Conduct an extent of condition evaluation when damage to a coating has been evaluated as significant and the damage was caused by nonconforming backfill to determine the extent of degraded backfill in the vicinity of the observed damage.	

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			l) Unacceptable cathodic protection survey results are entered into the plant corrective action program. m) When using the option of monitoring the activity of a fire pump instead of inspecting buried fire water system piping, a flow test or system leak rate test is conducted by the end of the next refueling outage or as directed by the current licensing basis, whichever is shorter, when unexplained changes in fire pump activity (or equivalent equipment or parameter) are observed. n) If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. This may include different values for large area minimum wall thickness and local area wall thickness. If the wall thickness extrapolated to the end of the PEO meets minimum wall thickness requirements, recommendations for expansion of sample size, below do not apply. o) Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired, or the affected component is replaced. In addition, where the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the PEO, an expansion of sample size is conducted. The number of inspections within the affected piping categories are doubled or increased by 5, whichever is smaller. If the acceptance criteria are not met in any of the expanded samples, an analysis shall be conducted to determine the extent of condition and extent of cause.	

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			The timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. However, in all cases, the expanded sample inspection is completed within the 10-year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. These additional inspections conducted during the four years following the end of an inspection interval cannot also be credited towards the number of inspections in Table XI.M41-2 for the following 10 year interval. The number of inspections may be limited by the extent of piping or tanks subject to the observed degradation mechanism. The expansion of sample inspections may be halted in a piping system or portion of system that will be replaced within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval.	
30	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (A.2.2.28)	XI.M42	Continue the existing Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, including enhancements to: a) Include the following internal coatings/linings in the scope of the AMP: ○ Emergency Diesel Generator Intercoolers ○ Fire Protection Cement-lined Piping ○ Internally Coated Four Inch Service Water Piping within the SWIS	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections no earlier than 10 years prior to the PEO and no

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			b) Perform visual inspections capable of identifying flaking, peeling, delamination, and spalling. c) Perform baseline inspections of coatings/linings in the 10-year period prior to the PEO for the o Emergency Diesel Generator Intercoolers. o Internally Coated Four Inch Service Water Piping within the SWIS. d) Perform subsequent inspections based on an evaluation of the effect of a coating/lining failure on the in-scope component's intended function, potential problems identified during prior inspections, and known service life history. Subsequent inspection intervals are established by a coating specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Inspection intervals should not exceed those in LR-ISG-2013-01 Table 4a, "Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers." e) Perform inspections of all accessible internally coated surfaces of in-scope heat exchangers. f) Establish qualifications for cementitious coatings/linings inspectors to have a minimum of 5 years of experience inspecting or testing concrete structures or cementitious coatings/linings, or a degree in the civil/structural discipline and a minimum of 1 year of experience. g) Perform opportunistic inspections of the cement lining applied to the internal surface of buried fire protection piping.	later than 6 months prior to the PEO or the last refueling outage prior to PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			h) Perform a pre-inspection review of the previous two inspections, when available that includes reviewing the results of inspections and any subsequent repair activities. i) Prepare post-inspection reports, by a coatings specialist, to include: a list and location of all areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. When corrosion of the base material is the only issue related to coating/lining degradation of the component and external wall thickness measurements are used in lieu of internal visual inspections of the coating/lining, the corrosion rate of the base metal is trended. j) Include the following acceptance criteria: ○ Indications of peeling and delamination are not acceptable. ○ Blisters, cracking, flaking, and rusting are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections. ○ Minor cracking and spalling of cementitious coatings/linings is acceptable provided there is no evidence that the coating/lining is debonding from the base material. ○ As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			k) Revise corrective actions to include the following: ○ As an alternative to repair/replacement, coatings exhibiting indications of peeling and delamination may be returned to service if: (a) physical testing is conducted to ensure that the remaining coating is tightly bonded to the base metal; (b) the potential for further degradation of the coating is minimized, (i.e., any loose coating is removed, the edge of the remaining coating is feathered); (c) adhesion testing using ASTM International standards endorsed in RG 1.54 is conducted at a minimum of 3 sample points adjacent to the defective area; (d) an evaluation is conducted of the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component; and (e) follow-up visual inspections of the degraded coating are conducted within 2 years from detection of the degraded condition, with a re-inspection within an additional 2 years, or until the degraded coating is repaired or replaced. ○ If coatings/linings are credited for corrosion prevention (e.g., corrosion allowance in design calculations is zero, the “preventive actions” program element credited the coating/lining) and the base metal has been exposed or it is beneath a blister, the component’s base material in the vicinity of the degraded coating/lining will be examined to determine if the minimum wall thickness is met and will be met until the next inspection. ○ If a blister is not repaired, physical testing may be conducted to ensure that the blister is completely surrounded by sound coating/lining bonded to the surface. Physical testing consists of adhesion testing using ASTM International standards endorsed in RG 1.54. An alternative means of determining that the remaining coating/lining is tightly bonded	

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			to the base metal may be conducted such as lightly tapping the coating/lining. Acceptance of a blister to remain in-service should be based both on the potential effects of flow blockage and degradation of the base material beneath the blister.	
31	ASME Section XI, Subsection IWE (A.2.2.29)	XI.S1	Continue the existing ASME Section XI, Subsection IWE AMP, including enhancements to: a) Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR-104213 with the existing procedures and practices for structural bolting. b) Prohibit the use of molybdenum disulfide or other sulfur containing lubricants for structural bolts. c) Augment existing procedures to monitor cracking due to cyclic loading of non-piping penetrations (i.e., equipment hatch, personnel airlocks, electrical penetrations, etc.) by periodic supplemental surface examinations consistent with the frequency of this AMP and the 10 CFR Part 50, Appendix J AMP. d) Implement pre-PEO supplemental one-time inspections, performed by qualified personnel using methods capable of detecting cracking due to SCC, comprising (a) a representative sample (4 penetrations and 1 transfer tube) of the stainless steel penetrations or dissimilar metal welds associated with high-temperature (temperatures above 140°F) stainless steel piping systems on each unit; and (b) the stainless steel fuel	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 5-year period prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			transfer tube on each unit. These inspections are intended to confirm the absence of SCC.	
32	ASME Section XI, Subsection IWL (A.2.2.30)	XI.S2	Continue the existing ASME Section XI, Subsection IWL AMP, including enhancements to: a) Clarify that concrete deterioration and distress includes damage or degradation, such as those described in ACI 201.1 and ACI 349.3R; b) Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R; c) Specify that inspection results are to be compared to previous results to identify changes from prior inspections, and that quantitative measurements and qualitative information are recorded and trended for applicable parameters monitored or inspected; and d) Include quantitative acceptance based on the “Evaluation Criteria” provided in Chapter 5 of ACI 349.3R to augment the qualitative assessment of the Responsible Engineer.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
33	ASME Section XI, Subsection IWF (A.2.2.31)	XI.S3	Continue the existing ASME Section XI, Subsection IWF AMP including enhancements to:	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032,

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			a) Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR 104213 with the existing procedures and practices for structural bolting. b) Ensure that the preventive actions for storage, lubricants, and SCC potential in RCSC publication "Specification for Structural Joints Using ASTM A325 or A490 Bolts" Section 2 are considered in specifications and procedures for ASTM A325 and A490 bolts. c) Prohibit the use of molybdenum disulfide or other sulfur containing lubricants for structural bolts. d) Specify that the following conditions are also unacceptable: ○ Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. ○ Cracked or sheared bolts, including high-strength bolts, and anchors.	or no later than the last refueling outage prior to the PEO.
34	10 CFR Part 50, Appendix J (A.2.2.32)	XI.S4	Continue the existing 10 CFR Part 50, Appendix J AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
35	Masonry Walls (A.2.2.33)	XI.S5	Continue the existing CPNPP Masonry Walls AMP, including enhancement – a) To include bricks and mortar near the silencer for each diesel generator and perform a baseline inspection; and b) of inspector and reviewer qualifications for Masonry Walls and other structural components to match current ACI 349.3R requirements through the Structures Monitoring AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
36	Structures Monitoring (A.2.2.34)	XI.S6	Continue the existing Structures Monitoring AMP, including enhancements to: a) Include the Diesel Generator Buildings, Switchgear Buildings, Transmission Towers associated with Startup Transformers (XST1, XST2), Alternate Start-up Transformers (XST1A, XST2A), and Seismic Category I Manholes, Handholes, and Duct Banks in the scope of the Structures Monitoring AMP. b) Perform periodic sampling and testing of groundwater chemistry at a frequency once every 5 years to determine the quality of groundwater. c) Inspect structural members of crane supports, high energy line break (HELB) and spray shields, stairs, and platforms, industrial and HELB doors. d) Include exposed steel embedment's in the "Steel Structural Elements" group	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			e) Inspect concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. f) Visually inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel. g) Provide guidance for documenting significant findings of the inspection, consistent with ACI 349.3R Section 3.5.5 to monitor and trend the extent of degradation. h) Provide guidance on documentation and archival requirements in accordance with ACI 349.3R Section 3.5. i) Provide guidance for inspection reports to be completed in accordance with ACI 349.3R Section 3.5.5. j) Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. k) Specify the qualification requirements for inspection of structures and components as well as the requirements for the reviewer to match the ACI 349.3R current code requirements. l) Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR104213 with the existing procedures and practices for structural bolting.	

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			m) Ensure that the preventive actions for storage, lubricants, and SCC potential in RCSC publication Section 2 are considered in specification and procedures for ASTM A325 or A490 bolts. n) Prohibit the use of molybdenum disulfide (MoS_2) or other sulfur containing lubricants for structural bolts.	
37	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (A.2.2.35)	XI.S7	Continue the existing RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, including enhancements to: a) Inspect concrete structures for an increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. b) Inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel. c) Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. d) Include guidance for documenting and trending all significant findings of the inspection, consistent with ACI 349.3R Section 3.5.5.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
38	Protective Coating Monitoring and Maintenance (A.2.2.36)	XI.S8	Continue the existing Protective Coating Monitoring and Maintenance AMP, including enhancement to: a) Ensure that inspection reports prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
39	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.37)	XI.E1	Implement the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
40	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (A.2.2.38)	XI.E2	Implement the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
41	Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.39)	XI.E3	Implement the new Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
42	Metal Enclosed Bus (A.2.2.40)	XI.E4	Implement the new Metal Enclosed Bus AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.

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No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
43	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.41)	XI.E6	Implement the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.
44	Operating Experience Program (A.1.4)	Appendix B	Continue the existing OE Program, including enhancement to: a) Require the review of internal and external OE for aging-related degradation or impacts to aging management activities, to determine if improvements to CPNPP aging management activities are warranted. NRC and industry guidance documents and standards applicable to aging management are considered part of this information. b) Provide procedural guidance for identifying and reviewing OE including descriptions of aging-related degradation. In general, the descriptions will be used to identify aging that is in excess of what would be expected, relative to design, previous inspection experience and the inspection intervals. c) Establish coding for use in identification, trending, and communication of aging-related degradation.	No later than the date the renewed operating licenses are issued.

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List of LR Commitments and Implementation Schedule

No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule
			d) Establish guidelines for reporting plant-specific OE on age-related degradation and aging management to the industry. e) Provide training, on a periodic basis, to those responsible for AMP implementation and those responsible for reviewing, evaluating, and communicating OE items related to aging management and aging-related degradation.	
45	Quality Assurance (A.1.3)	Appendix A	Continue the existing QA Program, including enhancement to include NNS SSCs that are subject to AMR for LR.	No later than the date that the renewed operating licenses are issued.

APPENDIX B

AGING MANAGEMENT PROGRAMS

COMANCHE PEAK NUCLEAR POWER PLANT UNITS 1 & 2

LICENSE RENEWAL APPLICATION

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B.1. INTRODUCTION

B.1.1. Overview

The LR AMP descriptions are provided in this appendix for each program credited for managing aging effects based upon the AMR results provided in Sections 3.1 through 3.6 of this LRA.

In general, there are four types of AMPs:

- Prevention programs that preclude aging effects from occurring;
- Mitigation programs that slow the effects of aging;
- Condition monitoring programs that inspect/examine for the presence and extent of aging; and
- Performance monitoring programs that test the ability of a structure or component to perform its intended function.

More than one type of AMP may be implemented for SSCs to ensure that aging effects are managed.

Part of the demonstration that the effects of aging are adequately managed is to evaluate credited programs and activities against certain required attributes. Each of the AMPs described in this section has ten (10) elements which are consistent with the attributes described in Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RLSB-1)" and in Table A.1-1 "Elements of an Aging Management Program for License Renewal" of NUREG-1800.

Credit has been taken for existing plant programs whenever possible. As such, programs and activities associated with a system, structure, component, or commodity group were considered. Existing programs and activities that apply to systems, structures, components, or commodity groups were reviewed to determine whether they include the necessary actions to manage the effects of aging.

Existing plant programs were often based on a regulatory commitment or requirement, rather than aging management. Many of these existing programs included the required LR 10-element attributes and have been demonstrated to adequately manage the identified aging effects. If an existing program did not adequately manage an identified aging effect, the program was enhanced as necessary, or a new program was created.

Consistent with the discussion above, the following new programs will be created at CPNPP for the purposes of LR:

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B.2.3.6) AMP,
- PWR Vessel Internals (B.2.3.7) AMP,
- One-Time Inspection (B.2.3.19) AMP,
- Selective Leaching (B.2.3.20) AMP,
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21) AMP,

- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP,
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37) AMP,
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.3.38) AMP,
- Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.39) AMP,
- Metal Enclosed Bus (B.2.3.40) AMP, and
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.41) AMP.

These new AMPs will be consistent with the 10 elements of their respective NUREG-1801 AMPs.

The following programs each have exception(s) justified by technical data:

- Water Chemistry (B.2.3.2) AMP,
- Reactor Head Closure Stud Bolting (B.2.3.3) AMP,
- Flow-Accelerated Corrosion (B.2.3.8) AMP,
- Steam Generators (B.2.3.10) AMP,
- Closed Treated Water Systems (B.2.3.12) AMP,
- Fire Water System (B.2.3.16) AMP,
- Fuel Oil Chemistry (B.2.3.17) AMP,
- Buried and Underground Piping and Tanks (B.2.3.27) AMP,
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP, and
- ASME Section XI, Subsection IWF (B.2.3.31) AMP.

There are no plant-specific AMPs in the CPNPP LRA.

B.1.2. <u>Method of Discussion</u>

For those AMPs that are consistent with the AMP descriptions and assumptions made in Section X and XI of NUREG-1801 as modified by LR-ISGs, or are consistent with exceptions or enhancements, each AMP discussion is presented in the following format:

- A Program Description abstract of the overall program form and function is provided. This Program Description also includes whether the program is existing or new for LR.

- A NUREG-1801 consistency statement is made about the AMP.

- Exceptions to the NUREG-1801 program are outlined and a justification for the exception(s) is provided.

- Enhancements or additions to make the AMP consistent with the respective NUREG-1801 AMP are provided. A proposed schedule for completion is discussed. This LRA defines "enhancements" as any changes to plant programs or activities that need to be implemented in order to align with the guidance of NUREG-1801.

- OE information specific to the AMP is provided.
- A Conclusion section provides a statement of reasonable assurance that the AMP for LR is effective or will be effective when implemented if new or enhanced.

B.1.3. Quality Assurance Program and Administrative Controls

The CPNPP QA Program implements the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Requirements for Nuclear Power Plants and Fuel Reprocessing Plants" and is consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)" of NUREG-1800. The CPNPP QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to nuclear safety related SSCs. CPNPP will enhance the QA Program to include NNS SSCs that are subject to AMR for LR. This enhancement will be implemented no later than the date that the renewed operating licenses are issued and conducted on an ongoing basis throughout the PEOs.

Generically, the elements of corrective action, confirmation process, and administrative controls are applicable as follows.

<u>Corrective Actions:</u>

A single CPNPP CAP is applied regardless of the safety classification of the SSC or commodity group. The CPNPP CAP requires the initiation of a CR for actual or potential problems, including unexpected plant equipment degradation, damage, failure, malfunction, or loss of function. Site documents that implement AMPs for LR direct that a CR be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met). Equipment deficiencies are corrected through the Work Control Process in accordance with plant procedures, and when required, through the design change process. The CPNPP CAP specifies that for equipment deficiencies, a CR will be initiated for condition identification, assignment of significance level and investigation class, investigation, corrective action determination, investigation report review and approval, action tracking, and trend analysis.

The following statement applies to CPNPP AMPs for LR:

> *Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the condition is determined, and that corrective action is taken to preclude recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented is documented and reported to appropriate levels of management. The corrective action controls of the Quality Assurance*

Program, as described in the CPNPP CAP Program, will be used to meet Element 7, Corrective Actions.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting and precluding repetition of adverse conditions. The CPNPP CAP includes provisions for timely evaluation of adverse conditions and implementation of corrective actions required, including root cause determinations and prevention of recurrence where appropriate (e.g., significant conditions adverse to quality). The CPNPP CAP provides for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken. The CPNPP CAP also includes monitoring for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions results in the initiation of a CR. The AMPs required for LR would also result in identification of related unsatisfactory conditions due to ineffective corrective action.

When enhanced, the 10 CFR Part 50, Appendix B, corrective actions, and confirmation process will be applied to nonconforming nuclear safety related and NNS SSCs subject to AMR for LR, therefore the CAP will be consistent with the NUREG-1800 and NUREG-1801 elements.

The following statement is applicable to CPNPP AMPs for LR:

Site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The Quality Assurance Program, as described in the CPNPP Quality Assurance Manual (Vistra OpCo Comanche Peak Nuclear Power Plant Quality Assurance Manual), will be used to meet Element 8, Confirmation Process.

The confirmation process is part of the corrective action program and includes the following:

- *Reviews to assure that proposed corrective actions are adequate*
- *Tracking and reporting of open corrective actions*
- *Review of corrective action effectiveness*

Any follow-up inspection required by the confirmation process is documented in accordance with the corrective action program. The corrective action program constitutes the confirmation process for CPNPP aging management programs and activities.

Administrative Controls:

The document control process will be applied to all generated documents, procedures, and instructions regardless of the safety classification of the associated SSC or commodity group. Document control processes are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. Administrative controls procedures provide information on procedures, instructions, and other forms of administrative control documents, as well as guidance on classifying these documents into the proper document type and as-building frequency. Revisions will be made to procedures and instructions that implement or administer AMP requirements for the purposes of managing the associated aging effects for the PEO.

The following statement is applicable to CPNPP AMPs for LR:

Site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The Quality Assurance Program, as described in the CPNPP Quality Assurance Manual (Vistra OpCo Comanche Peak Nuclear Power Plant Quality Assurance Manual), will be used to meet the required Administrative Controls.

B.1.4. Operating Experience

Internal OE (also referred to as plant-specific OE) and external OE (also referred to as industry OE) sources are captured and systematically reviewed on an ongoing basis in accordance with the QA program and the CPNPP OE program. The CPNPP OE program meets the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff." The CPNPP OE program will meet the guidance of NEI 14-12 "Aging Management Program Effectiveness." The CPNPP OE program interfaces with and relies on active participation in the INPO OE program, as endorsed by the NRC.

OE is used at CPNPP, to enhance existing programs, prevent repeat events, and prevent events that have occurred at other plants. Through INPO, as well as other sources, CPNPP receives external OE routinely. The OE process reviews OE from external and internal sources. CPNPP personnel screen, evaluate, and act on OE documents and information to prevent or mitigate the consequences of similar events. External OE includes INPO documents, NRC documents (e.g., INs, Regulatory Information Summaries, Interim Staff Guidance), and other documents. In addition, the LR ISG documents and revisions to the GALL Report will be considered as sources of industry OE and evaluated accordingly. Relevant foreign and domestic research and development are also reviewed. Relevant research and development sources include: (a) industry consensus standards development organizations (e.g., ASME, IEEE, ACI, API, NACE, International Organization for Standardization); (b) EPRI; (c) generic communications issued by the staff based on research conducted by national labs used by the NRC; and (d) NSSS vendor and owner's groups.

OE, including that involving age-related degradation, is tracked, and trended such that adverse trends are entered into the corrective action program, as appropriate, for evaluation. OE identified as potentially involving aging is evaluated with regard to: (a) SSCs, (b) materials, (c) environments, (d) aging effects, and (e) aging mechanisms, and will also be evaluated with regards to (f) AMPs, and (g) the activities, criteria, and evaluations integral to the elements of the AMPs. AMPs will have an established performance feedback mechanism in place by requiring CPNPP personnel to use the OE program to evaluate both internal and external OE for applicability. This process will provide reasonable assurance that AMPs will be informed and enhanced, if necessary, by relevant OE. CPNPP will meet the guidance of NEI 14-13 regarding the use of industry OE for AMPs.

Assessments of the effectiveness of the AMPs and activities will be conducted on a periodic basis per NEI 14-12 guidance. The assessments will include evaluation of the AMP or activity against the latest NRC and industry guidance documents and standards that are relevant to the particular program or activity. If there is an indication that the effects of aging are not being adequately managed, then an issue report is written and screened, and if a condition adverse to quality exists, a corrective action document is entered into the 10 CFR Part 50, Appendix B, program to either enhance the AMPs or develop and implement new AMPs, as appropriate.

Each AMP summary in this appendix contains a discussion of OE relevant to the AMP. This information was obtained through the review of internal OE captured in a condition report (CR), issue report, OE report, trending report; program assessments; program/system health reports, and through the review of external OE. Additionally, OE was obtained through interviews with site engineers and other plant personnel. New AMPs utilize internal and/or external OE as applicable and discuss the OE and associated corrective actions as they relate to implementation of the new AMP. The OE in each AMP summary may identify past corrective actions that have resulted in program enhancements and provides objective evidence that the effects of aging have been, and will continue to be, adequately managed so that the intended functions of the structures and components within the scope of each AMP will be maintained during the PEO.

As described above, the existing OE process at CPNPP, in conjunction with the corrective action program, has proven to be effective in learning from adverse conditions and events, and improving programs that address age-related degradation. In order to provide additional assurance that internal and external OE related to aging management is used effectively during the PEO, CPNPP will enhance its OE program to:

a) Require the review of internal and external OE for aging-related degradation or impacts to aging management activities, to determine if improvements to CPNPP aging management activities are warranted. NRC and industry guidance documents and standards applicable to aging management are considered part of this information.

b) Provide procedural guidance for identifying and reviewing OE including descriptions of aging-related degradation. In general, the descriptions will be used to identify aging that is in excess of what would be expected, relative to design, previous inspection experience and the inspection intervals.

c) Establish coding for use in identification, trending, and communications of aging-related degradation.

d) Establish guidelines for reporting plant-specific OE on age-related degradation and aging management to the industry.

e) Provide training, on a periodic basis, to those responsible for AMP implementation and those responsible for reviewing, evaluating, and communicating OE items related to aging management and aging-related degradation.

These enhancements will be implemented no later than the date that the renewed operating licenses are issued and conducted on an ongoing basis throughout the PEOs.

B.1.5. Aging Management Programs

Table B-1 lists the CPNPP AMPs for LR in the order the AMPs appear in NUREG-1801. Table B-1 states the respective AMP section numbers and whether the AMP is considered a new program or an existing program at CPNPP. Existing AMPs are based on an existing CPNPP program. Additionally, Table B-2 lists the CPNPP AMPs for LR in alphabetical order. The AMPs either are or will be consistent with their respective AMPs discussed in NUREG-1801 unless otherwise noted as an exception.

Table B-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Section	Aging Management Program	Existing AMP or New AMP
X.M1	B.2.2.1	Fatigue Monitoring	Existing
X.S1	N/A	Concrete Containment Tendon Prestress Not Applicable (CPNPP U1 and U2 do not have concrete containment tendons)	N/A
X.E1	B.2.2.2	Environmental Qualification of Electric Components	Existing
XI.M1	B.2.3.1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Existing
XI.M2	B.2.3.2	Water Chemistry	Existing
XI.M3	B.2.3.3	Reactor Head Closure Stud Bolting	Existing
XI.M4	N/A	BWR Vessel ID Attachment Welds Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M5	N/A	BWR Feedwater Nozzle Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M6	N/A	BWR Control Rod Drive Return Line Nozzle Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M7	N/A	BWR Stress Corrosion Cracking Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M8	N/A	BWR Penetrations Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M9	N/A	BWR Vessel Internals Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M10	B.2.3.4	Boric Acid Corrosion	Existing
XI.M11B	B.2.3.5	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	Existing

Table B-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Section	Aging Management Program	Existing AMP or New AMP
XI.M12	B.2.3.6	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	New
XI.M16A	B.2.3.7	PWR Vessel Internals	New
XI.M17	B.2.3.8	Flow-Accelerated Corrosion	Existing
XI.M18	B.2.3.9	Bolting Integrity	Existing
XI.M19	B.2.3.10	Steam Generators	Existing
XI.M20	B.2.3.11	Open-Cycle Cooling Water System	Existing
XI.M21A	B.2.3.12	Closed Treated Water Systems	Existing
XI.M22	N/A	Boraflex Monitoring Not Applicable (CPNPP does not credit Boraflex as a neutron absorber in SFP criticality analyses.)	N/A
XI.M23	B.2.3.13	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Existing
XI.M24	B.2.3.14	Compressed Air Monitoring	Existing
XI.M25	N/A	BWR Reactor Water Cleanup System Not Applicable (CPNPP U1 and U2 are PWRs)	N/A
XI.M26	B.2.3.15	Fire Protection	Existing
XI.M27	B.2.3.16	Fire Water System	Existing
XI.M29	N/A	Aboveground Metallic Tanks Not Applicable (CPNPP U1 and U2 do not have any tanks in the scope of this AMP)	N/A
XI.M30	B.2.3.17	Fuel Oil Chemistry	Existing
XI.M31	B.2.3.18	Reactor Vessel Surveillance	Existing
XI.M32	B.2.3.19	One-Time Inspection	New
XI.M33	B.2.3.20	Selective Leaching	New
XI.M35	B.2.3.21	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	New
XI.M36	B.2.3.22	External Surfaces Monitoring of Mechanical Components	Existing
XI.M37	B.2.3.23	Flux Thimble Tube Inspection	Existing
XI.M38	B.2.3.24	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	New
XI.M39	B.2.3.25	Lubricating Oil Analysis	Existing
XI.M40	B.2.3.26	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Existing
XI.M41	B.2.3.27	Buried and Underground Piping and Tanks	Existing

Table B-1
List of CPNPP Aging Management Programs

NUREG-1801 Section	Section	Aging Management Program	Existing AMP or New AMP
XI.M42	B.2.3.28	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	Existing
XI.S1	B.2.3.29	ASME Section XI, Subsection IWE	Existing
XI.S2	B.2.3.30	ASME Section XI, Subsection IWL	Existing
XI.S3	B.2.3.31	ASME Section XI, Subsection IWF	Existing
XI.S4	B.2.3.32	10 CFR Part 50, Appendix J	Existing
XI.S5	B.2.3.33	Masonry Walls	Existing
XI.S6	B.2.3.34	Structures Monitoring	Existing
XI.S7	B.2.3.35	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Existing
XI.S8	B.2.3.36	Protective Coating Monitoring and Maintenance Program	Existing
XI.E1	B.2.3.37	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New
XI.E2	B.2.3.38	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	New
XI.E3	B.2.3.39	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New
XI.E4	B.2.3.40	Metal Enclosed Bus	New
XI.E5	N/A	Fuse Holders Not Applicable (CPNPP U1 and U2 do not have any components within this program scope.)	N/A
XI.E6	B.2.3.41	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New
CPNPP Plant-specific Program	N/A	Not Applicable (CPNPP U1 and U2 do not have any unique plant-specific AMPs beyond those described in NUREG-1801)	N/A

Table B-2
Aging Management Programs

CPNPP Aging Management Program	Section	NUREG-1801 Section
10 CFR Part 50, Appendix J	B.2.3.32	XI.S4
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	B.2.3.1	XI.M1
ASME Section XI, Subsection IWE	B.2.3.29	XI.S1
ASME Section XI, Subsection IWF	B.2.3.31	XI.S3
ASME Section XI, Subsection IWL	B.2.3.30	XI.S2
Bolting Integrity	B.2.3.9	XI.M18
Boric Acid Corrosion	B.2.3.4	XI.M10
Buried and Underground Piping and Tanks	B.2.3.27	XI.M41
Closed Treated Water Systems	B.2.3.12	XI.M21A
Compressed Air Monitoring	B.2.3.14	XI.M24
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	B.2.3.5	XI.M11B
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B.2.3.41	XI.E6
Environmental Qualification of Electric Components	B.2.2.2	X.E1
External Surfaces Monitoring of Mechanical Components	B.2.3.22	XI.M36
Fatigue Monitoring	B.2.2.1	X.M1
Fire Protection	B.2.3.15	XI.M26
Fire Water System	B.2.3.16	XI.M27
Flow-Accelerated Corrosion	B.2.3.8	XI.M17
Flux Thimble Tube Inspection	B.2.3.23	XI.M37
Fuel Oil Chemistry	B.2.3.17	XI.M30
Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B.2.3.39	XI.E3
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	B.2.3.24	XI.M38
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.2.3.13	XI.M23
Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	B.2.3.37	XI.E1

Table B-2
Aging Management Programs

CPNPP Aging Management Program	Section	NUREG-1801 Section
Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	B.2.3.38	XI.E2
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	B.2.3.28	XI.M42
Lubricating Oil Analysis	B.2.3.25	XI.M39
Masonry Walls	B.2.3.33	XI.S5
Metal Enclosed Bus	B.2.3.40	XI.E4
Monitoring of Neutron-Absorbing Materials Other than Boraflex	B.2.3.26	XI.M40
One-Time Inspection	B.2.3.19	XI.M32
One-Time Inspection of ASME Code Class 1 Small-Bore Piping	B.2.3.21	XI.M35
Open-Cycle Cooling Water System	B.2.3.11	XI.M20
Protective Coating Monitoring and Maintenance Program	B.2.3.36	XI.S8
PWR Vessel Internals	B.2.3.7	XI.M16A
Reactor Head Closure Stud Bolting	B.2.3.3	XI.M3
Reactor Vessel Surveillance	B.2.3.18	XI.M31
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	B.2.3.35	XI.S7
Selective Leaching	B.2.3.20	XI.M33
Steam Generators	B.2.3.10	XI.M19
Structures Monitoring	B.2.3.34	XI.S6
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	B.2.3.6	XI.M12
Water Chemistry	B.2.3.2	XI.M2

B.2. AGING MANAGEMENT PROGRAMS

B.2.1. NUREG-1801 Aging Management Program Correlation

The correlation between the NUREG-1801 programs and the CPNPP AMPs are shown below.

Table B-3
Correlation with NUREG-1801 Aging Management Programs

NUREG-1801 Section	NUREG-1801 Aging Management Program	CPNPP Aging Management Program
X.M1	Fatigue Monitoring	Fatigue Monitoring (B.2.2.1)
X.S1	Concrete Containment Tendon Prestress	Not Applicable (CPNPP U1 and U2 do not have concrete containment tendons)
X.E1	Environmental Qualification of Electric Components	Environmental Qualification of Electric Components (B.2.2.2)
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)
XI.M2	Water Chemistry	Water Chemistry (B.2.3.2)
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Stud Bolting (B.2.3.3)
XI.M4	BWR Vessel ID Attachment Welds	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M5	BWR Feedwater Nozzle	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M6	BWR Control Rod Drive Return Line Nozzle	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M7	BWR Stress Corrosion Cracking	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M8	BWR Penetrations	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M9	BWR Vessel Internals	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion (B.2.3.4)
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B.2.3.5)

Table B-3
Correlation with NUREG-1801 Aging Management Programs

NUREG-1801 Section	NUREG-1801 Aging Management Program	CPNPP Aging Management Program
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B.2.3.6)
XI.M16A	PWR Vessel Internals	PWR Vessel Internals (B.2.3.7)
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (B.2.3.8)
XI.M18	Bolting Integrity	Bolting Integrity (B.2.3.9)
XI.M19	Steam Generators	Steam Generators (B.2.3.10)
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System (B.2.3.11)
XI.M21A	Closed Treated Water Systems	Closed Treated Water Systems (B.2.3.12)
XI.M22	Boraflex Monitoring	Not Applicable (CPNPP does not credit Boraflex as a neutron absorber in SFP criticality analyses.)
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13)
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring (B.2.3.14)
XI.M25	BWR Reactor Water Cleanup System	Not Applicable (CPNPP U1 and U2 are PWRs)
XI.M26	Fire Protection	Fire Protection (B.2.3.15)
XI.M27	Fire Water System	Fire Water System (B.2.3.16)
XI.M29	Aboveground Metallic Tanks	Not Applicable (CPNPP U1 and U2 do not have any tanks in the scope of this AMP)
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry (B.2.3.17)
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance (B.2.3.18)
XI.M32	One-Time Inspection	One-Time Inspection (B.2.3.19)
XI.M33	Selective Leaching	Selective Leaching (B.2.3.20)
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B.2.3.21)

Table B-3
Correlation with NUREG-1801 Aging Management Programs

NUREG-1801 Section	NUREG-1801 Aging Management Program	CPNPP Aging Management Program
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring of Mechanical Components (B.2.3.22)
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection (B.2.3.23)
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24)
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis (B.2.3.25)
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Monitoring of Neutron-Absorbing Materials Other than Boraflex (B.2.3.26)
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks (B.2.3.27)
XI.M42	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28)
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE (B.2.3.29)
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL (B.2.3.30)
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF (B.2.3.31)
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J (B.2.3.32)
XI.S5	Masonry Walls	Masonry Walls (B.2.3.33)
XI.S6	Structures Monitoring	Structures Monitoring (B.2.3.34)
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B.2.3.35)
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program (B.2.3.36)
XI.E1	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37)

Table B-3
Correlation with NUREG-1801 Aging Management Programs

NUREG-1801 Section	NUREG-1801 Aging Management Program	CPNPP Aging Management Program
XI.E2	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.3.38)
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.39)
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus (B.2.3.40)
XI.E5	Fuse Holders	Not Applicable (CPNPP U1 and U2 do not have any components within this program scope.)
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.41)

B.2.2. NUREG-1801 Chapter X Aging Management Programs

This section provides summaries of the NUREG-1801 Chapter X AMPs credited for managing the effects of aging at CPNPP.

B.2.2.1 Fatigue Monitoring

Program Description

The Fatigue Monitoring AMP is an existing preventive AMP that ensures fatigue usage remains within allowable limits for components identified to have a fatigue TLAA by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients is bounded by the design transient definitions for which they are classified, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components including those from NUREG/CR-6260 and those components identified to be more limiting than the components specified in NUREG/CR-6260. Tracking the number of critical thermal and pressure transients for the selected components ensures a CUF for fatigue within allowable limits, including environmental effects where applicable.

The AMP monitors the number of occurrences for the plant transients that cause significant fatigue usage. With enhancements, the AMP will also provide for updates of fatigue usage calculations on an as needed basis if an allowable cycle limit is approached or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components has been modified.

NUREG-1801 Consistency

The Fatigue Monitoring AMP, with enhancements, will be consistent with NUREG-1801, Section X.M1, "Fatigue Monitoring."

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
1. Scope 2. Preventive Actions	The program will be modified to include EAF analyses for locations, in addition to those listed in NUREG/CR-6260, that have been determined to be sentinel locations through the EAF screening evaluation.
2. Preventive Actions	The program will be modified, as needed, to monitor the environmental effects at the sentinel locations.
3. Parameters Monitored or Inspected	The program will be revised to account for additional critical thermal and pressure transients for components that have been identified to have a fatigue TLAA.
6. Acceptance Criteria	The program will be modified to include acceptance criteria based on the 60-year cycle projections used in the supporting analyses.
7. Corrective Actions	The program will be modified to provide clarity on when to initiate corrective action.

Operating Experience

The following examples of OE provide objective evidence that the Fatigue Monitoring AMP will be effective in ensuring that the intended functions are maintained consistent with the CLB for the PEO.

Industry OE

- NRC IN 2015-04 was issued to inform addressees about recent OE related to the structural integrity of recirculation system piping in boiling-water reactors (BWR) and to raise industry awareness regarding the possibility of emerging fatigue cracking in branch connections in all light-water reactors (LWRs).

  CPNPP has been aggressive in pursuing monitoring programs, verification, testing, and modifications as remedies that have minimized vibratory fatigue challenges to the safe and reliable plant operation. CPNPP has taken corrective measures towards the minimization of vibratory fatigue issues in the plant. Procedures have been revised or modified to address OE moving forward with plant operation. Procedure use and adherence is continuously stressed for personnel performing plant modifications and field activities. Strict use of the procedures, which are continuously improved to capture lessons learned, has resulted in enhanced system performance and relatively low down-time due to vibration fatigue failures at CPNPP.

- EPRI Material Reliability Program (MRP) Technical Report MRP-146, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines," provides guidelines and other good practice recommendations for evaluating and inspecting regions in normally stagnant PWR RCS branch lines where there may be the potential for thermal fatigue cracking.

  CPNPP has procedures in-place per NRC IEB 88-08, which implement the guidelines for the evaluation of thermal stratification monitoring data from instrumentation installed in both CPNPP Units 1 and 2, as well as inspection. The procedures include the latest revision of the MRP-146 (Revision 2) which was issued in 2016. This Revision contains “Needed” requirements as defined in the Implementation Protocol of NEI 03-08, Guidelines for the Management of Material Issues. Thermal stratification monitoring data is obtained through instrumentation (RTDs) which are physically connected to select segments of un-isolable Reactor Coolant branch line piping. Data measured by the instruments is transmitted to the Plant Computer. The data is then electronically retrieved from the Plant Computer and is evaluated by engineering.

- NRC (2011) – The NRC issued a regulatory issue summary (RIS) 2011-14 to address the NRC’s concerns using WESTEMS™ to demonstrate compliance with Section III of ASME Code.

  It was determined that RIS 2011-14 identifies the possible misuse of algebraic summation or the peak and valley options in the design analysis modules of WESTEMS™ software. Westinghouse demonstrated that the calculations generated for the operating plants which use the WESTEMS™ program have not misused algebraic summation or the peak and valley options and have met all ASME Code limits. Therefore, the monitoring program portion of WESTEMS™ used at CPNPP is acceptable.

Plant-Specific OE

- In January 2022, ASME Section III Class 1 piping transients for the RCS and auxiliary systems were evaluated and projected through PEO. The 60-year transient projections for Class 1 RCS and Auxiliary Systems remain below the cycle limits except for the Unit1 Letdown Flow Shutoff with Prompt Return to Service transient for Unit 1. This transient is not projected to exceed the 40-year design limit of cycles until entering the PEO. The Unit 1 Letdown Flow Shutoff with Prompt Return to Service limiting components were evaluated for EAF for 60 years of operation, which includes the charging nozzles. As a result of the screening evaluation, any locations that are potentially more limiting were also evaluated for EAF utilizing the 60-year cycles. The EAF analyses are projected to the end of the PEO and demonstrate that the CUF will remain below the ASME Code allowable of 1.0. Therefore, the fatigue analyses for CPNPP Units 1 and 2 vessels, piping, and components remain valid for the PEO.

- The Fatigue Monitoring AMP undergoes periodic audits and/or assessments. The audit/assessment performed in 2016 as part of the PWR material review identified a noteworthy characteristic of the installed resistance temperature detectors (RTDs) on various RCS branch lines, which is the ability to detect thermal stratification that can result in fatigue concerns. Previous assessments have provided additional improvements, including providing required reading to certain plant individuals to help them understand Thermal Transient and Fatigue Cycle Monitoring.

The above examples provide objective evidence that the existing Fatigue Monitoring AMP effectively monitors, tracks, and counts operational transients to prevent the aging effect of cumulative fatigue damage. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions are taken to prevent recurrence. Appropriate guidance for re-evaluation, repair, or replacement is provided for locations where cumulative fatigue damage may approach established limits. Assessments of the Fatigue Monitoring AMP are performed to identify the areas that need improvement to maintain the quality performance of the program. In addition, CPNPP AMPs, such as the Fatigue Monitoring AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12. Therefore, there is confidence that implementation of the Fatigue Monitoring AMP will effectively identify age-related degradation prior to failure.

Conclusion

The Fatigue Monitoring AMP, with enhancements, will continue to provide reasonable assurance that the fatigue design basis will be maintained such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.2.2 Environmental Qualification of Electric Components

Program Description

The Environmental Qualification of Electric Components AMP is an existing AMP that manages the aging of electrical equipment with the scope of 10 CFR 50.49, “Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants.” The NRC has established nuclear station EQ requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49, “Environmental Qualification of Electric Components Important to Safety for Nuclear Power Plants.”

The Environmental Qualification of Electric Components AMP provides the requirements for the environmental qualification of electrical equipment important to safety that could be exposed to harsh environment accident conditions as required by 10 CFR 50.49 and RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants." Harsh plant environments are those areas of the plant that could be subject to the harsh environmental effects of a LOCA, HELB, or post-LOCA environment. EQ Program electrical components are qualified to perform their safety function in those harsh environments after the effects of inservice aging. Qualified life of Class 1E Equipment which is qualified by analysis is determined from the time dependent effects of the environmental influences by quantitatively demonstrating that the performance characteristics of the equipment meet or exceed the design specifications of the equipment after a DBE, preceded by a time period during which the equipment is subjected to its normal design environment aging. The necessary information to support the environmental qualification of components included in the AMP is documented in Environmental Equipment Qualification Summary Packages (EEQSPs).

The Environmental Qualification of Electric Components AMP provides EQ-related surveillance and maintenance requirements for EQ equipment. Monitoring of certain environmental conditions or component parameters may be used to ensure that the component is within the bounds of its qualification basis, or as a means to modify the qualified life. Although 10 CFR 50.49 does not require monitoring and trending of EQ equipment, this AMP does provide surveillance and maintenance requirements for the EQ equipment, verifies that the required activities are performed, and tracks and maintains the service life of qualified components. EQ maintenance activities are performed within the time intervals specified for the qualified equipment for which maintenance is required to maintain qualified life, as identified in the EQ Maintenance Manual (EQMM).

As required by 10 CFR 50.49, EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. Requalification of equipment is controlled and documented in a process similar to the original qualification effort.

NUREG-1801 Consistency

The Environmental Qualification of Electric Components AMP, with enhancement, will be consistent with NUREG-1801, Section X.E1, “Environmental Qualification of Electric Components”.

Exceptions to NUREG-1801

None.

Enhancements

The Environmental Qualification of Electric Components AMP will be enhanced as follows for alignment with NUREG-1801, Section X.E1. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
Element 1	The program will be enhanced to implement Revision 1 of RG 1.89 [June 1984], which provides additional guidance for the application of IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" that was not available in the original issuance of RG 1.89.

Operating Experience

The following OE provides objective evidence that the Environmental Qualification of Electric Components AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- As required by the Electrical EQ DBD, all NRC INs, Bulletins or Circular issued since 1979 which are environmental EQ-related and are applicable to the equipment evaluated in EEQSPs shall be listed therein. All INs, Bulletins and Circulars issued are evaluated for EQ applicability and impact, when applicable, addressed in the respective EEQSP. The EEQSP shall include resolution of all NRC Notices, Bulletins and Circulars pertaining to environmental qualification of the subject component.

- In April 2014, the NRC identified that a vendor failed to ensure that the measuring and testing system used to determine the applied radiation dose to the nuclear components being tested was properly controlled. As a result, the actual radiation dose applied to the components was potentially less than what was reported on the irradiation certificates of conformance. In response to notification from the NRC and the vendor, CPNPP took an action to review EEQSPs to determine if they were affected by this finding. Of approximately

130 components evaluated, most were determined to not have been tested by this vendor, or they were affected but with no adverse impact on EQ required margins. In cases where an adverse impact on EQ required margins were identified, it was either determined that there were still sufficient margin levels to meet the (Institute of Electrical and Electronics Engineers) IEEE 323 requirements or follow-up actions were identified to further evaluate the impact on qualification of the component.

Plant-Specific OE

A review of plant OE indicates Issue Reports have been issued to make improvements to the CPNPP Environmental Qualification of Electric Components AMP or address deficiencies in program implementation. A review of CRs, self-assessments, and program health reports from 2011 to 2021 indicates the following examples:

- A 2017 assessment concluded that the Environmental Qualification Program demonstrates compliance with 10 CFR 50.49, Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants and ensures that equipment covered under the program can perform required functions under the harsh environmental service conditions that can exist during certain design-basis accidents in order to avoid common cause failures. The assessment also determined that implementation of some provisions of 10 CFR 50.49 are challenged by inadequate program requirements to ensure EQ replacement components/parts are certified to original vendor qualification reports when procured; unavailability of EQ replacement equipment and components due to obsolescence issues and long-lead times; deferred maintenance activities; inadequate interfaces among work departments; and ineffective resolutions to correct identified problems.
    - A number of EQ issues are open and have not been completed in a timely manner, resulting in some EQ packages not being maintained current. The EQ packages are therefore more difficult to use because open items must be reviewed upon each use, which challenges the effective implementation of 10 CFR 50.49(d). In response to this deficiency, an Engineering EQ Excellence Plan was developed to reduce the backlog of EQ open items. Corrective actions to address these concerns are currently being worked and remain open.
    - Several MCCs on Unit 1 and Unit 2 were identified as having a qualified life of 40.8 years and EQ-required maintenance. However, there are not any EQ PM activities for these MCCs, and a qualified life is not assigned to the components. As a result, there is a potential for the equipment to remain in service beyond its qualified life and the required maintenance may not be performed. As a corrective action, EQ basis PMs were created and scheduled to ensure repair/replacement is performed prior to the end of the component qualified life.
- In 2014, a vendor notified CPNPP that three Firezone 3HR cables have a lower qualified radiation level than previously documented in the qualification report. The new qualified radiation level was verified to still be above the

required total integrated gamma dose for the room in which the cables are located. As a result, the corrected qualified radiation level has no impact on the cable qualification. The EQ program documentation was revised to include the corrected values for qualified radiation dose for these cables.

The above OE provides objective evidence that the Environmental Qualification of Electric Components AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Environmental Qualification of Electric Components AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Environmental Qualification of Electric Components AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3. NUREG-1801 Chapter XI Aging Management Programs

This section provides summaries of the NUREG-1801 Chapter XI AMPs credited for managing the effects of aging at CPNPP.

B.2.3.1. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is an existing AMP that implements the requirements of ISI, repair, and replacement of code Class 1, 2, or 3 pressure-retaining components and their integral attachments. The components within the scope of the program are specified in ASME Code, Section XI, Subsections IWB-1100, IWC-1100, and IWD-1100.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP examines and tests as specified in Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1, respectively, for Class 1, 2, and 3 components. The tables specify the extent and schedule of the inspection and examination methods for the components of the pressure-retaining boundaries. The examinations and tests required by Subsections IWB, IWC, and IWD are completed during each of the 10-year ISI intervals.

The inspection and test techniques prescribed by the program are designed to maintain structural integrity and ensure that aging effects are discovered and repaired before the loss of intended function of the component. Inspection can reveal cracking, loss of material, loss of fracture toughness, leakage of coolant, and indications of degradation due to wear or stress relaxation. The program requires that flaw conditions or relevant conditions of degradation be evaluated in accordance with IWB-3000, IWC-3000, or IWD-3000. The program directs that repair and replacement activities be performed in accordance with IWA-4000.

This condition monitoring program provides adequate monitoring methods that are effective in detecting the relevant aging effects and age-related degradation.

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is consistent with the program described in NUREG-1801, Section XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- IN 2014-02, Failure to Properly Pressure Test Reactor Vessel Flange Leak-Off Lines. During an inservice inspection (ISI) at Palo Verde, Unit 2, NRC inspectors identified that the licensee had not adequately performed the required system leakage test of the reactor vessel flange leak-off lines, as described by ASME Code, Section XI. This IN was evaluated, which determined that CPNPP is in compliance with the information presented and properly pressure tests reactor vessel flange leak-off lines during ISI intervals.

- IN 2006-27, Circumferential Cracking in the Stainless Steel Pressurizer Heater Sleeves of Pressurized Water Reactors. CPNPP evaluated this condition and the associated recommendations of WCAP-16913-P. CPNPP has incorporated the recommendations of WCAP-16913-P.

- IN 2005-02, Pressure Boundary Leakage at Steam Generator Bowl Drain Welds (Westinghouse TB-04-19). PWSCC has been observed in SG bowl channel head drain stub welds inspected as part of a licensee's Alloy 600/82/182 program. This IN has been evaluated and incorporated through revision of Alloy 600 inspection plans for the Unit 2 SG bowl channel head drains to include a boric acid examination every refueling outage and a visual examination once per ISI interval. This is only applicable to CPNPP Unit 2 which has D5 model SGs. The Unit 1 SGs have been replaced and do not have channel head drains/stubs.

- IN 2003-11 Supplement 1, Leakage Found on BMI Nozzles. This notice discusses the issue of indications of leakage in the form of boron deposits discovered on BMI nozzles at South Texas Project Unit 1. This issue was reviewed, and actions taken following release of NRC IEB 2003-02. CPNPP responded to the bulletin via letter dated December 2, 2004 (Reference ML043430212). In that letter CPNPP stated that no indications were identified for either unit as a result of 360-degree bare metal visual examination on all 58 RPV lower head penetrations for either unit of which BMIs are located. These penetrations were inspected as part of the ISI program at CPNPP. No evidence of RPV lower head penetration leakage was observed.

- IN 2001-05, Through-Wall Circumferential Cracking of Reactor Pressure Vessel Head CRDM Penetration Nozzles at Oconee Nuclear Station, Unit 3. This IN discusses the detection of through-wall circumferential cracks in two of the CRDM penetration nozzles and weldments at the Oconee Nuclear Station, Unit 3 (ONS3). Subsequent regulatory requirements were identified by the NRC in IEB 2001-01. The issue was evaluated. The susceptibility ranking by the industry's MRP ranks CPNPP Units 1 and 2 in the least affected category. Current prediction models estimate that the time to reach a situation similar ONS3 is approximately 100 EFPYs on each unit. Inspections have been performed at CPNPP of the Alloy 600 family of RCPB components (including welds) and the decision was made to replace the Unit 1 reactor vessel head during the SG replacement outage. CPNPP established an RCS Materials Management Program and requires completion of necessary assessments to ensure that the appropriate programs are in place to monitor and manage the Alloy 600 family of materials. Unit 2 is still of the original design and the CRDM penetration nozzles are inspected as part of the ISI program at CPNPP.

Plant-Specific OE

- During the Spring 2022 outage for Unit 1, two wear marks were discovered on the inside surface of the CRDM head adapter at the center most penetration. Westinghouse performed an evaluation of this wear, which has been observed at other plants as well, based on maximum possible depth determined from the thickness of the centering pads on the thermal sleeve tube outer diameter (O.D) as it interacts with the CRDM head adapter. The wear was evaluated to be sufficiently low to preclude future operability concerns prior to the next regularly scheduled inspection; therefore, it was concluded that the Unit 1 CRDM head adapter wear indications are acceptable for continued operation in accordance with Section III of the ASME Code.

- In 2014, white residue was found during a 2RF14 ISI examination of a CRD penetration on the Unit 2 reactor vessel head. Further inspections and evaluations determined the residue to be boric acid from previous leakage of the core exit thermocouple flange. There was no evidence of degradation or wastage to the CRD penetration, which is constructed of stainless steel and resistant to BAC. The small accumulation of residue was cleaned and removed. Because the source of the leakage was positively identified, the leak site is not obstructed, and the leaking component and/or surrounding components and surfaces are not affected, the leakage was classified as minor. The CRD penetrations will continue to be monitored going forward with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, and if evaluation is needed, the Boric Acid Corrosion (B.2.3.4) AMP.

- In 2013, during an ISI liquid penetration exam of the head-to-shell weld on the letdown reheat heat exchanger, a linear indication was found. The indication was approximately ¼-inch long. Upon completion of surface conditioning, the indication was re-examined using liquid penetrant and the indication was no longer present. Therefore, the indication was removed via surface conditioning, and no further examination or evaluation was required.

- In 2013 a deficiency was observed during the performance of a tactical self-assessment of the ISI program in the tracking system for ISI inspections which could lead to inconsistent tracking of examinations. The tracking system was updated to show the correct examination categories and item numbers that align with the risk-informed ISI program at CPNPP.

The above OE examples provide objective evidence that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.2. Water Chemistry

Program Description

The Water Chemistry AMP is an existing mitigation AMP that manages primary and secondary water chemistry. The Water Chemistry AMP activities mitigate cracking, loss of material, and reduction of heat transfer. The Water Chemistry AMP includes monitoring and control of known detrimental contaminants such as chloride, fluoride, dissolved oxygen, and sulfate concentrations within the limits in accordance with EPRI 3002000505 "PWR Primary Water Chemistry Guidelines," Revision 7 and EPRI 3002010645 "PWR Secondary Water Chemistry Guidelines," Revision 8.

The Water Chemistry AMP consists of monitoring and controlling the chemical environments of those systems that are exposed to reactor coolant, treated water, steam, and treated borated water, such that aging effects of system components are minimized in accordance with the guidance specified in EPRI 3002000505 and EPRI 3002010645. Major component types include reactor vessel, RVI, pressurizer vessels, SG internals, heat exchangers, tanks, piping, piping components and piping elements.

The primary chemistry portion of the program is consistent with EPRI 3002000505 and includes specific limits for pH, lithium, fluoride, chloride, sulfate, dissolved oxygen, sodium, and other parameters. The chemistry control strategy for CPNPP primary systems is defined in the CPNPP primary chemistry strategic plan. The program functions to maintain concentrations of known primary system detrimental contaminants within limits in accordance with the EPRI guidelines. Limit specifications are relevant for systems and components that interface with the primary system such as the boric acid tanks, volume control tank, and SFP. Hydrazine and hydrogen are used for oxygen control. CVCS mixed bed demineralizer(s) may be used for crud burst cleanup when properly loaded. Lithium hydroxide is used to control pH.

The secondary chemistry portion of the program is consistent with EPRI 3002010645 and includes specific limits for pH, chloride, sulfate, sodium, dissolved oxygen, hydrazine, total iron, conductivity, and other parameters. The chemistry control strategy for CPNPP secondary systems is defined in the CPNPP secondary chemistry strategic plan. The program functions to maintain concentrations of known secondary system detrimental contaminants within limits in accordance with the EPRI guidelines. The secondary systems scope of the program includes the secondary side of the SGs, and various secondary systems. Hydrazine is used for oxygen control. Control of transport of metal oxide concentrations during start up and during operation is accomplished by operational chemistry. Approved amines or ammonia may be utilized for pH control.

Routine primary and secondary system sampling frequencies and action limits for control parameters are specified in site procedures in accordance with EPRI guidelines. Corrective actions include increased sampling frequencies or other appropriate actions until the parameters are returned within specifications.

Water chemistry programs are generally effective in removing impurities from intermediate and high flow areas. Industry experience has shown that water chemistry programs may not be effective in low flow or stagnant flow areas of plant systems. The Water Chemistry AMP does not provide for detection of aging effects. However, components located in low flow and stagnant flow areas at CPNPP will receive a one-time inspection prior to the PEO. This inspection will be performed as part of the One-Time Inspection (B.2.3.19) AMP. This program includes provisions specified by NUREG-1801 for the verification of proper chemistry control and aging management.

NUREG-1801 Consistency

The Water Chemistry AMP, with enhancements, will be consistent with one exception to NUREG-1801, Section XI.M2, "Water Chemistry".

Exceptions to NUREG-1801

Exception to Element 1, Scope of Program

CPNPP cites EPRI 3002000505 "PWR Primary Water Chemistry Guidelines," Revision 7 and EPRI 3002010645 "PWR Secondary Water Chemistry Guidelines," Revision 8. These are later revisions of the EPRI Guidelines identified in the program description.

Justification for Exception

These later revisions have been endorsed by NUREG-2191 GALL-SLR and SLR-ISG-2021-02-MECHANICAL, which updates the AMP XI.M2, "Water Chemistry" for SLR to align with these later revisions of the EPRI Water Chemistry Guidelines.

Enhancements

The Water Chemistry AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M2. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
7. Corrective Actions	Strategic plans will be enhanced to include evidence of aging effects as items to be evaluated, the cause identified, and the condition corrected.

Operating Experience

The following OE provides objective evidence that the Water Chemistry AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- In April 2014, an evaluation was performed regarding INPO CEI guidance for selected parameters and their corresponding grace periods during startup as found in the Data Element Manual and to enhance Primary and Secondary

Chemistry station procedures as applicable. The procedures were revised, as well as their respective forms as a result of this evaluation.

- The NRC issued IN 2007-37 to alert licensees of the potential for deposits to accumulate in their SGs and potentially affect SG performance and tube integrity. CPNPP did not provide a response but does perform sludge lancing to remove deposits on the secondary side of SGs as a method of deposit removal.

- The NRC issued IN 2001-16 to inform licensees regarding findings from inspections of SG tubes and secondary-side internal components and structures. CPNPP has addressed these issues through the site's secondary water chemistry program. CPNPP procedures provide secondary side inspections for each unit. CPNPP also stated that eddy-current testing of SG tubes has been proven to be the most reliable method to detect tube degradation.

- The NRC issued GL 97-01 to request licensees to describe their program for ensuring the timely inspection of PWR CRDM and other vessel closure head penetrations and require that all licensees provide to the NRC a written response to the requested information. In response to the GL, CPNPP provided the requested information and indicated that there have been no resin bead intrusion (from April 1990 to June 1997) into the RCS of the nature described in NRC IN 96-11. This conclusion was reached based on a review of sulfate and specific conductivity routine analysis data, which had been performed since the initial startup.

- In response to the NRC GL 95-05, CPNPP submitted a request for an amendment to the CPNPP Units 1 and 2 TS, which would permit implementation of voltage-based ARC for SG tubes affected by ODSCC at Unit 1. The NRC requested further information for approval, and the site included information on the methodology used for evaluation of tube integrity, as well as an extension of the scope if circumferential cracking or PWSCC were to be detected. The amendment was approved by the NRC.

- The NRC issued IN 94-63 to alert licensees to the potential for significant damage that could result from corrosion of reactor system components caused by cracking of the stainless steel cladding. North Anna Unit 1 found severe corrosion damage of carbon steel casing of a high head SI pump, which was caused by cracks through the stainless steel cladding. The licensee replaced the pump casing with an all stainless steel casing. IN 80-38 was issued with similar OE. Zion Unit 1 found cracking had occurred at a charging pump at the transition between the pump casing barrel and the pump suction end plate, which allowed for localized boric acid attack to occur. The licensee replaced the casing with a solid stainless steel casing. CPNPP main charging pump casings and SI pump casings are fabricated of solid stainless steel.

- The NRC issued IN 91-05 to inform licensees of recent problems involving IGSCC of PWR SI accumulator nozzles. CPNPP evaluated the IN with the determination that the accumulators in use on site were not manufactured by

Delta Southern and that the "stresses associated with the vessel to pipe weld at the two subject plants (Prairie Island Unit 2 and H. B. Robinson Unit 2) would not be expected at CPSES." After addressing the IN, no further action was required.

- In response to NRC IEB 89-01, and its supplements, CPNPP stated that the licensee planned to implement a program for replacement of all Inconel 600 mechanical plugs prior to predicted life expiration of any currently installed plugs. The CPNPP approach to mitigating PWSCC includes visual inspections and keeping the primary water chemistry parameters within acceptable limits.

There is OE reflected in SLR-ISG-2021-02-MECHANICAL regarding the XI.M2 Water Chemistry AMP which updates the revisions of the EPRI guidelines used for this AMP. This is reflected in the exception in Element 1 above.

<u>Plant-Specific OE</u>

A review of plant-specific OE indicates that numerous work orders and CRs have been issued as a result of the Water Chemistry AMP identifying water chemistry out of specifications and corrosion of components due to water chemistry.

- In November 2020, a self-assessment was performed to evaluate the adequacy and effectiveness of the CPNPP Chemistry Department Primary Chemistry controls and practices as compared to industry standards. The expectation for documenting chemistry adverse trends for systems and sampling issues had not been met. Requirements for trending were understood by personnel, and issues were worked to resolution, but the method for documenting the trends was not consistent throughout the group. Similar issues with trending and documentation were identified for the Secondary Chemistry Program in 2017. As a corrective action, the improvement opportunities were incorporated in plant procedures to document trends and sample analyses with detailed comments.

- In December 2016, sulfate samples were performed, and verification samples were performed on the SFP demineralizer. Both samples indicated that the resin was exhausted for the removal of sulfates and needed to be investigated. Both inlet and outlet demineralizer samples indicated approximately 40 Parts per Billion (ppb) sulfates. The specification for sulfates was 150 ppb, with an optimized value of 50 ppb. The demineralizer was placed in service in August 2016. Run time of SFP demineralizers is generally 12 to 18 months. It was determined that the Hot Lab Ion Chromatograph (IC) was having issues detecting sulfate during the time when the SFP and SFP demineralizer effluent samples were collected and analyzed. The IC was repaired, and new samples were collected resulting in sulfate concentrations well below the optimized limits. The SFP Demineralizer resin was determined to be working effectively.

- In January 2015, an evaluation recommended that the RCS sulfate sample frequency during unit startup should be once per 72 hours as opposed to once per seven days. RCS sulfate testing frequency is not in the technical specifications, and EPRI guidance for the frequency of sulfate monitoring during startup was not clear. Therefore, procedures were revised to reflect the increased frequency.

- In November 2014, sample results taken from the CVCS mixed bed demineralizer indicated that it was releasing chloride from the effluent of the demineralizer. Three samples were collected after being placed into service with values of 23.6, 21.4 and 22.6 ppb. The RCS chloride levels had begun to respond to the contamination from the mixed bed, with two RCS samples taken that indicated 1.6 ppb and 5.7 ppb chloride. The RCS chloride levels were expected to equilibrate at the 20 ppb level within 24 to 48 hours, with continued operation of the demineralizer, and with the letdown flow of 60 to 65 gallons per minute (GPM). The resin certificate of analysis indicated that the chloride sites (percent) were acceptable, but at the upper limit (0.1). OE from North Anna described a similar issue. The RCS chloride concentration decreased following removal of the CVCS mixed bed resin from service. Prior to the new resin being placed in service, chloride concentration was approximately 7 ppb, and after the new resin was placed in service, chloride concentration decreased to about 1 ppb. It was suspected the resin manufacturer could have been following improper storage methods. Therefore, procedural guidance was updated to inspect the stored resin to ensure it remains sealed and hydrated.

- In January 2013, a tactical self-assessment of the Primary Chemistry Program concluded that overall, the Primary Chemistry Program was found to be an excellent program that reflected industry-best practice in key areas such as minimizing oxygen ingress and optimizing pH. There were no deficient conditions noted. Enhancement opportunities were provided for both the Primary Strategic Water Chemistry Plan and the Chemistry procedures.

- In September 2011, a review was performed for consistency of the program implementing documents (forms and procedures). A note in the form addressed the context of Action Level 2 applicability for RCS dissolved oxygen. The form was reviewed against the procedure and the Primary Chemistry Control Program content to ensure proper guidance. The discrepancy was that the procedure indicating that Action Level 2 for low RCS hydrogen does require plant shut down, while the form note indicated that plant shut down was not applicable for low hydrogen Action Level 2. The note was revised to align with the procedure.

The above OE provides objective evidence that the Water Chemistry AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Water Chemistry AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Water Chemistry AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.3. Reactor Head Closure Stud Bolting

Program Description

The Reactor Head Closure Stud Bolting AMP is an existing preventive and condition monitoring AMP which uses ASME, Section XI, Table IWB-2500-1, Examination Category B-G-1, for examination and testing of reactor vessel closure studs, washers, nuts, and threads in flange. The program uses visual, surface, and volumetric examinations in accordance with the general requirements of Subsection IWA-2000. In addition, Examination Category B-P, which specifies a visual VT-2 examination for all pressure-retaining components, is performed in accordance with ASME Section XI. The ASME Section XI examinations can reveal cracking, loss of material due to corrosion, and leakage of coolant.

The Reactor Head Closure Stud Bolting AMP uses the inspection schedule of IWB-2400 and the extent and frequency of Table IWB-2500-1 to detect cracks, loss of material, and leakage. CPNPP examines reactor vessel threads in flange, reactor head closure studs, nuts, and washers during refueling outages in each ISI interval. Reactor head closure studs are examined during refueling outages by UT in accordance with ASME Section XI requirements. The ISI Program specifies the inspection schedule and extent of examination, which is consistent with ASME Section XI, IWB-2400. CPNPP follows inspection extent and frequency consistent with Table IWB-2500-1. Visual inspection (VT-2) for flange leakage is conducted following a refueling outage where the reactor vessel head is removed.

Repair and replacement are performed in accordance with the requirements of IWA-4000 and the material and inspection guidance of RG 1.65. The reactor head closure studs were fabricated from SA 540, Class 3, Grade B24 alloy steel and procured to a minimum yield strength of 130,000 psi and a minimum tensile strength of 145,000 psi. CPNPP applies the requirements of 10 CFR Part 50 Appendix B to the Reactor Head Closure Stud Bolting AMP through use of the CAP. Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material, and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the condition is determined, and that corrective action is taken to preclude recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented is documented and reported to appropriate levels of management.

NUREG-1801 Consistency

The Reactor Head Closure Stud Bolting AMP, with enhancements, will be consistent with one exception to the program described in NUREG-1801, Section XI.M3, “Reactor Head Closure Stud Bolting”.

Exceptions to NUREG-1801

Exception to Element 2, Preventive Actions

NUREG-1801 recommends using bolting material that has an actual measured yield strength of less than 150 ksi. Site documentation indicates that there are some reactor head closure stud nuts and washers installed that have actual measured yield strength that is greater than 150 ksi.

Justification for Exception

The AMR identified the stud material as “High strength low alloy steel bolting with yield strength of 150 ksi or greater” and identified cracking as an AERM. NUREG-2191 allows for existing material to have a maximum tensile strength of 170 ksi, and new material to have a yield strength of less than 150 ksi. All existing reactor head closure stud bolting material meet the 170 ksi tensile strength limit, consistent with latest industry guidance.

The closure studs are volumetrically (UT) examined per ASME, Section XI, Table IWB-2500-1, Category B-G-1, which is appropriate for identifying cracking. There have been no recordable indications identified by ISI program examinations of reactor head closure stud bolting components, indicating that the current program has been effective.

An additional preventive measure will be implemented to revise the purchasing requirements for reactor head closure stud material to assure that any stud bolting procured in the future will have measured yield strength of less than 150 ksi. Therefore, the Reactor Head Closure Stud Bolting AMP will be effective in managing the cracking aging effect during the PEO.

Enhancements

The Reactor Head Closure Stud Bolting AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M3. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
1. Scope 7. Corrective Actions	Revise the procurement requirements and/or engineering specification for the reactor head closure stud bolting material to assure the maximum yield strength of replacement reactor head closure stud material purchased in the future is limited to a measured yield strength of <150 ksi.
2. Preventive Actions	Revise maintenance documents for the installation of the reactor vessel head to explicitly prohibit the use of lubricants not meeting RG 1.65 guidance.

Operating Experience

The following OE provides objective evidence that the Reactor Head Closure Stud Bolting AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

The ISI Program at CPNPP is updated to account for industry OE. ASME Section XI is also revised every two years, which allows the code to be updated to reflect OE. The requirement to update the ISI Program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the ISI Program reflects enhancements due to OE that have been incorporated into ASME Section XI, as applicable.

Plant-Specific OE

- During the Fall 2021 refueling outage (2RF19), a reactor head stud was found to be stuck during removal of the Unit 2 closure studs. A standard Westinghouse stuck stud contingency plan was followed to successfully remove the stud, without the need to cut the stud. A work order was generated which inspected, cleaned, and chased the subject stud hole. As a result of this effort, the cause of the stuck stud was determined to be excessive N-5000 lubricant, and no further degraded condition was identified. All head bolts are in service.

- ISI exam reports for Unit 1 and Unit 2 from the Fall 2014 refueling outage (1RF17) through the Fall 2020 refueling outage (1RF21) were reviewed. A UT examination was performed on all Unit 1 reactor head closure studs during the Spring 2019 refueling outage (1RF20). No recordable indications were observed for any of the studs.

- In November 2017, reactor head removal procedures were revised to allow for an alternate lubricant (Loctite N-5000) to be used on closure studs that had been approved by the Original Equipment Manufacturer (OEM).

- In September 2016, contingency plans were developed for the removal of a potential stuck reactor vessel stud during 2RF16. Various contingency plans were evaluated in the event the stud became stuck including ensuring spare studs were available in stores and determining the height limit at which the stud may be installed. This is evidence that CPNPP is proactive in managing the material condition of reactor head closure studs.

- In July 2014, closure stud flange thread damage that had occurred over time was evaluated to determine acceptability. One thread location was found to have 13.75 missing threads, which exceeded the limit of 13.1 lost threads. An evaluation determined the maximum allowable missing threads and determined an increased limit of 17.22 missing threads. With this new criterion, the ISI program will continue to monitor these locations.

- In January 2013, outage delays occurred due to an issue with reactor stud "HydraNuts". These nuts have been replaced with the original reactor stud nuts and "HydraNuts" are no longer used for reactor stud applications at CPNPP.

No cases of cracking due to SCC or IGSCC have been identified with reactor vessel studs, nuts, flange threads, or washers. The CPNPP OE demonstrates that the

Reactor Head Closure Studs AMP is effective in identifying and resolving reactor vessel closure stud, nut, washer, and flange thread issues.

The above OE provides objective evidence that the Reactor Head Closure Stud Bolting AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Reactor Head Closure Stud Bolting AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Reactor Head Closure Stud Bolting AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.4. Boric Acid Corrosion

Program Description

The Boric Acid Corrosion AMP is an existing condition monitoring AMP that manages loss of material for components on which borated water may leak. The Boric Acid Corrosion AMP includes (a) visual inspection of external surfaces that are potentially in an environment of borated water leakage, including mechanical, electrical, and structural components; (b) timely identification of leak path and removal of boric acid residues; (c) assessment of degradation due to corrosion, if any; and (d) follow-up inspection for adequacy. This program was implemented in response to NRC GL 88-05 and industry OE, as well as WCAP-15988-NP, as use of an SLR attribute. The program provides programmatic guidelines to ensure that external leakage from borated systems is identified, evaluated, and effectively repaired or periodically monitored to prevent degradation of affected structures, systems, or components. Inspections for boric acid leakage are performed during work activities and observations (walkdowns, maintenance, etc.) inside and outside containment to identify any signs of borated water leakage, including discoloration. The inspections provide reasonable assurance that borated water leakage is detected, and potential leakage locations and leak paths are adequately assessed. Tracking and monitoring are performed for borated water leaks to assess the leakage rate, deposit amount, and characterization. The Boric Acid Corrosion AMP provides for screening of new and changed leakage conditions; corrosion evaluations that address the structural integrity of the affected component and any targets; and corrective actions to remedy, prevent, or mitigate the corrosion. Corrective actions are based on characterization of the leakage deposit and degradation, importance of the system, and its criticality to safe operation.

NUREG-1801 Consistency

The Boric Acid Corrosion AMP is consistent with the program described in NUREG-1801, Section XI.M10, “Boric Acid Corrosion”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Boric Acid Corrosion AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

- In October of 2020, a tracking report was generated to evaluate the applicability of industry OE. In May 2020, during a walkdown of the RCS during heat up following a refueling outage, personnel at a US PWR station identified boric acid leakage on several reactor in-core instrumentation flanges caused by manufacturing defects. An action was initiated for CPNPP staff to verify that seal rings from the same batch were not installed in the plant or stored in the warehouse. Inventory was verified to not include the flawed components. It was also confirmed with the vendor that the seal ring used at CPNPP is a different style and not subject to the condition described in the OE report.

- On March 31, 2015, a Level 3 INPO Event Report (IER) was issued as a result of a compression-fitting leak on a RCS sample line at another plant resulting in entry into an abnormal operating procedure (AOP), the spread of contamination, and evacuation of the AB. The leak went undetected and resulted in a buildup of dry boric acid crystals but was not evaluated within the timeframe required by the station's boric acid corrosion control program. In response, CPNPP included a procedure update to identify timely cleaning. Additionally, training requirements for installation, disassembly and reassembly of compression fittings were reviewed.

- In response to NRC IEB 2003-02, CPNPP provided detailed information pertaining to its RPV lower head penetration inspection program in a letter dated September 19, 2003. No evidence of operational leakage was observed.

- In response to NRC IEB 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity", CPNPP provided information regarding reactor vessel head inspection and maintenance programs. CPNPP also provided the basis for concluding that their boric acid inspection program is providing reasonable assurance of compliance with the applicable regulatory requirements discussed in GL 88-05. The CPNPP response, dated April 2, 2002, included a description and evaluation of CPNPP's inspection program and concluded that CPNPP is in compliance with the requirements of GL 88-05.

<u>Plant-Specific OE</u>

A review of plant-specific OE indicates that numerous work orders and CRs have been issued as a result of the Boric Acid Corrosion AMP discovering boric acid leaks and corrosion of components due to borated water leakage.

- The 2021 health report indicates there are no significant boric acid conditions. A majority of boric acid leakage is reported by line organizations in the course of performing other activities, which demonstrates station personnel's understanding of the process and programmatic requirements. Corrosion evaluations are completed within the timeline determined by the CAP.

- In January 2020, the boric acid inspection on the 2-02 Containment Spray Heat Exchanger identified dry boric acid accumulation at the split line between the end bell and the tube sheet flanges. The boric acid accumulation was approximately 1 tablespoon, extended the entire circumference of the flanges, and contained no discoloration. Dry boric acid accumulation was also identified at three of the main flange nuts. The boric acid accumulation was less than 1 tablespoon and contained some discoloration. There was no evidence of active leakage at the flanges or the fasteners, and there was no evidence of degradation or wastage to the main flanges. These components are constructed of stainless steel which is resistant to BAC. There was also no evidence of degradation or wastage to the main flange nuts or the exposed portions of the flange studs. A corrosion evaluation was performed, which revealed that some surface corrosion was evident on the nuts and exposed portions of the flange studs. These components are constructed of carbon steel, which is susceptible to BAC, but are coated to prevent contact. A conservative corrosion rate for these components was determined to be 0.0005 inches and that it would take 31 years to lose 10 percent of the thread height and 218 years to degrade the minimum diameter of the stud by 10 percent. It was concluded that the minor surface corrosion does not affect the structural integrity of the flange nuts or studs. Corrective actions were taken to clean the boric acid accumulation and replace the carbon steel main flange fasteners with stainless steel.

- In May 2019, insulation was removed to repair a dry boric acid leak at the butterfly valve blank-off plate for the RHR heat exchanger 1-02 bypass flow control valve. After removal of the insulation, excessive discolored boric acid accumulation and an active leak were identified. The origin of the leakage appeared to be the flange gaskets. The majority of the accumulation was dry; however, some active leakage was identified at the flange gaskets. There was no evidence of degradation or wastage to the butterfly valve body, pipe flanges, or the flange fasteners. These components are constructed of stainless steel which is resistant to BAC. A corrosion evaluation was performed for the identified boric acid accumulation, including the evaluation of minor surface corrosion, and staining of the stainless steel flange nuts. Corrective actions were taken to clean the boric acid accumulation and replace the flange gaskets.

- In April 2019, during the Unit 1 Mode 3 boric acid inspection, a boric acid leak was identified in the vicinity of the RCP 1-02 seal #1 bypass line snubber. Dry boric acid crystals had accumulated on the dust cover over the telescoping cylinder near the pin and spherical bearing. Additional inspection identified some minor material loss, surface corrosion, and staining of the carbon steel dust cover. There was no through wall corrosion to the cover and, therefore, no impact to the internal snubber components. The corrosion evaluation concluded that the snubber remained capable of performing its design function and its structural integrity was not impacted. The boric acid accumulation was removed and the area cleaned.

- In October 2017, during the Unit 1 Mode 3 boric acid inspection, a large accumulation of boric acid was identified in the overhead of the Steam Generator 1-02 Compartment. The leak originated from a letdown line vent valve pipe cap and the minor spray resulted in a large accumulation of boric acid deposits on the surrounding components and structures. While several of the affected components are stainless steel and not susceptible to BAC, other affected components are constructed of carbon steel, and thus susceptible, including a valve yoke, the floor grating in the room, the letdown line structural support, the pipe hanger, the pipe split-clamps, the HVAC ducting, and the HVAC structural support. All of these susceptible components were exposed to wet and dry boric acid in an aerated condition but there was no evidence of degradation or wastage to any of the components. The areas were subsequently cleaned of boric acid accumulation and the leaking pipe cap was replaced.

- In March 2017, CPNPP reported the following OE to the industry. Shortly after placing the boric acid storage tank into recirculation, the field operator reported a large spray of borated water from a bolted joint of the boric acid transfer pump. The boric acid transfer pump was determined to be inoperable. Boric acid and corrosion products had built up in the sealing surface of the boric acid transfer pump gasket joint allowing a larger leak path to develop over time. An inappropriate preventative maintenance task frequency contributed to the corrosion product buildup. The last inspection was nearly two years prior and only identified fitting leakage, not the gasket leakage. The gasket was replaced, and the frequency of the bare metal inspections was changed from 6 years to 18 months. The bare metal inspection performed at a shorter frequency will identify leakage at an early stage so that corrective action may be taken prior to leakage affecting the pump function.

- In April 2017, an NRC Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” occurred when CPNPP failed to perform an adequate operability determination associated with multiple nuclear safety related pipe supports. A corrosion evaluation was not performed as required for material wastage of pipe support clamps for the Unit 1 RCS Loop 1 Charging Valve discharge line. The Boric Acid Engineer incorrectly concluded that because the support clamps only contained minor degradation and the leakage would be isolated to prevent further degradation, a corrosion evaluation would not be required. The engineer received coaching on the procedure requirements and a corrosion evaluation was performed to identify the corrosion rates for the affected susceptible materials. The pipe support clamps were subsequently replaced and the valve which caused the leak was reworked.

- In February 2016, an active steam and water leak of approximately 30 gallons per day was discovered on Pressurizer 2-01 Pressure/Level Transmitter Low Return Valve, originating from the packing area. There was also a large accumulation of boric acid on the upper portion of the valve. The accumulation was cleaned, and the susceptible components (including the yoke, stem guide bushing, retaining ring, key, and hand wheel) were inspected for degradation or wastage. At the time of inspection, the valve was able to close and retain the packing. However, the corrosion evaluation determined that the corrosion rate of the valve yoke under the existing conditions would cause the valve to become inoperable. Structural components in the room were also impacted by the leak and evaluated; these components included floor mounted base plates and fasteners, structural tubing, and a section of the Pressurizer support skirt and fasteners, all of which are constructed of carbon steel and susceptible to BAC. There was no evidence of degradation or wastage on these components and the corrosion evaluation determined that their service life and structural integrity was not impacted. To stop the packing leak, sealant was injected through the valve bonnet in March 2016. This prevented further leakage onto components susceptible to BAC and eliminated the risk of valve failure. After the leak discovery, the valve was monitored by remote camera and periodic containment entry. Upon discovery of increased boric acid accumulation, additional inspections and re-evaluation of the valve yoke corrosion were performed. A second sealant injection was made in December 2016 to stop the leakage. Valve monitoring continued until the valve was replaced in 2RF16 (Spring 2017).

The above OE provides objective evidence that the Boric Acid Corrosion AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Boric Acid Corrosion AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Boric Acid Corrosion AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.5. Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

Program Description

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP is an existing condition monitoring AMP that manages the aging effects of PWSCC of nickel alloy-based components and associated welds, as well as loss of material due to boric acid-induced corrosion in susceptible components in the vicinity of nickel alloy RCPB components. This condition monitoring program includes periodic bare-metal visual and volumetric examinations of nickel alloy-based components, associated welds, and components in the vicinity of nickel alloy-based RCPB components that are susceptible to loss of material due to boric acid-induced corrosion, such as RPV components, pressurizer components, and RCPB piping and welds. This program also includes inspection requirements for RPV upper heads and SG drain stubs. Inspection methods, schedules and frequencies for susceptible components are implemented in accordance with 10 CFR 50.55a and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP. The long-term inspection requirements are consistent with ASME Section XI Code Case N-722-1, Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials, subject to the conditions listed in 10 CFR 50.55a(g)(6)(ii)I; Code Case N-729-6, Alternative Examination Requirements for PWR Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(D); and Code Case N-770-5, Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(F). Reactor coolant leakage is calculated and trended on a routine basis in accordance with technical specifications. The acceptance criteria for identified flaws and the methodology for evaluating the flaws are prescribed in 10 CFR 50.55a. Unacceptable indications of flaws are corrected through implementation of appropriate repair or replacement as dictated in 10 CFR 50.55a. The impacts of all boric acid leakage from non-nickel alloy RCPB components, provisions for identifying and evaluating leakage, and initiating corrective actions for boric acid leakage are managed by the Boric Acid Corrosion (B.2.3.4) AMP. The Water Chemistry AMP monitors and controls water environments in accordance with industry guidelines to ensure the reactor coolant water environments are favorable to mitigate PWSCC in nickel alloy components.

NUREG-1801 Consistency

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP is consistent with the program described in NUREG-1801, Section XI.M11B, “Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- In 2020, CPNPP performed a review of the updated final rule on 10 CFR 50.55a, which was published on May 4, 2020, to determine any programmatic impacts on the Alloy 600 Program. The primary impact was the update from code case N-729-4 to code case N-729-6 (Alternative Examination Requirements for PWR Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 1) and the update from code case N-770-2 to N-770-5 (Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material with or without Application of Listed Mitigation Activities Section XI, Division 1). The changes in the code cases resulted in changes to the required inspection frequencies for the Unit 1 replacement reactor head and the Unit 2 cold legs. Incorporation of the new code cases (N-729-6 and N-770-5) into the appropriate RCS Materials Management and ISI program documents was completed and inspection frequencies were verified to comply or modified, as required.

- In 2018, CPNPP performed a review of a vendor bulletin, which provides additional OE related to a known degradation mechanism on the D5 Steam Generators (applicable to CPNPP Unit 2). In accordance with the updated recommendations, the Alloy 600 inspection frequency for the Unit 2 SG bowl drain lines stubs was changed from every 3 years to every 18 months (every refueling outage). The CPNPP Alloy 600 inspection plan reflects the updated frequency of SG drain line stub inspections for Unit 2 every outage starting with 2RF19 (Fall 2021), noting that once per interval, the inspection is a visual examination in accordance with N-722-1 while all others are considered boric acid inspections. During the Fall 2021 inspection, no boric acid leakage of any kind was observed around the Unit 2 drain line penetrations.

- NRC RIS 2015-10 (July 16, 2015), Applicability of ASME Code Case N-770-1 as Conditioned in 10 CFR 50.55a, "Codes and Standards," to Branch Connection Butt Welds. This RIS informs addressees about RCS Alloy

82/182 branch connection dissimilar metal nozzle welds that may be of a butt weld configuration and therefore require inspection under 10 CFR 50.55a(g)(6)(ii)(F), "Augmented ISI requirements: Examination requirements for Class 1 piping and nozzle dissimilar-metal butt welds." This RIS required no action or written response. An evaluation for noteworthy OE was performed. This OE was determined to be not applicable to CPNPP, as CPNPP does not have branch connection butt welds fabricated with Alloy 600 weld materials, and no corrective actions are required.

- In 2014, CPNPP evaluated OE documented in EPRI Nondestructive Evaluation Program document, which describes a US PWR station not finding fabrication flaws in a structural weld overlay (SWOL) using conventional ultrasonic testing examination. The flaws were subsequently found using Phased Array techniques. The discovery of these flaws caused expanded scope and added time to an outage. CPNPP evaluation of this OE determined there are no gaps due to no current plans to perform SWOL on any ASME component. Note that CPNPP does have SWOLs on the pressurizers for both units, which are periodically UT inspected in accordance with code case N-770-5.

- In 2012, CPNPP evaluated and responded to industry OE and EPRI Nondestructive Evaluation Program documents, which describe a 2012 event at a US PWR station in which a qualified ultrasonic examination failed to detect two axial cracks in a DMW during a refueling outage. The cracks were discovered a few days later after machining the outside surface in preparation for an FSWOL repair. Investigation at this station revealed that the cracks provided typical responses and should have been detected in the examination. The CPNPP EOC review determined that there was not a risk of undetected cracks of a similar nature to those described in the OE report. Action was taken to verify that the EPRI programmatic recommendations were sufficiently covered in ISI and RCS Materials Management program documents; this was confirmed, and no further action was required.

<u>Plant-Specific OE</u>

A review of plant-specific OE indicates that there have not been any cracks or leakage due to PWSCC on nickel alloy components or welds. The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP continues to provide assurance that any PWSCC or BAC would be detected. Also, program and documentation improvements are updated and improved consistently based on assessments and changes in regulatory and industry guidance.

- During the Spring 2022 outage for Unit 1, two wear marks were discovered on the inside surface of the CRDM head adapter at the center most penetration. Westinghouse performed an evaluation of this wear, which has been observed at other plants as well, based on maximum possible depth determined from the thickness of the centering pads on the thermal sleeve tube O.D as it interacts with the CRDM head adapter. The wear was evaluated to be sufficiently low to preclude future operability concerns prior to the next regularly scheduled inspection; therefore, it was concluded that the

Unit 1 CRDM head adapter wear indications are acceptable for continued operation in accordance with Section III of the ASME Code.

- In the 2020 Self-Assessment for the Alloy 600/690 Program, several improvement opportunities and no performance gaps were identified. Several of the improvement opportunities were enhancements to procedures and program documents to include more complete and useful information. Another improvement opportunity identified was to participate in an INPO Material Review Visit at another site to gain additional knowledge and insight about how other stations implement and manage the Alloy 600 program, such that CPNPP can apply lessons learned.

- During the 2015 NRC ISI inspection, several Alloy 600 Program document deficiencies were identified by the inspector. These deficiencies were documented and resolved through the CAP. Examples include: no signature blocks on the NDE procedures or NDE test results to show Authorized Nuclear Inservice Inspector certification of test results and review of NDE procedures; and the Reactor Vessel Closure Head Visual Examination procedure did not include visual acuity requirements. Additionally, for the missing visual acuity requirements, CPNPP staff performed an operability review and an apparent cause evaluation. The Code Cases N-729, N-722, and N-770 required visual acuity requirement is to resolve characters 0.105 inches in height whereas the CPNPP instructions only required a visual acuity to resolve characters 0.158 inches in height. It was determined that current and past operability for the relevant Alloy 600 components and welds had been maintained for both Units, despite the incorrect criteria. The apparent cause was determined to be inattention to detail when updating the relevant procedures with information from the governing Code Cases. For each identified deficiency, the appropriate revision was made to the respective document.

- The RCS Materials Management Self-Assessment completed in 2015 identified one deficient condition and several improvement opportunities. The deficient condition was that not all of the 10 Key Elements for an Alloy 600 Program (Table 1.1, MRP-126) are identified in the RCS Materials Management Strategic Plan and other program documentation. The applicable documents were updated to fully address all 10 elements.

- In October 2012, when performing the Alloy 600 examination of the Unit 2 RPV head, a deposit was observed adjacent to and on Tube 78. There was no evidence of boron or ferritic steel wastage. The Alloy 600 examination was considered acceptable, but the presence of the deposit during the examination was investigated. It was determined that this deposit was from general contamination (not vessel head leakage) and was present and evaluated during the original baseline examination during 2RF06 (Spring 2002). There was no active or recurring leak or change to the deposit, so no additional actions were required. As a result of this occurrence, an enhancement was made to the Alloy 600 Program to include a list of significant CRs in the RCS Materials Management, ISI, and Reactor Internals Strategic Plan.

The above OE provides objective evidence that the Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.6. Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

Program Description

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP is a new monitoring AMP that provides assurance that RCPB CASS components susceptible to thermal aging embrittlement meet their intended functions. The ASME Code Class 1 CASS components are maintained by inspecting and evaluating the extent of thermal aging embrittlement in accordance with the requirements of the ASME B&PV Code, Section XI. The ASME Section XI Inservice Inspection program is augmented by the implementation of the Thermal Aging Embrittlement of CASS AMP, which monitors the aging effect of loss of fracture toughness due to thermal aging embrittlement of ASME Code Class 1 CASS components.

The Thermal Aging Embrittlement of CASS AMP includes a screening methodology to determine component susceptibility to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For “potentially susceptible” components, thermal aging embrittlement management is accomplished through plant-specific flaw tolerance evaluations. Inspections or evaluations are not required for components that are determined not to be susceptible to thermal aging embrittlement. Screening for ASME Code Class 1 CASS components susceptible to thermal aging embrittlement is not required for pump casings and valve bodies. The existing ASME Section XI inspection requirements are adequate for managing the aging effects of Class 1 pump casings and valve bodies.

The Thermal Aging Embrittlement of CASS AMP determined that three RCL CASS components are susceptible to thermal aging embrittlement via the screening process in accordance with NUREG-1801 described above. The three components are all from CPNPP Unit 1 and include a crossover leg 40-degree elbow, a crossover leg 90-degree elbow, and a crossover 90-degree elbow with plenum. A plant-specific flaw evaluation using plant-specific geometry and stress information was completed on all three of the components and it was determined that even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service.

The program provides flaw tolerance evaluations of susceptible components; it does not provide guidance on methods to mitigate thermal aging embrittlement. The flaw tolerance evaluations are based on specific geometry and stress information to verify that the thermally-embrittled material has adequate toughness throughout the PEO.

Inspection schedules for the ASME Section XI program are completed during the inspection interval in accordance with the schedule and extent of Table IWB-2412-1. There are no ASME Class 2 components within this program, therefore, Table IWC-2412-1 does not apply. The ASME Section XI program plans direct the inspection schedules and the extent of the inspections in the program planning documents as required to provide timely detection of flaws.

Flaws detected in RCPB ASME Code Class 1 CASS components are evaluated in accordance with the applicable procedures of IWB-3500. Flaw tolerance evaluations for components with ferrite content up to 25 percent are performed according to the principles associated with IWB-3640 procedures for submerged arc welds (SAW).

Ferrite content is calculated by using the Hull's equivalent factors (described in NUREG/CR-4513).

Repairs and replacements are performed in accordance with the ASME Section XI Code, which specify the requirements in IWA-4000, per the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP.

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP is a condition monitoring program whose methods effectively detect and monitor the applicable aging effects and the frequency is adequate to prevent significant age-related degradation.

NUREG-1801 Consistency

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP will be consistent with NUREG-1801, Section XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)".

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The Thermal Aging Embrittlement of CASS AMP is a new AMP. Industry OE will be considered in the implementation of this program. Plant OE will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the 10 CFR Part 50 Appendix B QA program.

This program applies to the potential reduction of fracture toughness due to thermal aging embrittlement. As stated in NUREG-1801, Revision 2, Section XI.M12, Element 10, this new program was developed using research data obtained on both laboratory-aged and service-aged materials.

The proposed inspection techniques specified by the program for examination of flaws are proven techniques used to satisfy ASME code inspection requirements. In addition, AMPs, such as the Thermal Aging Embrittlement of CASS AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12. Accordingly, there is reasonable assurance that this new AMP will be effective through the PEO.

Conclusion

The new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.7. PWR Vessel Internals

Program Description

The PWR Vessel Internals AMP is a new condition monitoring AMP with the principal objective to manage the effects of age-related degradation mechanisms that are applicable to PWR RVI components, which include:

- Cracking; SCC, PWSCC, IASCC, and cracking due to fatigue/cyclic loading;
- Loss of material induced by wear;
- Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement;
- Change in dimension due to void swelling or distortion; and
- Loss of preload due to thermal and irradiation-enhanced stress relaxation or creep.

The PWR Vessel Internals AMP, in accordance with the requirements of NEI 03-08, will implement the requirements of EPRI Technical Report No. 3002017168 (MRP-227, Revision 1-A), or the latest NRC-approved revision of MRP-227, which will be applied through the use of EPRI Technical Report No. 3002010399 (MRP-228, Revision 3), or the latest NRC-approved revision of MRP-228. The requirements of MRP-227, Revision 1-A were written for an operating period of 60 years; therefore, a gap analysis to identify program enhancements that are needed to address an 80-year operating period are not relevant to CPNPP.

The PWR Vessel Internals AMP applies the guidance of MRP-227, Revision 1-A for inspecting and evaluating RVI components at CPNPP. These examinations will provide reasonable assurance that the effects of age-related degradation mechanisms will be managed during the PEO. This program will include expanding periodic examinations and other inspections if the extent of the degradation identified exceeds expected levels.

MRP-227, Revision 1-A provides guidance for selecting RVI components which are expected to provide the leading indications of degradation. Through this process, the RVI will be assigned into one of the following four groups: Primary, Expansion, Existing Programs, and No Additional Measures. Definitions of each group are provided in MRP-227, Revision 1-A.

A set of Primary RVI component locations will be inspected because they are highly susceptible to the leading indications of the effects of at least one of the eight aging mechanisms identified above. Another set of Expansion RVI component locations will be specified to expand the inspection sample should the Primary component indications fail to meet acceptance criteria, which are provided in MRP-227, Revision 1-A, as supplemented by applicable interim guidance documents issued under the NEI 03-08 initiative.

A third set of RVI component locations, Existing Programs components, will be those components susceptible to the effects of at least one of the eight aging mechanisms and are deemed to be adequately managed by existing programs, such as the ASME B&PV Code, Section XI, Examination Category B-N-3, examinations of core support structures and water chemistry.

A fourth set of RVI component locations will be deemed to require No Additional Measures, for which the effects of all eight aging mechanisms do not require any additional aging management, as demonstrated in MRP-191, Revision 1.

The PWR Vessel Internals AMP will rely on the Water Chemistry (B.2.3.2) AMP to prevent or mitigate aging effects that can be induced by corrosive aging mechanisms. For the management of cracking, the PWR Vessel Internals AMP will monitor for evidence of surface-breaking linear discontinuities if a visual technique is used as the non-destructive examination (NDE) method or for relevant flaw indication signals if a volumetric, ultrasonic testing method is used as the NDE method. For the management of loss of material, the AMP will monitor for gross or abnormal surface conditions that may be indicative of loss of material occurring in the components. For the management of loss of preload, the AMP will monitor for gross surface conditions that may be indicative of loosening in applicable bolted, fastened, keyed, or pinned connections. The AMP will not directly monitor for loss of fracture toughness that is induced by thermal aging or neutron irradiation embrittlement. Instead, the impact of loss of fracture toughness on component integrity will be indirectly managed by: (1) using visual or volumetric examination techniques to monitor for cracking in the components, and (2) applying applicable reduced fracture toughness properties in the flaw evaluations, in cases where cracking is detected in the components and is extensive enough to necessitate a supplemental flaw growth or flaw tolerance evaluation. The AMP will use physical measurements to monitor for any dimension changes due to void swelling or distortion.

The inspection methods are determined in accordance with the most recent revision of MRP-228. In all cases, well-established inspection methods will be selected. These methods include volumetric ultrasonic examination methods for detecting flaws in bolting and various visual examinations (VT-3, VT-1, and Enhanced Visual Examination (EVT-1)) for detecting effects ranging from general conditions to detection and sizing of surface-breaking discontinuities. Surface examinations may also be used as an alternative to visual examinations for detection and sizing of surface-breaking discontinuities.

Cracking induced by SCC, IASCC, PWSCC, and fatigue will be monitored/inspected by either VT-1 or EVT-1 examination (for internals other than bolting) or by volumetric ultrasonic examination (bolting). VT-3 visual methods may be applied for the detection of cracking in non-redundant RVI components only when the flaw tolerance of the components, as evaluated for reduced fracture toughness properties, is known and the component has been shown to be tolerant of easily detected large flaws, even under reduced fracture toughness conditions. VT-3 visual methods will be acceptable for the detection of cracking in redundant RVI components (e.g., redundant bolts or pins used to secure a fastened RVI assembly).

In addition, VT-3 examinations will be used to monitor/inspect for the loss of material induced by wear and for general aging conditions, such as gross distortion caused by void swelling and irradiation growth, or by gross effects of loss of preload caused by thermal and irradiation-enhanced stress relaxation and creep. In some cases, as defined by MRP-227, Revision 1-A, physical measurements will be used as supplemental techniques to manage for the gross effects of wear, loss of preload due to stress relaxation, or for changes in dimensions due to void swelling or distortion.

The PWR Vessel Internals AMP will implement the guidance of MRP-227, Revision 1-A for defining the Expansion Criteria that need to be applied to the inspection findings of Primary components and for expanding examinations to include additional Expansion components. RVI component inspections will be performed consistent with the inspection frequency and sampling bases for Primary components, Expansion components, and Existing Programs components in MRP-227, Revision 1-A. The timing of baseline examinations for 40-60 years of operation is discussed in the OE section below.

The PWR Vessel Internals AMP will apply applicable fracture toughness properties, including reductions for thermal aging or neutron embrittlement, in the flaw evaluations of the components in cases where cracking is detected in a RVI component and is extensive enough to warrant a supplemental flaw growth or flaw tolerance evaluation.

For singly-represented components, the PWR Vessel Internals AMP will include criteria to evaluate the aging effects in the inaccessible portions of the components and the resulting impact on the intended function(s) of the components. For redundant components, such as redundant bolts, screws, pins, keys, or fasteners, some of which are accessible to inspection and some of which are not accessible to inspection, the AMP will include criteria to evaluate the aging effects in the population of components that are inaccessible by the applicable inspection technique and the resulting impact on the intended function(s) of the assembly containing the components. The acceptance criteria for inspections will fall into one of the following two categories:

- For visual examination (and surface examination as an alternative to visual examination), the examination acceptance criterion will be the absence of any of the specific, descriptive relevant conditions; in addition, there are requirements to record and disposition surface-breaking indications that are detected and sized for length by VT-1/EVT-1 examinations.

- For volumetric examination, the examination acceptance criterion will be the capability for reliable detection of indications in bolting, which will be demonstrated in the examination technical justification; in addition, there are requirements for system-level assessment of bolted or pinned assemblies with unacceptable volumetric ultrasonic examination indications that exceed specified limits.

The PWR Vessel Internals AMP will be consistent with existing site CAP procedures and guidance. Any conditions found, such as failures, malfunctions, deficiencies, deviations, defective material, and equipment, and non-conformances, will be promptly identified and corrected. In the case of significant conditions adverse to quality, measures will be implemented to ensure that the cause of the condition is determined, and that corrective action is taken to prevent reoccurrence. These measures may include engineering evaluations, supplementary examinations, repair, or replacement. Any repair or replacement activities are subject to ASME Code Section XI requirements in the PEO.

NUREG-1801 Consistency

The PWR Vessel Internals AMP will be consistent with NUREG-1801, Section XI.M16A, “PWR Vessel Internals”, as superseded by SLR-ISG-2021-01-PWRVI.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the PWR Vessel Internals AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

The tracking of active degradation mechanisms informs the program on potential issues which will be evaluated for potential augmented inspections or material modifications. Several issues and components with significant degradation indications throughout the industry have been identified, evaluated, and dispositioned for CPNPP.

- Clevis Inserts
    - The PWR Owners Group issued OG-21-160 in 2021 to address NEI guidance pertaining to PWR lower radial support clevis insert X750 bolt inspection requirements. This guidance was issued in response to recent 2020 OE in which the degradation of X-750 clevis insert bolts resulted in the partial displacement of one insert from its original designed interference fit in the vessel clevis. Based on this recent OE, Westinghouse plants are required to implement one of the following three options either at the next scheduled core barrel pull after July 1, 2023, or prior to 55 calendar years of plant operation – whichever comes first. (1) Proactive replacement of clevis insert bolts, (2) UT examination with contingency for bolt replacement, or (3) UT examination with contingency operability assessment.

      As this guidance applies to both Units 1 and 2 at CPNPP, a tracking report was issued to make this decision prior to the next core barrel removal, scheduled for Spring 2025 and Fall 2030, respectively, with a note to update the site Reactor Internals Strategic Plan as an immediate action.

- Westinghouse issued TB 14-5 after significant degradation of clevis insert bolts was identified at another site. During a 10-year ISI remote examination at this site in 2010, it was discovered that 7 of 48 clevis insert bolts were detached from the shank. A total of 29 bolts were removed and replaced in 2013, and review of video images from previous inspections showed no indications of wear, fractures, or other anomalies with the clevis insert cap screws or dowel pins at any location. The licensee determined the root cause of the degradation to be PWSCC due to the use of Alloy X-750 material with a susceptible heat treatment. The number of replacement bolts for the site was determined based on structural evaluations of the bolts assuming that none of the bolts remained functional; however, an evaluation of the entire support revealed that no bolts are required to maintain the intended safety function of the support clevis units.

  All Westinghouse-designed plants have confirmed a similar susceptible heat treatment of Alloy X-750 to that used in the cap screws as well as similarly applied preload stresses; therefore, CPNPP Units 1 and 2 are also susceptible to PWSCC of clevis insert bolts. This bulletin was an update to previous Westinghouse interim guidance released in IG-10-1, the inspection recommendations of which were already incorporated at CPNPP under a previous CR. TB 14-5 provides information on the root cause of clevis insert bolt failure and recommendations for inspection, which do not alter procedures written in response to the original discovery in 2013. A visual remote inspection of the clevis insert assembly was performed at CPNPP, with the lower internals (core barrel) removed, during the Spring 2010 outage and the Fall 2009 outage for Units 1 and 2, respectively. The inspection did not reveal any anomalies to the lower radial support clevis. Visual inspections of the clevis insert assembly for Unit 1 were completed during the Spring 2019 outage and for Unit 2 were completed during the Fall 2021 outage. The remote visual inspections of the clevis insert assemblies were acceptable and did not reveal any degradation issues.

- Fuel Alignment Pins

  - Westinghouse issued Technical Bulletin (TB) 16-4 after another site identified surface degradation of their LCP and upper core plate (UCP) fuel alignment pins. To provide the licensee with justification for acceptability, Westinghouse performed a dimensional and structural evaluation, which supported operation with degraded LCP and UCP fuel alignment pins. The fuel alignment pins at this site were constructed from Type 304 stainless steel with malcomized surface treatments, which were considered for potential surface degradation as early as the 1970s. Westinghouse performed an EOC review to determine the Westinghouse safety analysis functional areas that could be impacted if similar degradation were to be found in other plants. The EOC review evaluated Westinghouse plants with the same fuel alignment pin material and surface treatment design, which also use Westinghouse fuel. The evaluations performed as part of the EOC review confirm that if LCP and UCP fuel alignment pin degradation were to be identified in these plants, it would not constitute a substantial safety hazard and plant operation would not be impacted.

CPNPP Units 1 and 2 have similar components to those described in this bulletin; however, this industry OE is not applicable to CPNPP because the susceptible fuel alignment pin type is not utilized at CPNPP. CPNPP is not on the list of affected plants contained in this bulletin because the Unit 1 and 2 fuel alignment pins at CPNPP are constructed from cold-worked Type 316 stainless steel.

- Baffle Bolting
    - EPRI issued MRP 2018-002, under the NEI 03-08 initiative, to address significant stress increases in barrel-former bolts as a result of significant clusters of baffle-former bolt degradation in Westinghouse-designed units. This degradation would be a localized effect, only impacting barrel-former bolts within a certain distance of the degraded cluster of baffle-former bolts; therefore, lower support column bolts would not see an increase in stress due to baffle-former bolt degradation. Increased barrel-former bolt stress will cause the probability of IASCC initiation in the barrel-former bolts to increase. As a result of this phenomenon, MRP 2018-002 provides modified baffle- and barrel-former bolt requirements to those in MRP-227, Revision 1-A, which provide additional expansion examination criteria for barrel-former bolts if large clusters of baffle-former bolts with unacceptable indications are observed.
    - As previously stated, CPNPP has not yet completed baseline volumetric examinations of the baffle-former bolts. However, if the need arises upon completion of the baseline inspections that results in significant amounts of failure clustering observed in a baffle-former bolt inspection, PM activities created in response to NSAL 16-01 have been revised to provide reference for the required expansion inspection criteria contained in MRP 2018-002. Westinghouse released NSAL 16-01, endorsed by the NEI 03-08 initiative, to address baffle-former bolt degradation. At the time of issue, all PWR plants, both domestic and foreign, that had identified degradation of baffle-former bolts were less than 45 years of calendar age. This guidance categorizes plants using a four-tiered approach to reflect the relative risk of baffle-former bolt failure; plants operating in an upflow configuration have a lower relative risk of the cascading of baffle-former bolt failures experienced by the Tier 1 downflow plants and of baffle-former bolt failures in general over the remaining life due to bolt stress differences.

In accordance with this guidance, CPNPP is considered a Tier 4 plant, which is the lowest risk category. Plants in this risk category must perform a baseline inspection no later than 35 EFPYs. CPNPP has not yet completed baseline volumetric examinations of the baffle-former bolts; however, as a result of this guidance PM activities were created to perform these baseline inspections prior to 35 EFPYs for CPNPP Units 1 and 2.

- Guide Cards

  - Westinghouse issued WCAP-17451-P, Revision 1 in support of guidance discussed in NSAL-17-1, which was released under the NEI 03-08 initiative, to enhance the baseline inspection schedule for guide cards susceptible to wear. Findings contained in NSAL-17-1 report that plants with 17x17 A/AS/AXLR guide tubes are susceptible to aggressive guide card wear. Additionally, the use of ion nitride rod cluster control assemblies (RCCA) may further accelerate this condition. Specifically, the nuclear safety consequences of aggressive guide card wear are an increased rod drop time that could violate TS limits, and failure to insert RCCAs during a LOCA/seismic condition to achieve safe shutdown and outage extensions.

    The modified baseline inspection schedule criteria for CPNPP Units 1 and 2, which utilize 17x17 A/AS guide tubes, issued in this guidance, is no later than 29 EFPYs for both units. This guidance also provides recommendation for a sample size needed to achieve at least 95 percent confidence, based on number of loops and number of guide tubes with RCCAs. The accelerated inspection recommendation of 29 EFPY is based on OE released from Seabrook, which showed high levels of guide card wear that provided concern that the guide cards were susceptible to unexpected, accelerated wear. 29 EFPY was chosen as a limit bounded by the estimated time for the most worn guide card at Seabrook to reach an unacceptable level of wear.

    During the Spring 2022 outage, all 53 Unit 1 guide tubes and associated guide cards were inspected and measured for wear based on guidance in WCAP-17451, Revision 1. Due to the low wear levels observed, recommendations based on the inspection were to follow MRP-227, Revision 1-A and perform subsequent measurements of all 53 guide tubes within the next 10 EFPY from the time of the initial inspection, given that there are no major changes in plant hardware or operating conditions that could potentially impact guide card wear. The re-inspection criteria outlined in MRP-227, Revision 1-A is to be used until Revision 2 is approved by the NRC, at which point the re-inspection interval is relaxed to 20 EFPY. Unit 2 will be inspected prior to reaching 29 EFPY during the Spring 2023 outage.

- Thermal Sleeve Flange Wear

  - Westinghouse issued NSAL 20-01 after new OE was identified involving thermal sleeve cracking and complete separation of flange from sleeve. The cracking and separation of the flange from the sleeve is a potential degradation mechanism for Westinghouse plants that operate in a T-Cold configuration and have CRDM thermal sleeves with a collar below the flange. This separated condition, when combined with the type of flange wear discussed in NSAL 18-01, can potentially impede control rod movement and RCCA insertability. This OE involves a new thermal sleeve failure mechanism; however, because the safety significance of this issue is associated with conditions discussed in NSAL 18-01, the recommendations captured in NSAL 20-01 should be considered in addition to those provided in NSAL 18-01.

However, NSAL 20-01 has been issued as Revision 1 to revise the position that CRDM penetration thermal sleeve flange separation due to cross-sectional fracture at the flange collar is a reportable defect. The revision summarizes the latest PWROG technical evaluation, removes the inspection recommendations, and clarifies that CRDM thermal sleeve cross-sectional failures at the flange collar cannot create a substantial safety hazard.

At CPNPP, baseline inspections were completed during the Fall 2021 outage for Unit 2. Normal wear was found during visual inspections with a recommendation to re-inspect within 6 cycles. Baseline inspections for Unit 1 were completed during the Spring 2022 outage, also showing normal wear with a recommendation to re-inspect in 12 cycles.

- EPRI released MRP 2018-027, under the NEI 03-08 initiative, to endorse the recommendations contained in Westinghouse NSAL 18-01. Westinghouse issued this advisory letter in response to thermal sleeve flange degradation at Belleville Unit 2 in France, in which a flange remnant from a separated thermal sleeve became cocked and interfered with control rod movement (i.e., created a stuck rod). Previous evaluations of separated sleeves and flanges considered this interference to be unlikely; however, considering the similarities of the foreign plant to domestic Westinghouse NSSS plants, Westinghouse reported the issue to the NRC under 10 CFR Part 21 because it has the potential to create a substantial safety hazard. Flange wear failures at multiple core locations could occur and result in a potential safety concern of multiple stuck control rods if no action is taken to monitor and correct potential flange wear.

  The wear of thermal sleeves (primarily outer and inner diameter wear) is a known issue that the industry has successfully managed for over ten years. Reported outer and inner diameter wear has consistently shown that thermal sleeve wear at plants with higher upper head bypass flow, referred to as “T-Cold” head plants, tends to be greater than sleeve wear at plants with lower upper head bypass flow, referred to as “T-Hot” head plants. Therefore, T-Cold plants are potentially more susceptible to experiencing thermal sleeve flange wear than T-Hot plants.

NSAL 18-01 lists CPNPP Units 1 and 2 as having higher susceptibility to thermal sleeve flange wear because both units are T-Cold units. Per NSAL 18-01, it is recommended that units on their original or replacement reactor vessel closure head perform dimensional measurements and/or visual inspections consistent with the "Recommended Actions" section of NSAL 18-01 after exceeding 25 EFPY. However, a range of 20-25 EFPY was imposed for these measurements and/or inspections in MRP 2018-027 and later adopted by PWROG-16003-P, Revision 2. PM activities were issued to ensure that wear measurements and inspections are performed. The measurements for Unit 2 were completed in the Fall 2021 outage and found normal wear, resulting in a recommendation to re-inspect in the next 6 cycles. The measurements for Unit 1, which has a replacement closure head, were performed during the Spring 2022 outage, also showing normal wear with a recommendation to re-inspect in the next 12 cycles. The scope of future inspections will be determined using results from these baseline measurements/inspections. The NEI 03-08 interim guidance issued as a result of NSAL 18-01, and subsequent guidance documents related to thermal sleeve flange wear, as discussed below, were prepared after the development of MRP-227, Revision 1-A and will be included within the next NRC-approved version of MRP-227.

- PWROG-16003-P, Revision 2 was issued to supersede the guidance of MRP 2018-027; however, the PWROG-16003-P guidance in Revision 2 was also updated in response to the foreign OE discussed in NSAL 18-01, in which it was concluded that there is potential for failure at the thermal sleeve flange at rodded locations that pose a control rod insertability concern. To aid in the recommended inspections of NSAL 18-01, the PWROG-16003-P guidance determines conservative acceptance criteria to apply to the measured lowering of thermal sleeves. The criteria are based on thermal sleeve groupings, determined based on plant design and thermal sleeve type. Bounding criteria are determined for each plant group based on ASME allowable loads and plant-specific design tolerance stack ups.

  Application of these criteria provides confidence that thermal sleeve flange separation will not occur as a result of wear. This is achieved by maintaining a minimum structural section of the thermal sleeve. It is recommended that thermal sleeves which do not meet the above criteria be re-evaluated considering possible removal and replacement. Although thermal sleeves in unrodded locations do not pose a concern for control rod insertability, the acceptance criteria may conservatively be applied for unrodded thermal sleeve locations at the discretion of the utility in order to prevent separation of a thermal sleeve at an unrodded location and the possible creation of loose parts.

  CPNPP Unit 2 contains unrodded thermal sleeves, Unit 1 does not. Initial wear measurements and inspections for Unit 2 were performed during the Fall 2021 outage. These Unit 2 inspections were moved to the Fall 2021 outage, in which the unit had operated for greater than 25 EFPY, from the original scheduling during the Spring 2020 outage due to the staffing limitations resulting from the COVID-19 pandemic.

- Flexible Power Operations
  - Industry interim guidance released in EPRI MRP 2019-002, under the NEI 03-08 initiative, discusses the potential implications of flexible power operations (i.e., load following) for RVI components. This guidance also provides screening criteria requirements Westinghouse-designed plants using flexible operation must meet to be bounded under MRP-227, Revision 1-A guidance.

    CPNPP Units 1 and 2 have both operated at base load conditions for the life of the units and future flexible power operations are not planned for either unit.

- Core Support Barrel
  - EPRI released MRP 2019-009, under the NEI 03-08 initiative, as a result of cracking indications identified during a Spring 2018 inspection of the core support barrel (CSB) at St. Lucie Unit 1, which is a CE-designed PWR. These indications were located adjacent to the MGW and MAW of the CSB, in and near the high fluence core beltline region. Most of the flaws observed in the St. Lucie CSB were oriented perpendicular to the MAW, similar to "off-axis" cracks observed at several BWR plants in recent years, which have been linked to potential causes including construction and field-fabrication issues or age-related degradation.

    Based on the evaluation in MRP 2019-009, it is concluded that age-related cracking at axial welds is not likely to be any more prevalent or significant than cracking at circumferential welds. While the St. Lucie and BWR OE highlights the potential for circumferential cracking to be present in axial welds and the conclusions of the potential for a fully separated core barrel to go undetected should it occur during normal/upset operation, it is not credible that circumferential cracks extending from axial welds will grow substantially into the base metal during normal/upset operation due to few known driving mechanisms and relatively low crack growth rates. Therefore, full separation during normal/upset operation due to this cracking is not expected. Furthermore, the automatic reactor trip associated with a faulted condition as well as the alignment provided by design features of the reactor internals will ensure safe shutdown can be achieved if separation were to occur during a faulted event. As a result, while the MRP-227 reactor internals inspection and evaluation guidance as written may allow for an inspection to overlook circumferential cracking in an axial weld, the monitoring of girth welds remains a reasonable surrogate for identification of age-related cracking of the core barrel prior to any significant degradation which could impact plant safety from the standpoint of shutdown capability and core damage.

Therefore, it is concluded that no further actions are needed to incorporate recommendations of this NEI 03-08 “Good Practice” guidance at CPNPP. Per NEI 03-08, “Good Practice” recommendations can be implemented at the discretion of the individual plant or utility.

Plant-Specific OE

- During the Spring 2022 outage, while inspecting guide cards, it was identified that some legacy debris existed within four guide tube locations. The debris consisted of a rust stain, paint or boron flakes, and a nylon bristle. The flakes and the bristle were removed; however, the rust stain remained but was not considered a concern.

- In 2019, MRP 2019-001 was evaluated for applicability to address the issuance of MRP-228, Revision 3, which contains five “Needed” and three “Good Practice” requirements, as defined in NEI 03-08. Revision 3 of MRP-228 is applicable for all MRP-227 inspections occurring six months after its publication.

  CPNPP has not yet performed inspections dictated by MRP-227, Revision 1-A, as the PWR Vessel Internals AMP is a new AMP at CPNPP. However, when the required inspections of MRP-227, Revision 1-A are implemented at CPNPP, they will be applied through the revised requirements contained in MRP-228, Revision 3.

- During the Spring 2019 FOSAR inspection of Unit 1, eight items of debris were identified during the vessel inspection without the core barrel in place. All items appeared to be either rust or dried boron flakes and were successfully removed using the filter. The rust and boron flakes were determined to be normal from the vessel flange area and it was concluded that no adverse conditions were present.

- During the Fall 2018 FOSAR inspection for Unit 2, six pieces of debris (small bits of rust) were identified on the LCP, measuring no larger than 1 inch in any dimension, as well as an accumulation of rust-colored debris found around the vessel flange area. All foreign material was retrieved using a filter and vacuum. The cause of the material was determined to be debris created from normal wear from the vessel flange area.

- In 2016, MRP-227, Revision 1-A was evaluated for applicability, which resulted in updates to the previously created program plan, the guidance of which will be effective during the pre-PEO baseline inspections and the PEO MRP-227 inspections.

- During the Fall 2015 reactor upper internals installation for Unit 2, an object was observed on the east region of the upper internals lower support plate. This object was found using underwater cameras monitoring the lift after approximately six feet of vertical movement. The lift was stopped, and reactor engineering was contacted for guidance/disposition. Similar debris had previously been found and retrieved from this area on the north end of the upper internals, and on the top baffle plate of the lower internals. This material was believed to be a corrosion product consisting of iron and boron. The object was brushed into the upper internals storage area of the reactor cavity. The debris was noted to disintegrate when contacted with a long pole; therefore, the object was considered not to be foreign material and not to be indicative of interconnecting system degradation. As a result of this discovery, the lower support plate of the upper internals package was added to the reactor vessel FOSAR scope.

- In 2012, a CR was initiated to track the future implementation of examination and inspections requirements released in MRP-227, Revision A. In response to the issuance of MRP-227, Revision A, a program plan to address aging management of RVI components was drafted to be implemented during the PEO in anticipation of the CPNPP LRA effort.

- In April 2002, foreign material was identified in the hot leg of a SG. The material was removed and identified as a locking device for the split pin that secures the guide tube to the upper core plate. These original split pins were constructed of X-750 nickel alloy, which has experienced failures in Westinghouse PWR internals.

  As a result of this discovery, and indications of similar degradation throughout the industry, the original Alloy X-750 split pins were replaced with Type 316 stainless steel split pins, which utilize a superior design and a less susceptible material. The split pins for Units 1 and 2 were replaced during 2004 and 2005, respectively. Replacement 316 stainless steel split pins are considered to be “No Additional Measures” components, and therefore do not require a plant-specific evaluation in accordance with MRP-227, Revision 1-A.

The above OE provides objective evidence that the PWR Vessel Internals AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the PWR Vessel Internals AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new PWR Vessel Internals AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.8. Flow-Accelerated Corrosion

Program Description

The Flow-Accelerated Corrosion AMP is an existing condition monitoring AMP that manages loss of material (wall thinning) caused by FAC. This AMP is based on commitments made in response to NRC GL 89-08. This AMP relies on implementation of the EPRI guideline, Nuclear Safety Analysis Center (NSAC)-202L-R4 for an effective Flow-Accelerated Corrosion AMP. This AMP includes the following:

a) Identifying all FAC-susceptible piping systems and components.

b) Developing FAC predictive models to reflect component geometries, materials, and operating parameters.

c) Performing analyses of FAC models and, with consideration of OE, selecting a sample of components for inspections.

d) Inspecting components.

e) Evaluating inspection data to determine the need for inspection sample expansion, repairs, or replacements, and to schedule future inspections.

f) Incorporating inspection data to refine FAC models. The AMP includes the use of predictive analytical software (CHECWORKS™) that uses the implementation guidance of NSAC-202L-R4. CHECWORKS software is controlled under CPNPP's Software QA Program. Updates to CHECWORKS predictive models are independently reviewed consistent with NSAC-202L-R4 recommendations. CPNPP has implemented the industry utilized database known as FAC Manager which works with CHECWORKS to assist with the evaluation and trending of inspection data. FAC Manager software is controlled under the Software QA Program.

Since the Flow-Accelerated Corrosion AMP is a condition monitoring program, no preventive actions are taken. With that noted, the rate of FAC or erosion, where applicable, is affected by piping material, geometry and hydrodynamic conditions, and operating conditions such as temperature, pH, steam quality, operating hours, and dissolved oxygen content.

The Flow-Accelerated Corrosion AMP monitors the effects of wall thinning due to FAC and erosion mechanisms by measuring wall thicknesses. Relevant changes in system operating parameters, (e.g., temperature, flow rate, water chemistry, operating time), which result from off-normal or reduced power operations, are considered for their effects on the CHECWORKS™ predictive FAC models, and these parameters are included in updates to the CHECWORKS™ predictive FAC models. Components are suitable for continued service if calculations determine that the predicted wall thickness at the next scheduled inspection will meet the minimum allowable wall thickness. The minimum allowable wall thickness is the thickness needed to satisfy the component design loads under the original code of construction; additional code requirements are met, as applicable. A conservative safety factor is applied to the predicted wear rate determination to account for uncertainties in the wear rate calculations and UT measurements. The safety factor for acceptable wall thickness and remaining service life is 1.1 or greater, as recommended by NSAC-202L-R4.

The Flow-Accelerated Corrosion AMP procedures require reevaluation, repair, or replacement of components for which the acceptance criteria are not satisfied, prior to their return to service. For FAC, long-term corrective actions may include replacing components with FAC-resistant materials. Operating parameters that affect predicted FAC wear rates (e.g., operating time, hydrodynamic conditions, water treatment, component material, etc.) may also be adjusted, as long as the corresponding CHECWORKS™ models are also updated. When carbon steel (steel) piping components are replaced with FAC-resistant material, the susceptible components immediately downstream are considered for monitoring to identify any increased wall thinning.

The Flow-Accelerated Corrosion AMP will also manage wall thinning caused by erosion mechanisms in limited situations where periodic monitoring is used in lieu of eliminating the cause, typically a design or operational deficiency, in components that contain treated water (including borated water) or steam. These limited situations are based on plant-specific OE and will be monitored similar to other FAC locations that are not modeled.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion AMP, with enhancements, is consistent with one exception to the program described in NUREG-1801, Section XI.M17, “Flow-Accelerated Corrosion”, as amended by LR-ISG-2012-01.

Exceptions to NUREG-1801

<u>Exception to Element 1, Scope of Program</u>

The NUREG-1801 Revision 2 Chapter XI.M17, Flow-Accelerated Corrosion program, as updated by LR-ISG-2012-01, relies on implementation of the EPRI guidelines in the Nuclear Safety Analysis Center (NSAC)-202L-R2 or -R3 for an effective Flow-Accelerated Corrosion AMP. The Flow-Accelerated Corrosion AMP is based on EPRI NSAC-202L-R4, “Recommendation for an Effective Flow-Accelerated Corrosion AMP”.

<u>Justification for Exception</u>

EPRI periodically revises the Flow-Accelerated Corrosion recommendations as new information becomes available based on industry OE, best practices, and research. In all instances, the recommendations are the same or more conservative than EPRI NSAC-202L-R2 and -R3. In no instances are flow-accelerated corrosion recommendations relaxed. NUREG-2191 Chapter XI.M17 includes NSAC-202L-R4 as an acceptable version of the EPRI guideline for SLR. Therefore, the Flow-Accelerated Corrosion AMP, as defined by NSAC-202L-R4, will continue to be effective in mitigating wall thinning due to FAC.

Enhancements

The Flow-Accelerated Corrosion AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M17. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
1. Scope	The program will be enhanced to include erosion mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement for the components that contain treated water (including borated water) or steam.
3. Parameters Monitored or Inspected	The program will be enhanced to address erosion as an aging mechanism for all components that are susceptible to erosion wall-thinning mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement. This will include guidelines for measuring wall thickness due to erosion.
4. Detection of Aging Effects	The program will be enhanced to ensure that identification of locations susceptible to erosion is based on the extent of condition reviews from corrective actions in response to plant-specific and industry OE. Components may be treated in a manner similar to “susceptible-not-modeled” lines discussed in NSAC-202L-R4. Additionally, include guidance from EPRI 1011231 for identifying potential damage locations and EPRI TR-112657 and/or NUREG/CR–6031 guidance for cavitation erosion.
5. Monitoring and Trending	• The program will be enhanced to include trending of wall thickness measurements at locations susceptible to erosion mechanisms to adjust the monitoring frequency and to predict the remaining service life of the component for scheduling repairs or replacements. Inspection results will be evaluated to determine if assumptions in the extent-of-condition review remain valid. If degradation is associated with infrequent operational alignments, such as surveillances or pump starts/stops, then trending activities may consider the number or duration of these occurrences. The program will be enhanced to consider periodic wall thickness measurements of replacement components, which would continue until the effectiveness of corrective actions has been confirmed. • Procedures will be enhanced to ensure that updates to plant predictive models are controlled and independently reviewed by a second qualified flow-accelerated corrosion engineer, consistent with NSAC-202L recommendations.

Element Effected	Enhancement
7. Corrective Actions	The program will be enhanced so that, for erosion mechanisms, long-term corrective actions to eliminate the cause will consider adjusting operating parameters or changing component designs, and the effectiveness of these corrective actions will be verified. The program will be enhanced to continue periodic monitoring activities for any components (susceptible to erosion) replaced with an alternate material, since a material that is completely erosion resistant is not currently available.

Operating Experience

Industry OE

- In 2019, CPNPP completed a review of “NRC Information Notice (IN) 2019-08: Flow-Accelerated Corrosion Events” to determine if they are applicable to CPNPP. The two events described in IN 2019-08 were determined applicable to CPNPP. In response to the Davis-Besse event modeled components in CHECWORKS were reviewed, in particular orifice sizes, to ensure that the same potential error did not exist at CPNPP. The Indian Point event was reviewed, and it was determined, similar to the Davis-Besse event, that the site had historical data that would indicate that future issues may reoccur and should be closely observed to prevent reoccurrence. Both sites indicated that if their models within their Flow-Accelerated Corrosion AMP had been accurately validated that it is possible these events could have been prevented. For CPNPP, previous inspection data and models are evaluated to determine if new inspection locations are necessary. Several components and piping systems have been preemptively replaced through the history of the Flow-Accelerated Corrosion AMP. CPNPP utilizes the current version of CHECWORKS and has implemented the industry utilized database known as FAC Manager which works with CHECWORKS to assist with the evaluation and trending of inspection data.

- In 2017, CPNPP completed a review of IER LR-15-41, BWR Reactor Water Cleanup System Piping Wall Thinning. This industry OE was reviewed by the Flow-Accelerated Corrosion AMP owner and determined not applicable due to the difference between BWRs and CPNPP which is a PWR.

- In 2014, CPNPP completed an effectiveness review of INPO SOER 82-11. Based on the review, the FAC commitment was updated to include the exact wording of SOER 82-11, and the corrosion monitoring inspection plan was revised to include SOER 82-11 as a reference document.

- INPO-OED 2007-19, “Elevated Wear Rates in FAC Susceptible Piping Downstream of FAC Resistant Piping” describes elevated wear rates on FAC susceptible components that are downstream of components that contain elevated chromium in a phenomenon known as “leading edge effect.” This document was evaluated for inclusion into the Flow-Accelerated Corrosion

AMP, and components downstream of FAC-resistant components are considered in selection of inspection locations.

- The development of the Flow-Accelerated Corrosion AMP considered the industry OE provided by INPO SOER 82-11, “Erosion and Subsequent Failure of Steam Piping Sections”, INPO SOER 87-3, “Pipe Failures in High Energy Systems due to Erosion/Corrosion”, and NRC IEB 87-01, “Thinning of Pipe Walls in Nuclear Plants”. In response to NRC IEB 87-01, CPNPP issued a commitment, developing the corrosion monitoring program.

Plant-Specific OE

A review of plant-specific OE indicates that the Flow-Accelerated Corrosion AMP is effective in identifying components susceptible to FAC, repairs FAC related failures, and updates the program as needed based on industry and plant-specific OE.

- Flow-Accelerated Corrosion program health reports document that the program is in good health. One FAC-related failure within the previous reporting period did occur and was subsequently repaired during refueling outage 1RF21 in Fall, 2020. No unplanned FAC failures occurred during this reporting period.

- As a result of CHECWORKS User Group benchmarking, FAC qualification cards were updated to be more task based by demonstrating the ability to maneuver within the various programs such as CHECWORKS and the new recently acquired FAC Manager Program. The qualification card was enhanced to include demonstrating the ability to perform a wear rate analysis and to make determinations on inspection scopes.

- In 2020, a self-assessment of the Flow-Accelerated Corrosion program identified a gap related to NSAC-202L-R4 recommendations. Flow-Accelerated Corrosion procedures were revised to implement the recommendations provided in specific sections of NSAC-202L-R4.

- In December of 2017, during evaluation of pipe thickness data for a 20"x24" expander under the Flow-Accelerated Corrosion program, data indicated low thickness measurements. To ensure accurate data readings, a second set of data was obtained with similar results. From the data obtained, the component could operate for two full cycles before it should be replaced. The component was replaced after the subsequent two cycles.

- In November of 2015, a Turbine Plant Cooling Water valve was making noise indicative of potential cavitation issues. The FAC engineer confirmed the system is low temperature, low energy, and that there is not a FAC concern; however, cavitation may have been occurring where water vapor forms at low pressure immediately downstream of the valve disc. Cavitation in the butterfly valve was determined to be possible, leading to potential valve and pipe degradation. The valve was replaced with a slightly larger and different model valve. Inspection of the original valve and surrounding piping indicated both were in good condition and not degraded.

The above OE provides objective evidence that the Flow-Accelerated Corrosion AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Flow-Accelerated Corrosion AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Flow-Accelerated Corrosion AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.9. Bolting Integrity

Program Description

The Bolting Integrity AMP is an existing preventive and condition monitoring AMP. The program provides for aging management for loss of preload, cracking, and loss of material due to corrosion of closure bolting on pressure retaining joints within the scope of LR. The program includes closure bolting on pressure retaining joints in indoor air, outdoor air, air with borated water leakage, air with steam or water leakage, condensation, raw water, waste water, and soil. The Bolting Integrity program will incorporate NRC and industry recommendations delineated in NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and EPRI TR-104213, “Bolted Joint Maintenance & Applications Guide.”

Preventive measures include material selection (e.g., minimized use of materials with an actual yield strength greater than 150 ksi), lubricant selection (e.g., restricting the use of molybdenum disulfide), applying the appropriate preload (torque), and checking for uniformity of gasket compression where appropriate to preclude loss of preload, loss of material, and cracking.

The program includes periodic inspection of closure bolting, at least once per refueling cycle, for indications of loss of preload, cracking, loss of material, and to identify leaks. The program credits volumetric, surface, and visual inspections of ASME Class 1, 2, and 3 bolts, nuts, washers, and other associated bolting components performed in accordance with ASME Section XI, Subsections IWB, IWC, and IWD. Periodic system walkdowns perform visual inspections of non-ASME (NNS) pressure retaining bolted joints (in non-ASME Class 1, 2, 3 and MC systems) for detection of visible leakage. Inspection activities of closure bolting on pressure retaining joints within the scope of LR in submerged environments will be performed in conjunction with associated component maintenance activities, or at least once every ten years. These monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation.

The program will perform inspections of pressure-retaining closure bolting in locations that preclude detection of joint leakage, where the piping system contains air or gas for which leakage is difficult to detect. At a minimum, in each 10-year interval during the PEO, inspections shall be completed on a representative sample of at least 20 percent of the population of bolt heads and threads at each unit, up to a maximum of nineteen for each unit, for each material/environment combination. Inspection methods will be capable of detecting leakage for systems containing air or gas. A sample size of nineteen per unit is acceptable as the environments for which the bolts are externally exposed (indoor air, outdoor air, raw water, and soil) are substantially similar between units. Based on the operations of the plant, the location of the plant and its systems, and the plant’s OE, there are no environmental differences between the two units in which the bolting at CPNPP is exposed.

The program will ensure that submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the PEO a representative sample of bolt heads and threads is inspected. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 19 bolt heads and threads per unit over a 10-year period, then it will be stated how integrity of the bolted joint will be demonstrated. For example: (a) periodic pump vibration measurements are taken and trended; or (b) sump pump operator walkdowns are performed demonstrating that the pumps are appropriately maintaining sump levels.

The preventive measures of the Bolting Integrity Program manage loss of preload for buried fire water, SSW, and emergency diesel generator system bolting, which is inspected under the Buried and Underground Piping and Tanks (B.2.3.27) Program.

When pressure retaining bolted joint leakage or other age-related degradation is identified the condition is evaluated and entered into the CAP. The CAP is used to document and manage those components where leakage or age-related degradation is identified during routine observations, including walkdowns and maintenance activities. The program will consider more frequent inspections if identified leak rates are increasing.

NUREG-1801 Consistency

The Bolting Integrity Program, with enhancements, will be consistent with NUREG-1801, Section XI.M18, “Bolting Integrity”.

Exceptions to NUREG-1801

None.

Enhancements

The Bolting Integrity AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.M18. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
2. Preventive Actions 4. Detection of Aging Effects 7. Corrective Actions	Procedures will be enhanced to incorporate the applicable guidance from EPRI NP-5769, NUREG-1339, and EPRI TR-104213.
2. Preventive Actions	Procedures will be enhanced to explicitly prohibit the use of molybdenum disulfide (MoS_2) as a lubricant for use on pressure retaining bolts.

Element Effected	Enhancement
2. Preventive Actions	Procedures will be enhanced to minimize any future use of bolting material with an actual yield strength greater than or equal to 150 ksi in portions of systems within the scope of the Bolting Integrity program. If bolting with an actual yield strength greater than or equal to 150 ksi is used, bolting will be monitored for cracking, with volumetric examinations performed in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1.
3. Parameters Monitored or Inspected	Procedures will be enhanced to opportunistically inspect closure bolting for loss of preload during piping excavations.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	• Procedures performing SSW pump and Safeguards Building sump pump inspections will be enhanced to inspect submerged bolting for signs of leakage, loss of material, cracking, and loss of preload. • Procedures will be enhanced, or a new procedure will be issued to perform inspections of pressure-retaining closure bolting in locations that preclude detection of joint leakage, where the piping system contains air or gas for which leakage is difficult to detect. At a minimum, in each 10-year interval during the PEO, inspections shall be completed on a representative sample of at least 20% of the population of bolt heads and threads at each unit, up to a maximum of nineteen for each unit, for each material/environment combination. Inspection methods will be capable of detecting leakage for systems containing air or gas. • Procedures will be enhanced, or a new procedure will be issued to ensure that submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the PEO a representative sample of bolt heads and threads is inspected. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 19 bolt heads and threads per unit over a 10-year period, then it will be stated how integrity of the bolted joint will be demonstrated. For example: (a) periodic pump vibration measurements are taken and trended; or (b) sump pump operator walkdowns are performed demonstrating that the pumps are appropriately maintaining sump levels.
4. Detection of Aging Effects 5. Monitoring and Trending	Procedures will be enhanced to ensure periodic system walkdowns inspecting closure bolting occur at least once per refueling cycle for the portions of systems that are within the scope of LR.
5. Monitoring and Trending	Procedures will be enhanced to consider more frequent bolting inspections if identified leak rates are increasing.

Operating Experience

The following OE provides objective evidence that the Bolting Integrity Program will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. The review of plant-specific OE did not identify any failure of an intended function of non-Class 1 mechanical components due to closure bolting degradation.

Industry OE

- Degradation of threaded bolting and fasteners in closures for the RCPB has occurred from BAC, SCC, and fatigue loading (NRC IEB 82-02, NRC GL 91-17). SCC has occurred in high strength bolts used for nuclear steam supply system component supports (EPRI NP-5769). The bolting integrity program developed and implemented in accordance with the applicant's docketed responses to NRC communications on bolting events have provided an effective means of ensuring bolting reliability. These programs are documented in EPRI NP-5769 and TR-104213 and represent industry consensus.
- Additional OE is reflected in SLR guidance documents. Element 10 of NUREG-2191 includes the following OE, "SCC of A-286 stainless steel closure bolting has occurred when seal cap enclosures have been installed to mitigate gasket leakage at valve body-to-bonnet joints (NRC IN 2012-15). The enclosures surrounding the bolts filled with hot reactor coolant that had leaked from the joint and mixed with the oxygen-containing atmosphere trapped within the enclosure. The enclosures did not allow for inspections of the bolted joints." CPNPP evaluated IN 2012-15 and concluded that it does not have similar enclosures used for boric acid leak mitigation. Temporary enclosures are common but are rarely extended beyond a refueling outage. CPNPP procedures were revised to require engineering review and approval if enclosures are required in the future.
- In 2007 EPRI released EPRI – 1015337, "Nuclear Maintenance Applications Center: Assembling Gasketed Flange Bolted Joints." The guidance provided in this document was reviewed and incorporated into CPNPP procedures.

Plant-Specific OE

A review of plant-specific OE indicates that the Bolting Integrity AMP is effective in identifying degraded bolted connections and tracking leak rates.

- In December of 2020, while performing operator rounds it was noted that two of the body to bonnet bolts on a demineralized water valve had backed out and needed to be tightened. The bolts were subsequently re-torqued.
- In December of 2016, the Unit 2 train 2-01 emergency diesel generator right bank intercooler lower adapter flange fasteners were loose. The fasteners were tightened, and no air leakage was observed from the flange. New gasket material with a specific compressibility capability was utilized which requires retorque after installation. Corrective action to retorque the bolts

was initiated, and the cause was determined to not be applicable to the other EDGs.

- In April of 2016, a flange between the jacket water heater and keep warm pump was identified leaking jacket water at a rate of approximately 4 drops per minute. The leak was determined to not impact the operability of the system. The leak was caused by a relaxed bolt which was re-torqued, and the leak was stopped.

Per review of CPNPP documentation and operating experience, Molybdenum Disulfide (MoS_2) has not been used on closure bolts within the scope of the CPNPP Bolting Integrity AMP.

The above OE provides objective evidence that the Bolting Integrity AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Bolting Integrity AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Bolting Integrity AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.10. Steam Generators

Program Description

The Steam Generators AMP is an existing preventive, mitigative, condition monitoring, and performance monitoring AMP that manages the aging of SG tubes, plugs, sleeves, divider plate assemblies, head (interior surfaces of channel or lower heads), tubesheets (primary side), tube-to-tubesheet welds, and secondary side components that are contained within the SG (i.e., secondary side internals). The aging of SG pressure vessel welds is managed by other AMPs, such as the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1) AMP, Water Chemistry (B.2.3.2) AMP, and One-Time Inspection (B.2.3.19) AMP.

The establishment of a SG program for ensuring SG tube integrity is required by the CPNPP TSs. Additionally, administrative controls require tube integrity to be maintained to specific performance criteria, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, and leakage monitoring requirements. The NDE techniques used to inspect SG components covered by this AMP are intended to identify components (e.g., tubes, plugs) with degradation that may need to be removed from service, repaired, or replaced, as appropriate.

The Steam Generators AMP is based on the guidelines provided in NEI 97-06, Revision 3, "Steam Generator Program Guidelines." As such, this AMP incorporates the following industry guidelines:

- EPRI 3002007572, "PWR Steam Generator Examination Guidelines";
- EPRI 1022832, "PWR Primary-to-Secondary Leak Guidelines";
- EPRI 3002000505, "Pressurized Water Reactor Primary Water Chemistry Guidelines";
- EPRI 3002010645, "Pressurized Water Reactor Secondary Water Chemistry Guidelines"; and
- EPRI 3002007856, "Steam Generator In-Situ Pressure Test Guidelines".

Through these guidelines, a balance of prevention mitigation, inspection, evaluation, repair, and leakage monitoring measures are incorporated. Specifically, this AMP incorporates the following from NEI 97-06 (Reference ML111310708):

a) Performance criteria are intended to provide assurance that tube integrity is being maintained consistent with the CLB.

b) Guidance for monitoring and maintaining the tubes, which provides assurance that the performance criteria are met at all times between scheduled tube inspections.

Since degradation of divider plate assemblies, channel heads (internal surfaces), tubesheets (primary side), or tube-to-tubesheet welds may have safety implications, the Steam Generators AMP addresses degradation associated with SG tubes, plug, sleeves, divider plates, interior surfaces of channel heads, tubesheets (primary side), tube-to-tubesheet welds, and secondary side components that are contained within the SG (i.e., secondary side internals). This AMP does not include in its scope the SG secondary side shell, any nozzles attached to the secondary side shell or SG head, or the welds associated with these components. In addition, the scope of this AMP does not include SG primary side chamber welds (other than general corrosion of these welds caused as a result of degradation (defects/flaws) in the primary side cladding).

In March 2012, CPNPP submitted an application to amend the CPNPP Unit 2 Steam Generator Program as well as TS 5.5.9 and 5.6.9. This application provided a technical justification to establish a permanent SG tube alternate repair criterion (H*) for tubing flaws located in the lower region of the tubesheet and accompanying inspection and reporting requirements. This application was reviewed and approved by the staff by letter dated October 18, 2012 (Reference 12263A036). This ARC removes the Unit 2 SG tube-to-tubesheet welds from the credited pressure boundary and removes the inspection criteria for the portion of the tube below 14.01 inches from the top of the tubesheet.

The Steam Generators AMP includes preventive and mitigative actions for addressing degradation. This includes foreign material exclusion as a means to inhibit wear degradation and secondary side maintenance/cleaning activities, such as sludge lancing, for removing deposits that may contribute to degradation. Primary side PM activities include monitoring all corrosion susceptible plugs and preventively plugging tubes susceptible to degradation. Additionally, this AMP works in conjunction with the Water Chemistry (B.2.3.2) AMP, which monitors and maintains water chemistry to reduce susceptibility to SCC or IGSCC.

The procedures associated with this AMP provide parameters to be monitored or inspected except for SG divider plates, channel heads, tubesheets, and tube-to-tubesheet welds. For these later components, visual inspections are performed at least every 72 effective full power months or every third refueling outage for Unit 1 and at least every 48 effective full power months or every other refueling outage for Unit 2, whichever results in more frequent inspections, respectively. These inspections of the SG head interior surfaces, including the divider plate, are intended to identify signs that cracking, or loss of material may be occurring (e.g., through identification of rust stains).

The analyses performed by the industry (EPRI 3002002850) are applicable to the CPNPP Unit 2 SGs, which have alloy-600 divider plates. The industry analyses have been determined to be bounding for the CPNPP Unit 2 SGs, therefore a one-time inspection of the Unit 2 SG divider plates and associated welds is not required to manage SCC.

The goal of the inspections associated with this AMP is to ensure that the in-scope components continue to function consistent with the design and CLB of the facility (including regulatory safety margins). These inspections, based on the CPNPP TS, are performance-based, and the actual scope of the inspections and the expansion of sample inspections are justified based on the results of previous inspections. If degradation or evidence of degradation is detected, then more detailed inspections or evaluations are to be performed. The AMP procedures reflect these requirements and outline the inspection program to detect degradation of tubes, plugs, sleeves, and secondary side internals and provide inspection frequencies. The inspections and monitoring are performed by qualified personnel using qualified techniques in accordance with approved licensee procedures. The CPNPP Primary-to-Secondary Leakage Monitoring Program also provides a potential indicator of a loss of SG tube integrity.

Condition monitoring assessments are performed to determine whether the structural and accident-induced leakage performance criteria were satisfied during the prior operating interval. Operational assessments are performed to verify that structural and leakage integrity will be maintained for the planned operating interval before the next inspection. If tube integrity cannot be maintained for the planned operating interval before the next inspection, corrective actions are taken in accordance with the CPNPP CAP. Comparisons of the results of condition monitoring assessment to the predictions of the previous operational assessment are performed to evaluate the adequacy of the previous operational assessment methodology. If the operational assessment was not conservative in terms of the number and/or severity of the condition, corrective actions are taken in accordance with the Steam Generator Integrity Assessment Guidelines. Assessment of tube integrity and plugging or repair criteria of flawed tubes is in accordance with CPNPP TS.

Degraded plugs, sleeves, divider plate assemblies, channel heads (interior surfaces), tubesheets (primary side), tube-to-tubesheet welds (Unit 1 only), and secondary side internals are evaluated for continued acceptability on a case-by-case basis. The intent of all evaluations is to ensure that the components will continue to perform their functions consistent with the design and licensing basis of the facility and will not affect the integrity of other components (e.g., by generating loose parts). In addition, when degradation of SG tubes is identified, the TS specified actions are followed. For degradation of other components, the appropriate corrective action is evaluated per NEI 97-06 and the associated EPRI guidelines, the ASME Code Section XI, 10 CFR 50.65, and 10 CFR Part 50, Appendix B, as appropriate.

Procedures implement the performance criteria for tube integrity, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, leakage monitoring requirements, and operational leakage and accident-induced leakage requirements from the TS.

Steam generator tubes not meeting the TS limits for continued operation are removed from service by installation of tube plugs. This plug installation redefines the RCPB, and loss of SG tube plug integrity can impact the ability of the SGs to perform their intended function if permitted to continue without corrective action. Newly installed tube plugs are fabricated from an Inconel Alloy 690 material, which have a high resistance to PWSCC. Installed plugged are routinely inspected and 100 percent of all installed Alloy 600 tube plugs are examined during each primary side inspection.

Aging is managed through assessment of potential degradation mechanisms, inspections, tube integrity assessments, plugging and repairs, primary-to-secondary leakage monitoring, maintenance of secondary side component integrity, primary side and secondary side water chemistry, and foreign material exclusion.

Volumetric inspections are performed to identify degradations of SG tubes, such as PWSCC, ODSCC, and loss of material due to foreign objects and tube support structures. Visual inspections are performed on other primary side and secondary side components. The visual inspections of the primary components listed above are performed in accordance with the Degradation Assessment (DA) that is prepared as each SG is scheduled for examination.

The Steam Generators AMP includes a DA in accordance with the requirements defined in the EPRI Steam Generator Integrity Assessment Guidelines; a DA is performed to determine the type and location of flaws to which a component may be susceptible, and implementation of inspection methods capable of detecting those forms of degradation are addressed. The DA includes a review of applicable industry OE, as well as plant-specific OE which has occurred since the previous DA was performed.

A condition monitoring assessment is performed at the conclusion of each inspection to determine whether inspection criteria is met. A forward-looking evaluation, an operational assessment is used to predict that the structural integrity and accident leakage performance will be acceptable during the operating interval until the next inservice inspection.

NUREG-1801 Consistency

The Steam Generators AMP will be consistent, with three exceptions, with the program described in NUREG-1801, Section XI.M19, “Steam Generators”, as modified by LR-ISG-2016-01.

Exceptions to NUREG-1801

<u>Exception to Element 1, Scope of Program.</u>

The tube-to-tubesheet welds of the CPNPP Unit 2 SGs are exempt from inspection and monitoring per NRC approval of a permanent Alternate Repair Criteria (H*) for SG tubes (Reference ML12263A036).

<u>Exception to Element 3, Parameters Monitored or Inspected.</u>

EPRI 3002018267 is used in place of EPRI 1022832 in order to capture the latest industry OE, research, and interim guidance regarding SG primary-to-secondary leakage.

<u>Exception to Element 6, Acceptance Criteria.</u>

EPRI 3002007856 is used in place of EPRI 1025132 in order to capture the latest industry OE, research, and interim guidance regarding SG in-situ pressure testing.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Steam Generators AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- For the domestic fleet of A690TT tubing SGs, the low percentage of tubes plugged to date have been a result of loose part or tube support structure wear, rather than any corrosion induced degradation mechanism. These degradation mechanisms have been identified on eight Unit 1 SG tubes at CPNPP, as of the most recent Unit 1 SG primary side inspections conducted during the Fall 2017 outage and are closely monitored for wear progression during each SG primary side inspection.

- Industry OE released suggests that degradation in the cladding and/or divider plate-to-channel head weld or tubesheet-to-channel head weld, resulting in exposure and corrosion of the channel head base material is a potential degradation mechanism for SGs with A600TT components. CPNPP incorporated channel head interior and tubesheet (primary side) visual inspections, carried out by video inspections, during the 2013 refueling outage for Unit 1 and during the 2014 refueling outage for Unit 2, and has continued these inspections in all subsequent outages in which primary-side SG components have been inspected. A discoloration in the channel head cladding in the cold leg of CPNPP SG 2-01 was identified in 2014, caused by a flaw in the cladding, located near the joint between the channel head shell and the tubesheet and near a peripheral tube. This flaw was evaluated by Westinghouse and deemed acceptable for continued operation, with a similar indication found on SG 2-02 in 2017 bounded under the same evaluation.

- Industry OE also suggests that ODSCC is another potential degradation mechanism for A600TT SG tubing, specifically in the freespan regions and at dings in SG tubes. CPNPP currently tracks axial ODSCC at tube support plates, at the top of the hot leg tubesheet, in the freespan regions, and at dings in SG tubes as potential degradation mechanisms for Unit 2 SGs. Additionally, one tube was plugged in the CPNPP Unit 2 SGs during the Fall 2021 outage as a result of cracking in the freespan region. The aging mechanism was changed from potential to existing in the Unit 2 SG DA and inspection for this mechanism is required in the Spring 2023 outage.

- Identification of significant AVB and tube-to-tube wear in replacement CE SGs at San Onofre Nuclear Generating Station (SONGS) in 2012 stands as an industry anomaly for units operating with A690TT SG tubing. The tube wear discovered in the Unit 2 and 3 SGs at SONGS was identified after the first operating cycle for the replacement SGs and was determined to have been caused by in-plane fluid elastic instability, which involves a combination of localized high steam/water velocity, high steam void fraction, and insufficient tube-to-AVB contact forces to overcome excitation forces. A CR was issued to address the potential implications of the tube wear discovered at SONGS for the replacement Unit 1 SGs at CPNPP. Since the Unit 1 SGs at CPNPP have already operated for multiple fuel cycles without similar degradation to that discovered at SONGS, tube wear caused by in-plane fluid elastic vibration is considered a non-relevant degradation mechanism for the Unit 1 SGs. The design of the CE SGs at SONGS is also significantly different than that of the Unit 1 Westinghouse SGs at CPNPP; hence, a similar type of tube degradation is not expected in the CPNPP SGs.

- During an inspection in 2009 of the Surry Unit 1 SGs, one indication of axial PWSCC was found at the hot-leg expansion transition (top-of-tubesheet) was identified in SG "A," which is constructed with A600TT tubing. An in-situ pressure test was performed, and the tube was removed from service after stabilization. In 2017, CPNPP identified circumferential PWSCC indications in three separate tubes in SG 2-03 at or below the top of the tubesheet, which was identified as a new degradation mechanism for the Unit 2 SGs. This indication prompted an expansion of the inspection criteria to 100 percent +POINT probe inspection of hot-leg top-of-tubesheet from +3.00/-15.00 inches in SG 2-03, 100 percent +POINT probe inspection of all known BLG/OXP locations in SGs 2-01, 2-02, and 2-04, and +POINT probe inspection of hot-leg top-of-tubesheet from +3.00/-15.00 inches for all tubes which had not been tested in either the Spring 2014 or Spring 2017 outages for Unit 2. This was issued to achieve 100 percent coverage of +POINT probe inspection on the hot-leg top-of-tubesheet in the last three sequential outages for SGs 2-01, 2-02, and 2-04. Although one circumferential PWSCC indication was in a high residual stress tube, the expansion was not limited to the high residual stress tube population; however, no additional expansion was required because the CPNPP base inspection scope includes appropriate +POINT probe inspection of the susceptible regions in all high residual stress tubes. No additional Unit 2 PWSCC indications have been discovered to date.

<u>Plant-Specific OE</u>

- Unit 1
    - In the Spring of 2013, one tube was stabilized and plugged in SG 1-04 during the Unit 1 outage as a preventive measure, because it was located adjacent to a loose part that could not be retrieved. Another tube in SG 1-03 was plugged in the factory due to a manufacturing defect. These two plugged tubes account for 0.01 percent of the total tubes in the Unit 1 SG population. As of Fall 2017, no further tubes have been plugged and no corrosion-induced anomalies have been detected.
    - As of the Spring 2022 outage for Unit 1, AVB tube wear remains only a potential degradation mechanism for Unit 1 SGs, as no AVB wear indications have been detected to date; however, the Westinghouse Delta style SGs have been observed to slowly produce AVB tube

wear indications over SG life, therefore it is monitored as a potential degradation mechanism. Tube wear at tube support plates was discovered on seven tubes in Fall 2017, including one identified in Spring 2013, of which six exhibited normal wear conditions well below the through-wall wear threshold. The seventh wear indication was caused by a small burr on the edge of the tube support plate. None of these wear indications exceeded 18 percent through-wall using +POINT, and tubes affected were found in all four Unit 1 SGs (1 in SG 1-01, 1 in SG 1-02, 4 in SG 1-03, and 1 in SG 1-04). Foreign object wear was also found in one tube during Fall 2017, worn 18 percent through-wall; however, foreign object search and retrieval inspection identified no foreign objects potentially detrimental to tube integrity at the time. Continued observation of this mechanism is dependent on material ingress; therefore, the mechanism is considered potential and will continue to be monitored. Additionally, 36 new tube support plate indications were called during the Spring 2022 outage, all with acceptable SG tube through-wall percentages. As of Spring 2022, wear at tube support plates remains the only existing degradation mechanism for the Unit 1 SGs.

- The most recent Unit 1 SG channel head inspections occurred during Spring 2022, with no anomalies or degradation identified in the cladding or welds. Based on OE from another plant, a general scan of the tube-to-tubesheet weld region and the z-seam (tubesheet-to-channel head) weld areas was conducted at the same time. At several locations, reddish surface deposits were observed at an elevation consistent with the nozzle drain plug elevation and just below the z-seam weld. These deposits were determined to be artifacts of reactor coolant water levels during various hold points as the RCS was drained down to mid-loop. No visible degradation of the cladding is evident at these locations.

- Unit 2

  - During SG primary-side inspections for Unit 2, Spring 2017 (Reference ML17313A447), a total of three tubes were plugged and stabilized in SG 2-03 due to the indication of PWSCC, which was the first indication of this degradation mechanism for the Unit 2 SG tubes. No tubes were plugged in the follow-up Unit 2 SG inspection, conducted during Fall 2018 (Reference ML19171A190), and 6 tubes were plugged during the next primary side inspection, which was deferred to Fall 2021. These 6 tubes were plugged as a result of previously identified degradation mechanisms; no further indication of PWSCC was identified in either the Fall 2018 or Fall 2021 outages. The cumulative number of tubes plugged across all Unit 2 SGs is 102, 24 in SG 2-01, 35 in SG 2-02, 24 in SG 2-03, and 19 in SG 2-04, which account for 0.56 percent of the total number of tubes, which is well below the tube plugging threshold.

  - As of the Spring 2017 outage, in which tube wear from AVBs, tube support plates, and loose parts was inspected in the Unit 2 SGs, AVB wear indications did not exceed 39 percent through-wall, which remains below the condition monitoring limit. The total number of tubes identified with AVB wear is 331 across all four Unit 2 SGs, of which 4 tubes in SG 2-01 and 5 tubes in SG 2-03 were new indications in Spring 2017. Tube wear at preheater baffle plates in the Unit 2 SGs has been detected in small quantities, with the deepest indication well below the through-wall repair limit. The first quatrefoil tube support plate wear was also detected in Spring 2017 at 16 percent through-wall, which is below the repair limit. Four indications of tube support plate wear have been detected across all four Unit 2 SGs. Several loose parts wear indications were also found during Spring 2017, many of which were existing wear indications due to loose parts that were previously removed. The maximum depth identified from this degradation remains below the condition monitoring limit. A total of 11 tubes across all four Unit 2 SGs were identified with loose parts wear during Spring 2017. All tubes with any of the three degradation mechanisms above were determined to uphold burst and leakage integrity under normal and accident conditions. Additionally, 3 tubes were preventatively plugged during the Fall 2021 outage due to wear from a foreign object which could not be removed; however, it was determined that continued wear of the plugged tubes would not lead to damage of neighboring tubes, due to the proximity of AVB straps.

- In Spring 2017, wear was discovered on a tube in SG 2-04 due to a possible loose part during the cold leg eddy current inspection. The surrounding tubes were bounded (via eddy current testing) and evaluated. The additional tubes did not indicate signs of wear; however, additional inspection/removal could not be performed on the possible loose part, because the location could not be reached from the secondary side. It was determined by Westinghouse that this tube wear would not adversely affect the SG for at least one operating cycle. As a result, the affected tubes were inspected again in Fall 2018, in which wear indications measured lower than the operational assessment flaw projection. This demonstrates that CPNPP flaw projection methodology is valid and conservative.
- In July 2014, the presence of whole bead resin in all four SG sludge samples was found for Unit 1 following the Spring 2013 outage, despite normal sulfate levels which indicate no resin intrusion or resin degradation mechanism in progress. The resin was determined to have been trapped in the strainer bypass line of the Steam Generator Blowdown system, which is normally closed, and later introduced into the SGs during a back flush of the sluice pump. As a corrective action, CPNPP utilized a new system flush and resin transfer process, benchmarked at Fermi, who performs this transfer process more frequently than CPNPP, which includes flushing the system using demineralized water as opposed to using the sluice pump as a fluid driver. This new process also flushes the strainer bypass line, ensuring resin buildup will not enter the SG secondary side.
- In January 2012, two CRs were issued following an INPO Steam Generator Review visit in November 2011. These reports addressed INPO recommendations to (1) increase SG eddy current inspection scope for the

detection of loose parts, specifically to fully include expanded tubes in the preheater baffle plate, peripheral regions of the hot leg top of the tubesheet, and a sample of top of the tubesheet cold leg tubes and (2) evaluate tubes undergoing four cycles of service between inspections for AVB wear initiation; include PWSCC at expansion transitions as a potential degradation mechanism in the DA; cover tube stabilization in the operational assessment; validate that axial ODSCC at tube support plates has been addressed properly; add Unit 1 SG tubing benign pilgering marks to analysis guidelines for future reference; and improve the involvement of NDE Level III before and after inspections. These recommendations were implemented starting with SG inspections in the Spring 2013 outage for the Unit 1 SGs and the Spring 2014 outage for Unit 2 SGs, both of which involved an increase in NDE Level III personnel participation and enhanced degradation, condition monitoring, and operational assessments.

The above OE provides objective evidence that the Steam Generators AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Steam Generators AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Steam Generators AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.11. Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water System AMP is an existing preventive, mitigative, condition monitoring, and performance monitoring AMP that manages heat exchangers, piping, and piping components in nuclear safety related and NNS raw water systems that are exposed to a raw water environment for loss of material, flow blockage, and reduction of heat transfer. The Open-Cycle Cooling Water System AMP manages components constructed of various materials including steel, stainless steel, copper alloy, and nickel alloy. The activities for this program are consistent with the site commitments to the requirements of NRC GL 89-13 and provide for management of aging effects in raw water cooling systems through tests, inspections, and component cleaning. System and component testing, visual inspections, non-destructive examination (i.e., ultrasonic testing and eddy current testing), and biocide and chemical treatment are conducted to ensure that identified aging effects are managed such that system and component intended functions are maintained.

The guidelines of GL 89-13 are utilized for the surveillance and control of biofouling for the Open-Cycle Cooling Water System AMP. Procedures provide instructions and controls for chemical and biocide injection.

Periodic heat transfer testing, visual inspection, and cleaning of nuclear safety related heat exchangers that transfer heat away from nuclear safety related components to the ultimate heat sink are performed in accordance with the site commitments to GL 89-13 to verify heat transfer capabilities. Specifically, the CCW heat exchangers are tested in accordance with "Heat Exchanger Performance Monitoring Guidelines for Service Water Systems" (EPRI Report NP-7552, December 1991). The centrifugal charging pump lube oil coolers, the containment spray pump bearing coolers, and the SI lube oil coolers are not tested and instead temperatures are recorded during surveillance runs of associated pumps. The diesel generator jacket water heat exchangers do not undergo thermal performance testing due to limitations of the ability to measure performance data on this heat exchanger component type due to jacket water temperature stratification and mixing at the outlet end. The diesel generator intercooler water temperature is instead monitored. Trends are analyzed periodically. For heat exchangers that are not heat transfer tested, inspections and cleanings are performed on a periodic basis. SSW flowrates to these components are also monitored on a periodic basis to verify that the flow rates meet design requirements. Strainers in the SSW are periodically cleaned out and mitigate effects of micro- and macro-biological fouling on the systems components. Periodic flushing is performed on stagnant pipe segments that were evaluated and determined to require periodic flushing. SSW piping is inspected every refueling outage per the Corrosion Monitoring Program.

Routine inspections and maintenance ensure that corrosion, erosion, sediment deposition (silting), and bio-fouling do not degrade the performance of nuclear safety related systems serviced by the Open-Cycle Cooling Water System AMP. Coatings and linings will be managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System AMP, with enhancements, will be consistent with NUREG-1801, Section XI.M20, "Open-Cycle Cooling Water System", as modified by LR-ISG-2013-01 and LR-ISG-2012-02.

Exceptions to NUREG-1801

None.

Enhancements

The Open-Cycle Cooling Water System AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.M20. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
5. Monitoring and Trending	Implementing documents will be enhanced to ensure that if corrosion buildup or fouling is noted, the system also is evaluated for their impact on the heat transfer capability of the system.
5. Monitoring and Trending	Implementing documents will be enhanced to ensure that evidence of corrosion in these systems is evaluated for its potential impact on the integrity of the piping. For relevant indications, inspections or nondestructive testing is used to determine the extent of biofouling, the condition of the surface coating, the magnitude of localized pitting, and the amount of MIC, if applicable.
7. Corrective Actions	Implementing documents will be enhanced to ensure evaluations are performed for test or inspection results that do not satisfy established acceptance criteria, and a CR is initiated to document the concern in accordance with plant administrative procedures.

Operating Experience

The following OE provides objective evidence that the Open-Cycle Cooling Water System AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

INPO Significant OE Report (SOER) 07-02 "Intake Cooling Water Blockage" identifies OE relating to intake cooling water blockage events that adversely affect nuclear safety related systems and plant reliability. The SOER recommended that utilities perform an aggregate assessment of plant-specific intake blockage scenarios and include a review of the environmental changes that have occurred since original station construction; improve monitoring and prediction methodologies to anticipate intake cooling water blockage; review the adequacy of intake structure, component and associated system design features based on station and industry OE; implement maintenance strategies to ensure reliability of intake cooling water systems; and upgrade operations procedures and training to prevent or mitigate intake cooling water blockage events.

CPNPP evaluated the SOER and took actions, accordingly, including creating PM items in accordance with recommendations from this SOER.

INPO SOER 84-1, “Cooling Water System Degradation Due to Aquatic Life” discusses OE from other plants in the industry regarding biofouling. The significance of this OE is that fouling in SSWs can result in common-cause failure of redundant nuclear safety related components. Biofouling problems can also result in reduced plant capacity and availability.

CPNPP evaluated this SOER and revised site procedures and documents to enhance them in accordance with this SOER.

The following additional OE is described in Section XI.M20, Element 10 of NUREG-2191 GALL-SLR:

- LER 247/2001-006, LER 306/2004-001, LER 483/2005-002, LER 331/2006-003, LER 255/2007-002, LER 454/2007-002, LER 254/2011-001, LER 255/2013-001, And LER 286/2014-002: Loss of material due to corrosion, including MIC and erosion.
    - A review of CPNPP OE found instances of loss of material due to corrosion, including MIC and erosion. CPNPP procedures and guidelines, along with this AMP will continue to manage these aging effects identified and discussed in the LERs listed above.
- LER 286/2002-001 and LER 286/2011-003: protective coatings have failed, leading to unanticipated corrosion.
    - A review of CPNPP OE revealed instances of failed protective coatings and unanticipated corrosion. Coatings and linings will be managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP.
- LER 413/1999-010, LER 305/2000-007, LER 266/2002-003, LER 413/2003-004, LER 263/2007-004, LER 321/2010-002, LER 457/2011-001, LER 457/2011-002, LER 397/2013-002, in 2008-11, and IN 2006-17: Reduction of heat transfer and flow blockage due to fouling has occurred in piping and in heat exchangers from protective coating failures, and accumulations of silt and sediment.
    - A review of CPNPP OE revealed instances of reduction of heat transfer and flow blockage due to fouling in SSW components, including heat exchangers. Coatings and linings will be managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) AMP.

- LER 305/2002-002: Cracking due to SCC has occurred in brass tubing.
    - Brass components have not been identified in scope of the SSW
- LER 247/2013-004: Pitting in stainless steel has occurred.
    - A review of CPNPP OE has revealed possible pitting in stainless steel components in the SSW. Site procedures and guidelines, along with this AMP will continue to manage this aging effect.

CPNPP's response to IER L3 14-53 is documented in a CR. IER L3 14-53 discusses leaks caused by crevice corrosion as a result of stagnant flow in unlined carbon steel piping. After the site reviewed this piece of significant OE, the site reviewed the set of plant-specific OE for ten (10) years prior for evidence of thru-wall pipe leaks in class 3 SSW piping. No leaks were identified during that time period. CPNPP installed 316 stainless steel creviced coupons in the stagnant SSW areas to be able to monitor this aging effect periodically. CPNPP also reviewed SSW lines to determine lines needing periodic flushing to mitigate this aging effect. The site created PMs and generated procedures for performing the flushes.

<u>Plant-Specific OE</u>

- The Service Water System Health reports indicate no major issues related to aging of in-scope components. Some corrosion issues have been identified, which is not unexpected for an open-cycle system. Recurring internal corrosion has not been identified for components within the scope of the Open-Cycle Cooling Water AMP.
- In January 2018, debris consisting of concrete pieces, rocks and shells was found in the SSW inlet channel of a Unit 1 CCW heat exchanger. The heat exchanger was inoperable for cleaning and prior to the shutdown of the heat exchanger, no indications of tube leakage or heat exchanger fouling were observed. The issue was limited to the SSW Train A. The issue did not inhibit the ability of the SSW to perform its design function for all trains on both units. Previous SSW visual inspections of the tube side of the heat exchanger showed evidence of rocks in the heat exchanger since October 2011. Component inspections were performed satisfactorily after the debris was removed.
- In April 2017, UT thickness measurements of a SSW piping segment identified a thickness of 0.172 inches. The pipe segment was schedule 40 with a nominal value of 0.216 inches and an 87.55 percent of nominal equal to 0.189 inches. Since the found thickness was less than 0.189 inches, the CR was written. The condition was reviewed by a qualified civil engineer and determined that it would have no effect on operability. The pipe only supported itself and water for a length of 1 foot and 4 inches and the stresses were conservatively considered to be less than 10 percent, resulting in a minimum thickness of less than 1 millimeter. The piping was a class 5 drain tail-piece downstream of a normally closed valve and located just above the floor such that in the event it broke off, it could not impact other equipment. The tailpiece piping and associated flange was subsequently replaced.

- In October 2012, a layer of organic material was found on SSW piping and on the auxiliary feedwater side of a pump suction valve. The same condition had been found before in two previous inspections. The affected components were cleaned and the organic material inside of the piping was also evaluated. As a result of this inspection, the procedure for system cleanness control and cleaning was revised to clarify cleanliness requirements of the SSW to auxiliary feedwater cross-connect piping.

The above OE provides objective evidence that the Open-Cycle Cooling Water System AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Open-Cycle Cooling Water System AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Open-Cycle Cooling Water System AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.12. Closed Treated Water Systems

Program Description

The Closed Treated Water Systems AMP is an existing mitigative and condition monitoring AMP that manages aging of the internal surfaces of heat exchangers, piping, piping components, piping elements, pump and turbocharger casings, tanks, and valve bodies exposed to a closed treated water environment during the PEO. The Closed Treated Water Systems AMP manages the aging effects of loss of material due to corrosion, cracking due to corrosion and SCC, and reduction in heat transfer due to fouling. The program scope includes managing aging of the CCW, DGJW, CHS, TPCW, and CHN Systems.

The Closed Treated Water Systems AMP is a mitigation program that also includes condition monitoring to verify the effectiveness of the mitigation activities. The AMP includes: (a) water treatment, including the use of corrosion inhibitors (which also act as a biocide), to modify the chemical composition of the water such that the effects of corrosion and microbiological activity are minimized; (b) chemical testing of the water so that the water treatment program maintains the water chemistry within acceptable guidelines; and (c) inspections to determine the presence or extent of corrosion and/or cracking. Hydrazine-based corrosion inhibitors are used for the CCW system and nitrite-based inhibitors are used for the DGJW, CHS, TPCW, and CHN systems.

To prevent loss of material and cracking due to corrosion and SCC, the Closed Treated Water Systems AMP periodically monitors the closed cooling system chemistry to verify it is being maintained within specified limits. The parameters monitored are in accordance with EPRI Closed Cooling Water Chemistry Guidelines and manufacturer recommendations where applicable.

When water chemistry concentrations are not within normal operating ranges, monitoring frequency is increased, as appropriate, and water chemistry parameters are returned to the normal operating range within the prescribed timeframe for each action level, or a CR is initiated to evaluate and correct the water chemistry. The water sampling procedures provide corrective steps to take if water chemistry is outside of the recommended ranges. Additionally, the water chemistry parameters are trended in a database.

In addition to monitoring and maintaining the water chemistry parameters of the closed treated water systems, the Closed Treated Water Systems AMP includes condition monitoring activities, which provide for opportunistic and periodic inspections and NDEs on a representative sample of piping and components that is selected based on likelihood of corrosion or cracking. Opportunistic inspections will be performed whenever the system boundary is opened, and periodic inspections will be performed at a 10-year frequency.

NUREG-1801 Consistency

The Closed Treated Water Systems AMP, with enhancements, will be consistent with one exception to the program described in NUREG-1801, Section XI.M21A, “Closed Treated Water Systems”, as amended by LR-ISG-2012-02.

Exceptions to NUREG-1801

Exception to Element 3, Parameters Monitored and Inspected

NUREG-1801 recommends that specific water chemistry parameters monitored and the acceptable ranges of values for these parameters are in accordance with EPRI Report 1007820, “Closed Cooling Water Chemistry Guidelines”. An exception is taken for the Closed Treated Water Systems AMP as water testing is performed in accordance with EPRI 3002000590, “Closed Cooling Water Chemistry Guidelines,” Revision 2.

Justification for Exception

There are two differences between EPRI Reports 1007820, Revision 1 (April 2004) and 3002000590, Revision 2 (December 2013). The first difference is for a chromate-based program. EPRI Report 3002000590 allows for a higher chromate concentration upper limit. Justification is provided in 3002000590 that allows the high value but recommends routine inspection of carbon pump seals, if applicable, by plants with chromate concentrations in excess of 500 ppm to assure no abnormal wear is occurring. Presently, Closed Treated Water System AMP does not utilize a chromate-based treatment program and if one is utilized in the future, the guidance of 3002000590 will be followed.

The second difference, also for chromate control programs, is a lower limit for pH. EPRI Report 3002000590 allows for a lower limit of 7.5 while EPRI Report 1007820 controls to 8.0. However, CPNPP procedures maintain pH at 8.5 or higher. Therefore, the difference between EPRI Reports is acceptable. Approved precedents for use of the more recent version of the above guideline are documented in the NRC’s SERs for Turkey Point and Peach Bottom (Reference 19191A057 and ML19280D820, respectively).

Enhancements

The Closed Treated Water Systems AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.M21A, as amended by LR-ISG-2012-02. The changes and enhancements are to be implemented no later than six months prior to entering the PEO.

Element Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	• Update implementing documents or create new documents to include visual inspection of surfaces exposed to the closed treated water (closed-cycle cooling water) environment for evidence of loss of material, cracking, or fouling whenever the system boundary is opened. At a minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 components) of piping and components will be inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The representative sample will be selected based on likelihood of corrosion or cracking. Inspections will be conducted in accordance with applicable ASME code requirements.

Element Affected	Enhancement
	If there are no ASME code requirements, inspections will be conducted in accordance with the EPRI Closed Cooling Water Chemistry Guideline. Guidance will be included to report and evaluate any detectable loss of material, cracking, or fouling associated with the surfaces exposed to the closed treated water (closed cooling water) environment per the CPNPP CAP. Components will meet system design requirements, such as minimum wall thickness. If visual examination identifies adverse conditions, additional examinations, including ultrasonic testing, are conducted. Inspection results will be trended so that the progression of any corrosion or cracking can be evaluated and predicted. • Based on OE, loss of material due to recurring internal corrosion (RIC) has been identified as an aging effect in the TPCW system at weld locations. Implementing documents will be updated or new documents created to perform volumetric inspection of welds located within in-scope carbon steel TPCW piping (located within the Control Building and Auxiliary Building) to address RIC. At a minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 welds) of in scope TPCW welds will be inspected using techniques capable of detecting loss of material. Inspection results which indicate a reduction in wall thickness greater than 50 percent or below minimum wall thickness values will be entered into the corrective action program for evaluation.

Operating Experience

The following OE provides objective evidence that the Closed Treated Water Systems AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

The list below provides aging mechanisms and industry OE relevant to the Closed Treated Water Systems AMP, as mentioned in NUREG-1801, Section XI.M21A:

- NRC LER 50-327/93-029-00: Degradation of closed-cycle cooling water (CCCW) systems due to corrosion product buildup
- NRC LER 50-280/91-019-00: Degradation of CCCW systems due to through-wall cracks in supply lines

CPNPP Units 1 and 2 were granted their original operating licenses in 1990 and 1993, respectively. Therefore, the plant had insufficient operating time to be affected by the issues identified in these LERs at that time. Later industry guidance, addressing these types of concerns, have been incorporated into station procedures.

The following additional industry OE is described in NUREG-2191, Section XI.M21A:

- LER 263/2014-001: SCC of stainless steel reactor recirculation pump seal heat exchanger coils (attributed to localized boiling of the CCCW system which concentrated water impurities on coil surfaces)

This issue involves reactor recirculation pumps, which are components of BWRs. Both units at CPNPP are pressurized water reactors, and do not have reactor recirculation pumps.

<u>Plant-Specific OE</u>

- Tube wall thinning was identified in the Unit 2 TPCW heat exchanger caused by localized corrosion on the interior surface of the tubes. This corrosion has caused an increasing number of tubes to be plugged. In 2020, 25 percent of the tubes were replaced, reducing the number of plugged tubes from 289 to 240. An analysis determined that up to 1,066 tubes may be plugged without causing the TPCW water to increase above its design limit. Based on the most recent inspection status, the worst-case projection predicts that it is possible to exceed 1,066 plugged tubes in October 2024. Corrective actions are being tracked under the Heat Exchanger Program.

- In November 2019, hydrazine was found in a sample taken from the catalytic recombiner phase separator. The presence of hydrazine in this sample indicated a tube leak from CCW into the cooler condenser. An evaluation determined that approximately one gallon of water leaked over the course of 24 hours, which was calculated to equal 0.042 gpm. The allowable leakage limit for Unit 2 CCW is 10 gpm, and the leak list identified three leaks of approximately 0.002 gpm. The combined leakage rate remained well below the allowable leakage limit and the ability of the CCW to perform during normal or accident conditions was not challenged.

- In September 2018, the Unit 1 CCW filter demineralizer skid resin appeared to be exhausted and needed to be changed out. An increasing trend in system pH was observed, which was an indication of excess ammonia in the system, which in turn was attributed to maintaining hydrazine concentration high in the band. The resin was subsequently replaced prior to reaching specification limits.

- In August 2018, an increasing trend in the Unit 2 CCW bulk water chloride concentration was observed. The trend was attributed to CCW demineralizer resin exhaustion. The normal chloride concentration is < 1 ppb, and the sample result was 8 ppb (which was well within the specification limit of less than or equal to 150 ppb). The resin was subsequently replaced prior to reaching specification limits.

- OE reviews have identified through-wall leaks in the TPCW system located at welds on carbon steel piping. A 2013 evaluation of these through-wall leaks in carbon steel TPCW welds identifies that the associated portion of the TPCW system was constructed with undersized welds. When TPCW through-wall weld leaks are identified, the defective weld is repaired or replaced. This degradation in the TPCW system, limited to carbon steel weld locations, qualifies as RIC based on the guidance in LR-ISG-2012-02. An enhancement for the Closed Treated Water Systems AMP includes inspection of a representative sample of in-scope TPCW system carbon steel welds every 10 years during the PEO.

- In March 2014, the Unit 1 CCW fluoride and chloride concentrations exceeded the administrative limits but remained well below the specification limits. The Unit 1 CCW ion exchange resin was changed out and samples collected at a later date confirmed that the chloride and fluoride levels returned to below the optimized administrative limits.

- In August 2013, a decreasing trend in nitrite concentration and pH were observed in Train A of the Unit 1 Safety Chilled Water System. In addition, an increasing trend in Free RLU (a measure of bacteria in the bulk water) was observed. Evaluation determined that the trends were attributable to bacteria in the water. The nitrite concentration never dropped below the lower specification limit. Biocide (nitrite) was added to mitigate the bacteria.

- In February 2013, a CHN subsystem was being diluted, requiring additional treatment with nitrite corrosion inhibitor to maintain nitrite levels above the low limit. Three nitrite additions had been required since January 2013. The system engineer worked together with shift operations to identify the leak causing the system to continue to be diluted. Water was flowing from an open drain valve on one of the primary plant cooling coil assemblies. The valve was closed, which stopped the leak. Chemistry control remained constant since the drain valve was closed.

- In January 2013, a CHN subsystem was out of specification for nitrite (<500 ppm). The out-of-spec reading was confirmed with a second sample. The Chemistry Supervisor was notified, and nitrite corrosion inhibitor was added. A subsequent sample confirmed that the system returned to within limits (>500 PPM) in a timely manner.

The above OE provides objective evidence that the Closed Treated Water Systems AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Closed Treated Water Systems AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Closed Treated Water Systems AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.13. Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Program Description

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP is an existing condition monitoring AMP that evaluates the effectiveness of maintenance monitoring activities for cranes and hoists that are within the scope of LR. The program consists of periodic and on-demand visual inspections for loss of material due to general corrosion on the bridge rails, bridge, and trolley structural components for those cranes that are within the scope of 10 CFR 54.4, and the effects of wear on rails. The program also manages loss of preload of associated bolted connections.

The extent of cranes, hoists, monorails, and rigging beams within the scope of LR includes those previously evaluated as part of CPNPP's compliance with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," as well as other equipment handling systems operating over nuclear safety related equipment. Fuel and equipment handing systems that handle 'light' loads over fuel and nuclear safety related equipment are also managed by this program.

The AMP is implemented through station procedures that are based on the ASME B30 series standards and rely upon visual inspections to manage loss of material due to corrosion and wear. Structural bolting is monitored for loss of preload by inspecting for loose or missing bolts, or nuts. Inspection frequencies are consistent with the recommendations within the ASME B30 series of standards. For handling systems that are infrequently in service, periodic inspections may be deferred until just prior to use. The inspection methods are effective in detecting loss of material due to corrosion and wear and evidence of loss of preload, and the inspection frequencies are adequate to prevent significant age-related degradation from occurring.

The program will be enhanced to ensure implementing documents for periodic inspections specifically inspect components for loss of material due to corrosion and wear.

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, with enhancements, will be consistent with NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems".

Exceptions to NUREG-1801

None.

Enhancements

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP will be enhanced as follows, for alignment with

NUREG-1801, Section XI.M23. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
3. Parameters Monitored or Inspected 6. Acceptance Criteria	Procedures will be enhanced to specifically inspect for visual indications of loss of material due to corrosion and wear. Any visual indication of loss of material due to corrosion or wear and any visual signs of loss of bolting pre-load will be evaluated according to ASME/ANSI B30.2 or ASME B30.16.

Operating Experience

Industry OE

There has been no history of corrosion-related degradation that threatened the ability of a crane to perform its intended function. Likewise, because cranes have not been operated beyond their design lifetime, there have been no significant fatigue-related structural failures. OE indicates that loss of bolt preload has occurred, but not to the extent that it has threatened the ability of a crane structure to perform its intended function.

Plant-Specific OE

- Recent health reports for the Cranes, Hoists & Elevator System indicates the cranes are in good condition. Some material condition concerns with the turbine building gantry cranes were noted, which are not within the scope of LR. The system health concerns involve the XSAM system on the Fuel Building Overhead Crane, and the Unit 2 Polar Crane remote, which are instrumentation and control related. The XSAM system is scheduled to be replaced after refueling outage 1RF22.

- In January of 2017, the Fuel Building Overhead Crane 5-ton block sheaves were identified as showing wear. On one sheave, the wire rope was beginning to leave an impression in the metal. The wire rope and 5-ton block were subsequently replaced.

- In December 2017, during hoisting operations of an RHR motor, one set of bearings on the permanently installed 5-ton RHR Pump hoist failed. The hoist from the Unit 1 RHR Pump was removed and transferred to the Unit 2 RHR Pump. A new hoist was ordered and will be installed prior to necessary lifting operations.

- In November of 2018, during the inspection of the Refueling Machine crane hoist the as-found condition of the load brake assembly was unsatisfactory with unexpected wear. A new load brake assembly needed to be obtained from the OEM and installed. The Unit 1 hoist was reworked in 1998 and the upgraded load brake assembly was installed at that time. The upgraded load brake assembly requires Automatic Transmission Fluid (ATF) for lubrication, and the lubrication removed during the inspection was not ATF, so this could have contributed to the wear. The load brake was replaced as part of a hoist rebuild. The maintenance procedure was updated to ensure proper oil is used in the hoist and load brake.

The above OE provides objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.14. Compressed Air Monitoring

Program Description

The Compressed Air Monitoring AMP is an existing condition and performance monitoring AMP that manages the loss of material of piping, piping components, and valve bodies in the Instrument Air System. The Compressed Air Monitoring AMP includes monitoring of moisture content and contaminants such that specified limits are maintained and inspection of components for indications of loss of material.

The Compressed Air Monitoring AMP is based on CPNPP's response to NRC GL 88-14, "Instrument Air Supply Problems" and utilizes guidance and standards provided by ANSI/ISAS7.0.01-1996; INPO SOER 88-01, "Instrument Air System Failures"; and ISO 8573, "Compressed Air". The Compressed Air Monitoring AMP activities implement the moisture content and contaminant criteria of ANSI/ISA-S7.0.01-1996. Program activities include air quality checks at various locations to ensure that dew point and particulates are maintained within the specified limits and periodic inspections of select CAS component internal surfaces for signs of loss of material due to corrosion.

The program includes testing and inspection of instrument air compressors, instrument air dryers, and receivers upstream of components within the scope of LR. The effects of corrosion and presence of contaminants are detected during PM inspections of air dryers, receiver tanks, and specific Instrument Air System components. The procedures and maintenance activities for these inspections include specific inspection acceptance criteria. The periodic inspections of accessible internal surfaces of components provide assurance that the systems within the scope of LR will perform their intended function.

Procedures will be enhanced to ensure that the results from the periodic inspections are compared with previous inspections to provide for timely detection of aging effects. The monitoring methods are effective in detecting the applicable aging effects and the frequency of monitoring is adequate to prevent significant age-related degradation. Deficiencies are documented in the CAP and evaluations are performed for test or inspection results that do not satisfy established criteria. The CAP ensures that the conditions adverse to quality are promptly corrected. The site CAP is implemented in accordance with the requirements of CPNPP's 10 CFR Part 50, Appendix B QA program.

NUREG-1801 Consistency

The Compressed Air Monitoring Program, with enhancements, will be consistent with NUREG-1801, Section XI.M24, "Compressed Air Monitoring".

Exceptions to NUREG-1801

None.

Enhancements

The Compressed Air Monitoring AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.M24. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	Procedures performing periodic internal inspections will be enhanced to specifically inspect components for signs of corrosion and abnormal corrosion products. Visual inspection results will be compared to previous inspection results to ascertain if adverse long-term trends exist. Signs of corrosion will be evaluated.
5. Monitoring and Trending	• Procedures performing air quality analysis will be enhanced to describe review of analysis results and comparison of previous results. • Procedures will be enhanced to trend dewpoint temperature readings.
7. Corrective Actions	Air sampling procedures will be enhanced to describe the corrective actions taken if air samples are unsatisfactory.

Operating Experience

Industry OE

- Potentially significant safety related problems pertaining to air systems have been documented in NRC IN 81-38; IN 87-28; IN 87-28, Supplement 1; and License Event Report 50-237/94-005-3. Some of the systems that have been significantly degraded or that have failed due to the problems in the air system include the decay heat removal, auxiliary feedwater, main steam isolation, containment isolation, and fuel pool seal systems. In 2008, one plant incurred an unplanned reactor trip from a failure of a mechanical joint in the instrument air system (NRC IN 2008-06). Nevertheless, as a result of NRC GL 88-14 and in consideration of INPO SOER 88-01, EPRI NP-7079, and EPRI TR-108147, performance of air systems has improved significantly.
- A CPNPP Commitment was issued in response to NRC GL 88-14 and consideration of INPO SOER 88-01, and PM activities were enacted for quarterly sampling of Instrument Air.
- In December of 2013, SOER-88-01 Rev. 1 was issued, revising original maintenance recommendations. In response CPNPP issued A CR and revised procedures to ensure quarterly air samples are performed in

accordance with ISO-8573. CPNPP committed to sampling in accordance with ISO-8573.

Plant-Specific OE

- Instrument Air System health reports indicate that the system is found to be in generally good condition. The Unit 1 train 1 instrument air compressor and air dryer were recently replaced. All other compressors and dryers are in good condition with no open improvement initiatives.

- In December 2020, a leak in an Instrument Air Isolation Valve was identified. The valve was closed in order to isolate a leaking instrument air dryer and monitoring of the IA header pressure showed that the pressure remained at 96 to 99 psig vs the 105 to 108 psig expected as read on the U1 Containment IA header pressure gauge. After shutting down the instrument air dryer, the header pressure rose to the normal expected range. The valve was repaired, fixing the leak.

- In February 2017, an instrument air prefilter drain valve on a Unit 1 air dryer was identified as leaking through the body to bonnet, requiring replacement. The cause was determined to be a combination of wear and age. The valve was replaced in March of 2017, which eliminated the leak.

- In December 2016, during scheduled PM work on one of the common unit instrument air dryers, after removing the inlet switching valve, maintenance personnel noted that the carbon steel piping located immediately beneath the switching valve has a thin layer of surface corrosion (rust). Per maintenance process/procedure, piping that is known or suspected not to meet cleanliness standards for the instrument air system is required to be inspected by site personnel (System Engineer) for cleanliness. The System Engineer reviewed the information provided by Maintenance personnel and determined that the surface corrosion is a normal circumstance given that the instrument air dryers have carbon steel piping and noted that the piping is not obstructed by any corrosion products. The piping carries moisture-laden air to the desiccant towers for moisture removal and to the exhaust switching valve during desiccant regeneration (sweep air). The instrument air dryers are designed with pre-filters and after-filters to remove corrosion and desiccant (dust) particles. Any desiccant or corrosion material does not enter into the instrument air header. The noted internal surface corrosion did not impact the functionality of the instrument air dryer.

- In September of 2015, during a quarterly PM for instrument air sample testing, two of the five sample points for the Instrument Air System were reported by the testing lab to have exceeded the maximum particle size requirements of 40 microns. The sample points were re-sampled and verified to be within specification.

The above OE provides objective evidence that the Compressed Air Monitoring AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Compressed Air Monitoring AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Compressed Air Monitoring AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.15. Fire Protection

Program Description

The Fire Protection AMP is an existing condition and performance monitoring AMP that manages cracking, loss of material, separation, delamination, and change in material properties (e.g., shrinkage, loss of strength) through periodic visual inspection of components and structures with a fire barrier intended function (i.e., seals, fire barrier walls, ceilings, floors, and other fire-resistant materials). The program also performs periodic visual and functional testing of fire doors to ensure their operability as well as periodic visual and functional testing of the halon fire suppression system.

The program includes visual inspections of 100 percent of each type of penetration fire seal every 15 years. These inspections examine any sign of degradation, such as cracking, seal separation from walls and components, separation of layers of material, rupture and puncture of seals that are directly caused by increased hardness, and shrinkage of seal material. If any signs of degradation are detected within the sample, the scope of the inspection is expanded to include additional seals.

Visual inspections of the fire barrier walls, ceilings, and floors in structures within the scope of LR are performed in accordance with the plant’s NRC-approved fire protection program. Visual inspection of the fire barrier walls, ceilings, and floors and other fire barrier materials to detect any sign of degradation are performed to ensure their intended fire protection functions are maintained.

Periodic visual and functional tests are used to manage the aging effects of fire doors. The frequency of visual inspections of the fire door surfaces and functional testing of fire doors closing mechanisms and latches is in accordance with the plant’s NRC-approved Fire Protection AMP.

Periodic visual and functional tests are used to manage the aging effects of the halon fire suppression system. The frequency of visual inspections of the halon system components and functional testing of the system are performed in accordance with the plant’s NRC-approved Fire Protection AMP.

NUREG-1801 Consistency

The Fire Protection AMP, with enhancements, will be consistent with NUREG-1801, Section XI.M26, “Fire Protection”.

Exceptions to NUREG-1801

None.

Enhancements

The Fire Protection AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M26. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
4. Detection of Aging Effects	• Expand the sample size of inspected fire penetration seals if any sign of degradation is found in the sample. • Require qualified fire protection personnel perform inspections associated with the Fire Protection AMP.

Operating Experience

The following OE provides objective evidence that the Fire Protection AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

As discussed in element 10 to NUREG-1801, Section XI.M26, this program considers the technical information and industry OE provided in NRC IN 88-56, IN 94-28, IN 97-70, IN 91-47 and NRC GL 92-08.

Plant-Specific OE

- In 2020, deterioration was found on a fire door that had previously shown deteriorated condition in 2018. The original deterioration was cracks found in the skin of the fire door near a hinge, and screws backing out from the door closure mechanism. The cause of the deterioration was determined to be the door repeatedly slamming shut due to high differential pressure. The door was weld repaired to ensure function could be maintained with the high differential pressure.

- In 2019, a fire door was found that would not latch correctly due to being stuck in the open position. The door latch was repaired so that the door and latch functioned correctly.

- In 2018, degradation was found on flush bolts in a fire door. The cause of the degradation was determined to be loss of material due to wear. The fire door bolting was subsequently replaced to ensure the fire door could continue to perform its function.

- In 2017, a fire door failed during the performance of a mechanical hold open test. The cause of the failure was determined to be a sprocket or gear not releasing due to improper configuration. The configuration was corrected, and the fire door was subsequently repaired.

- In 2012, a silicone penetration seal was in danger of exceeding the specified damage criteria. The fire protection supervisor was contacted, and a fire impairment was initiated. The penetration seals were reworked and repaired in accordance with site procedures.

- In 2012, a gravity damper was found with a degraded condition in the fire water pump house. The condition did not impede air flow into the room or prevent the exhaust function; however, the gravity damper was repaired.

- In 2012, damaged fire rated seals were found during a walkdown. The fire seals were determined not to be functional, and a fire impairment was put in place. An apparent cause report was generated to document the causes of degradation found in the seals. Causes ranged from temporary cable installation and removal, work activities damaging penetrations, and material being torn away by plant personnel. The seals were reworked and repaired to restore their function. Periodic site training was revised which provides a module on fire protection and penetration seals. This is a reoccurring training for all plant personnel to reinforce the importance of the fire barrier assemblies.

The above OE provides objective evidence that the Fire Protection AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Fire Protection AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Fire Protection AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.16. Fire Water System

Program Description

The Fire Water System AMP is an existing condition and performance monitoring AMP that manages loss of material and flow blockage due to fouling for in-scope long-lived passive water-based fire suppression system components using periodic flow testing and visual inspections. The Fire Water System AMP will also manage loss of coating integrity for the FWSTs, via periodic internal tank inspections. When visual inspections are used to detect loss of material and fouling, the inspection technique will be capable of detecting surface irregularities that could indicate wall loss due to corrosion, corrosion product deposition, and flow blockage due to fouling. There are no fire pump suction strainers for the main fire protection pumps, or foam water sprinkler systems within the scope of LR.

Testing or replacement of sprinkler heads that have been in service for 50 years will be performed in accordance with the 2011 Edition of NFPA 25. Portions of the water-based fire water system that (a) are normally dry, but periodically subject to flow (e.g., dry-pipe or downstream of the deluge valve in a deluge system) and (b) cannot be drained or allow water to collect are subject to augmented examination beyond that specified in NFPA 25. The augmented examinations for the portions of normally dry piping that are periodically wetted or experiencing recurring internal corrosion include (a) periodic full flow tests at the design pressure and flow rate, or internal inspections, and (b) volumetric wall thickness evaluations. These augmented tests and inspections are described in the enhancement section below.

Water system pressure is continuously monitored such that loss of pressure is detected and corrective action initiated. A drop of system pressure would cause automatic start of the electric fire pump and/or the emergency diesel driven fire pumps. Upon actuation, associated alarms would annunciate locally, in the FB, and in the Control Room, indicating pump start and potential loss of system pressure.

Volumetric wall thickness inspections will be performed if visual inspections detect surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition. If the presence of organic or inorganic material sufficient to obstruct piping or sprinklers is detected, the material will be removed, and the source determined.

The training and qualification of individuals involved in FWST coating inspections is conducted in accordance with ASTM International standards endorsed in RG 1.54, including limitations (if any) identified in RG 1.54 on a particular standard.

Program acceptance criteria include (a) the water-based fire protection system can maintain required pressure, (b) no unacceptable signs of degradation or fouling are observed during nonintrusive or visual inspections, and (c) in the event surface irregularities are identified, testing is performed to ensure minimum design pipe wall thickness is maintained. In the event the fire water tank fails to meet the acceptance criteria for coating or the tank (e.g., peeling, delamination, blistering, flaking, cracking, or rust), the program requires corrective actions consistent with LR-ISG-2013-01 Appendix C Element 7.

The external surfaces of buried and underground fire main piping are managed by the Buried and Underground Piping and Tanks (B.2.3.27) program. Loss of material of the internal surfaces and loss of coating/lining integrity of cement lined buried and underground fire main piping are managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B.2.3.28) program. Loss of material due to selective leaching is managed by the Selective Leaching (B.2.3.20) program.

NUREG-1801 Consistency

The Fire Water System AMP, with enhancements, will be consistent with two exceptions to NUREG-1801, Section XI.M27, "Fire Water System", as amended by LR-ISG-2012-02 and LR-ISG-2013-01.

Exceptions to NUREG-1801

Exception 1: Element 4, Detection of Aging Effects

NUREG-1801, Chapter XI.M27, Element 4, as modified by LR-ISG-2012-02, states that deluge valves shall be trip tested annually at full flow or tested with air to ensure the nozzles are not obstructed. LR-ISG-2012-02 states that where plant conditions prevent the performance of tests and inspections, the tests and inspections may be performed during plant shutdowns on a refuel cycle interval. The CPNPP deluge valves for Containment Preaccess Filtration System charcoal filter units and Primary Plant Ventilation ESF filter units cannot be tested with water and have no provisions to perform an air test to verify that the spray openings are not obstructed.

Justification for Exception 1

The CPNPP fire water deluge systems for the ventilation charcoal filters and ESF filters have all of their spray spargers located within their associated charcoal filter plenums and are not directly accessible for inspection. A water flow test cannot be performed for these deluge valves because the filter media efficiency will be compromised if the charcoal is wetted, and the design does not include provisions for alternate air flow testing as described in NFPA 25. The preaccess filtration charcoal filter deluge piping is stainless steel and supplied demineralized water, which minimizes conditions which could promote corrosion of internal surfaces or generation of corrosion products that could obstruct the spray openings in the spargers. The ESF filter deluge piping is supplied treated water. The spray openings are located inside the filter plenums where they are protected from inadvertent bumping and mechanical damage that could impact their spray capability.

In lieu of testing, the Fire Water System AMP will be enhanced to perform external visual inspection of the deluge header inside the filter plenum and accessible portions of the spray spargers to assure they are not obstructed every refuel cycle interval. The Fire Water System AMP will also be enhanced to perform internal visual inspections of one of the 2 preaccess filtration charcoal filter deluge systems every five years. Additionally, the Fire Water System AMP will be enhanced to perform internal visual inspection of two of the eighteen ESF filter deluge systems every five years. If degraded conditions are identified during charcoal filter deluge system inspection, the inspections will be expanded to all charcoal filter deluge systems every five years. If degraded conditions are identified during ESF filter deluge system inspection, the inspection population will be expanded. These inspections provide reasonable assurance that the charcoal filter deluge systems will continue to perform their intended function.

Exception 2: Element 7, Corrective Actions

Regardless of physical constraints, lightly tapping the coating/lining surrounding a blister may be performed as an alternative to adhesion testing in order to determine whether the remaining coating/lining is tightly bonded to the base metal.

Justification for Exception 2

Adhesion testing using ASTM international standards endorsed in RG 1.54 is destructive to the coating/lining. These adhesion testing methods are based on using tape tests (ASTM D 3359-09), portable adhesion testers (ASTM D 4541-09), or a knife (ASTM D 6677-07). Therefore, there is no potential for a blister to remain in service after adhesion testing. Lightly tapping the coating/lining is an appropriate alternative for testing blisters in a non-destructive manner and determining whether the coating/lining is tightly bonded to the base metal.

Enhancements

The Fire Water System AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.M27, as amended by LR-ISG-2012-02 and LR-ISG-2013-01. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
1. Scope 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 6. Acceptance Criteria 7. Corrective Actions	A new procedure will be created to inspect the fire water storage tank internal linings. The internal linings will be inspected for blistering, cracking, flaking, peeling, delamination, and rusting. The training and qualification of individuals involved in tank lining inspections and evaluation of degraded conditions will be conducted in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with a particular standard. The procedure will include the following coating/lining acceptance criteria: a. Indications of peeling and delamination are not acceptable. b. Blisters will be evaluated by a qualified coating specialist. c. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, "Standard Test Method for Evaluating Degree of Blistering of Paints"). d. As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. For fire water storage tank linings inspected by the procedure that do not meet acceptance criteria, appropriate corrective measures will be taken, consistent with LR-ISG-2013-01 Appendix C Element 7, with the exception of adhesion tests.

Element Effected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	• Procedures will be enhanced to ensure that visual inspections for loss of material use inspection techniques capable of detecting surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition. Where such irregularities are detected, follow-up volumetric wall thickness examinations will be performed. • A new procedure will be created to perform augmented tests and inspections on piping segments that cannot be drained or piping segments that allow water to collect. In each 5-year interval, beginning 5 years prior to the PEO, either a flow test or flush sufficient to detect potential flow blockage will be conducted, or a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect will be performed. In each 5-year interval of the PEO, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect will be subject to volumetric wall thickness inspections. Measurement points will be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval will be in different locations than previously inspected piping. If the results of a 100-percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections will be necessary. For portions of the normally dry piping that are configured to drain, the above augmented tests and inspections are not required.
4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria	Update existing procedures and develop new procedures, as directed per the table below, to state that testing and visual inspections are performed in accordance with Table 4a from LR-ISG-2012-02 Appendix L. This table, “Fire Water System Inspections and Tests,” is based on NFPA 25, 2011 edition. Unless recommended otherwise, external visual inspections are to be conducted on a refueling outage interval.
6. Acceptance Criteria	Procedures will be enhanced to state that minimum design wall thickness must be maintained for in-scope fire protection piping.

Fire Water System Inspections and Tests

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
Sprinkler Systems		
Sprinkler inspections	5.2.1.1	Current Compliance Plant procedures require visual inspections of headers/ sprinkler spray patterns every 18 months. Inspections every 18 months (every refueling outage) are allowed per NFPA 25 Section 5.2.1.1.7 and note 5 of LR-ISG-2012-02 table 4a. Plant procedures perform visual inspections of sprinkler systems to verify their operational integrity. Sprinklers are inspected from floor level. Using a sprinkler inspection form, sprinklers are checked for corrosion, leaks, physical damage, and obstructions to discharge patterns. Required Enhancements Plant procedures will be enhanced to incorporate the requirements of NFPA 25 Section 5.2.1.1 to ensure that sprinklers meet acceptance criteria, which include no signs of leakage, corrosion, foreign materials, paint (unless painted by manufacturer), physical damage, loading, and loss of fluid in glass bulb heat responsive elements. The procedures will be enhanced to ensure that any sprinkler that does not meet these criteria will be replaced.
Sprinkler Testing	5.3.1	Current Compliance None Required Enhancements A new procedure will be prepared and implemented to incorporate the sprinkler testing instructions of NFPA 25, Section 5.3.1, including subsections. Either sprinklers will be replaced before reaching 50 years in service, or a representative sample of sprinklers will be tested. Steps with asterisks have additional clarifying information in NFPA 25, Annex A.
Standpipe and hose systems		
Flow tests	6.3.1	Current Compliance None

Description	**NFPA 25 Section(s)**	**Current Compliance and Required Enhancements**
		Required Enhancements A new procedure will be prepared and implemented, or an existing procedure will be revised to incorporate standpipe and hose system flow tests as described in NFPA 25, Section 6.3.1, including subsections. Steps with asterisks have additional clarifying information in NFPA 25, Annex A. Results of flow testing will be monitored and trended. Degradation identified during testing will be evaluated.
Private Fire Service Mains		
Underground and exposed piping flow tests	7.3.1	Current Compliance Plant procedures require flow tests at least once per 5 years by performing a flow test of the system in accordance with Chapter 5, Section 11 of the Fire Protection Handbook, 14th Edition, published by the National Fire Protection Association. Plant procedures perform flow tests to determine the flow capacity of the fire suppression system. Flows are representative of those expected during a fire. Flow tests with discrepancies or unsatisfactory results are reported to the Responsible Maintenance Supervisor for follow-up actions, as part of the corrective action process. Required Enhancements None
Hydrants	7.3.2	Current Compliance Plant procedures require performing a flow check of each hydrant to assure operability. Fire hydrant flush/flow tests are performed annually. Tests determine the ability of each fire hydrant to deliver water to satisfy the requirements of NFPA code. Required Enhancements Plant procedures will be enhanced to meet the requirements of NFPA 25, Section 7.3.2 subsections, including maintaining flow for not less than 1 minute, and ensuring full drainage takes no longer than 60 minutes.

Description	**NFPA 25 Section(s)**	**Current Compliance and Required Enhancements**
Fire Pumps		
Suction screens	8.3.3.7	N/A. The Fire Pumps receive treated water and do not have suction screens.
Water Storage Tanks		
Exterior Inspections	9.2.5.5	Current Compliance None Required Enhancements A new procedure will be created to perform visual inspections of the fire water storage tanks and supporting structure's painted or coated exterior surfaces for signs of degradation on an annual interval. This inspection will be in accordance with NFPA 25, Section 9.2.5.5. The inspection will include inspection of the exterior tank coating for protective coating degradation. If degradation is identified, follow-up volumetric examinations will be performed to ensure wall thickness is equal to or exceeds nominal wall thickness.
Interior Inspections	9.2.6, 9.2.7	Current Compliance Plant procedures require periodic 5-year internal inspections of the fire water storage tanks for corrosion. Required Enhancements A new procedure will be created to ensure interior inspections of the CPNPP fire water storage tanks are consistent with NFPA 25, Sections 9.2.6 and 9.2.7 and LR-ISG-2012-02 Table 4a Note 4. The procedure will also include inspections of the internal tank lining for blistering, cracking, flaking, peeling, delamination, and rusting. The training and qualification of individuals involved in tank lining inspections and evaluation of degraded conditions will be conducted in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with a particular standard. The following lining acceptance criteria will be applied: a. Indications of peeling and delamination are not acceptable. b. Blisters will be evaluated by a qualified coating specialist.

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
		c. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, “Standard Test Method for Evaluating Degree of Blistering of Paints”). d. As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. For fire water storage tank linings inspected by the procedure that do not meet acceptance criteria, appropriate corrective measures will be taken, consistent with LR-ISG-2013-01 Appendix C Element 7, with the exception of adhesion tests. In addition, the new plant implementing document will require bottom-thickness measurements on each tank during the first 10-year period of the period of extended operation. Tank bottoms will be tested for metal loss and/or rust on the underside by use of ultrasonic testing where there is evidence of pitting or corrosion. Removal, visual inspection, and replacement of random floor coupons are an acceptable alternative to ultrasonic testing.
Valves and System-Wide Testing		
Main drain test	13.2.5	Current Compliance None Required Enhancements A new implementing document will be prepared, or an existing implementing document will be revised to incorporate the instructions and requirements for the fire main drain test from NFPA 25, Section 13.2.5 and subsections, with consideration of LR-ISG-2012-02 Appendix L Table 4a Note 5 on required frequencies. Test results will be monitored and trended, and any identified degradation during testing will be evaluated. Test results will be compared to previous results to determine if there has been a 10% or greater reduction in full flow pressure, and if there is, the issue will be entered into the CAP and the cause of the reduction will be identified and corrected, as necessary. This provides reasonable assurance throughout the PEO that a degrading trend will be identified and corrected to ensure that the intended function of the fire water system will be maintained.

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
Deluge Valves	13.4.3.2.2 through 13.4.3.2.5	Current Compliance Plant procedures require trip tests of deluge system valves every 18 months. (Tests every 18 months (every refueling outage interval) are allowed per note 5 of LR-ISG-2012-02 table 4a as well as NFPA 25-2011 13.4.3.2.2.3) Plant procedures verify that system deluge valves will trip open on manual pull station actions or at actuation of solenoid valves. Devices and equipment subject to damage by system discharge are protected. Due to the nature of protected property, in certain cases water cannot be discharged for test purposes. In those instances, the trip test is conducted in a manner that does not necessitate discharge into the protected area. Verification of spray nozzle discharge patterns and obstructions is addressed under "Operational Tests" below. As noted within that section, due to the nature of the protected property water cannot be discharged through some spray nozzles. In these instances, nozzles are inspected for correct orientation and the system is tested with air to ensure that the nozzles are not obstructed. In all cases where deluge valves are not trip tested at full flow, nozzles are air tested, except for charcoal filter deluge valves which are addressed below. For pre-action valves, Plant procedures require functional trip tests of pre-action systems at least every 3 years. Trip tests ensure pre-action valves actuate when actuated by a glass break pull station or remote pull station, as required. Exception NUREG-1801, Chapter XI.M27, as modified by LR-ISG-2012-02, states that deluge valves shall be trip tested annually at full flow or tested with air to ensure the nozzles are not obstructed. LR-ISG-2012-02 states that where plant conditions prevent the performance of tests and inspections, the tests and inspections may be performed during plant shutdowns on a refuel cycle interval. The deluge valves for Containment Preaccess Filtration System charcoal filter units (2 per Unit) and Primary Plant Ventilation Engineered Safety Feature (ESF) filter units (18 total) cannot be tested with water and have no provisions to perform an air test to verify that the spray openings are not obstructed. Justification The fire water deluge systems for the Containment Preaccess Filtration System charcoal filter units and Primary Plant

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
		Ventilation ESF filter units have all of their spray spargers located within their associated charcoal filter plenums and are not directly accessible for inspection. A water flow test cannot be performed for these deluge valves because the filter media efficiency will be compromised if the charcoal is wetted, and the design does not include provisions for alternate air flow testing as described in NFPA 25. The preaccess filtration charcoal filter deluge piping is stainless steel and supplied demineralized water, which minimizes conditions which could promote corrosion of internal surfaces or generation of corrosion products that could obstruct the spray openings in the spargers. The ESF filter deluge piping is supplied treated water. The spray openings are located inside the filter plenums where they are protected from inadvertent bumping and mechanical damage that could impact their spray capability. In lieu of testing, the Fire Water System AMP will be enhanced to perform external visual inspection of the deluge header inside the filter plenum and accessible portions of the spray spargers to assure they are not obstructed every refuel cycle interval. The Fire Water System AMP will also be enhanced to perform internal visual inspections of one of the two preaccess filtration charcoal filter deluge systems every five years for each Unit. Additionally, the Fire Water System AMP will be enhanced to perform internal visual inspection of two of the eighteen ESF filter deluge systems every five years. If degraded conditions are identified during preaccess filtration charcoal filter deluge system inspection, the inspections will be expanded to the opposite train charcoal filter deluge system. If degraded conditions are identified during ESF filter deluge system inspection, the inspection population will be expanded. These inspections provide reasonable assurance that the charcoal filter deluge systems covered by this exception will continue to perform their intended function. Required Enhancements A new implementing document will be prepared, or an existing implementing document will be revised to perform external visual inspection of deluge headers inside the Containment Preaccess Filtration System and Primary Plant Ventilation ESF filter plenums and accessible portions of the spray spargers to assure they are not obstructed every refuel cycle interval. The Fire Water System AMP will also be enhanced to perform internal visual inspections of one of the two Containment Preaccess Filtration System charcoal filter deluge systems every five years on each Unit. Additionally, the Fire Water System AMP will be enhanced to perform internal visual inspection of two of the eighteen ESF filter deluge systems every five years. If degraded conditions are

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
		identified during preaccess filtration charcoal filter deluge system inspection, the inspections will be expanded to the opposite train charcoal filter deluge system. If degraded conditions are identified during ESF filter deluge system inspection, the inspection population will be expanded. These inspections provide reasonable assurance that the charcoal filter deluge systems will continue to perform their intended function. Pre-action valve test procedures will be enhanced to trip-test the valves with the control valve fully open in accordance with NFPA 25 Section 13.4.3.2.3.
Water Spray Fixed Systems		
Strainers	10.2.1.6, 10.2.1.7, 10.2.7	Current Compliance Plant procedures require periodic strainer maintenance, with instructions provided for strainer maintenance/replacement. Plant procedures perform mainline strainer maintenance every 5 years, ensuring strainers are removed and inspected for damaged or corroded parts. Required Enhancements Procedures performing periodic system flow tests will be enhanced to ensure strainers are flushed after each flow test, until the flow stream is clear with no observed entrained debris.
Operational Tests	10.3.4.3	Current Compliance Plant procedures require visual inspection of headers/ nozzle spray patterns every 18 months. Plant procedures perform inspections of deluge spray nozzles and ensure that water discharge patterns are not impeded by plugged nozzles, ensure nozzles are correctly positioned, and ensure obstructions do not prevent discharge patterns from wetting surfaces to be protected. Due to the nature of the protected property such that water cannot be discharged, in addition to the inspections above, nozzles are tested with air to ensure the nozzles are not obstructed.

Description	NFPA 25 Section(s)	Current Compliance and Required Enhancements
		Required Enhancements None.
Foam Water Sprinkler Systems		
Strainers, Operational Tests, and Storage Tanks	11.2.7.1 11.3.2.6	N/A. CPNPP does not use foam water sprinkler systems
Obstruction Investigation		
Obstruction, internal inspection of piping	14.2, 14.3	Current Compliance None Required Enhancements A new implementing document will be prepared, or an existing implementing document will be revised to incorporate the instructions and requirements for internal inspection of piping and obstruction investigation from NFPA 25, Sections 14.2, 14.3, and subsections. The alternative nondestructive examination methods permitted by NFPA 25 Sections 14.2.1.1 and 14.3.2.3 will be limited to those that can ensure that flow blockage will not occur. Existing procedures will also be enhanced to require obstruction investigations, if the presence of sufficient foreign organic or inorganic material to obstruct pipe or sprinklers is detected during pipe inspections.

Operating Experience

The following OE provides objective evidence that the Fire Water System AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- In March 2012, the staff and licensee personnel found that a portion of the internally galvanized piping of a 6-inch preaction sprinkler system could not be properly drained because the drainage points were located on a smaller diameter pipe that tied into the side of the 6-inch pipe. A borescopic inspection of the lower portions of the pipe showed that it contained residual water, that the galvanizing had been removed, and that significant quantities of corrosion products were present whereas in the upper dry portions, the galvanized coating was still intact. (IN 2013-06)

CPNPP reviewed IN 2013-06 and determined that there were no required actions for CPNPP. CPNPP has committed to, and installed sprinkler systems to, NFPA 13, except where justified deviations have been taken. CPNPP has developed and implemented procedures for testing of fire protection systems based on NFPA guidance. Additionally, CPNPP has not documented the conditions identified in IN 2013-06.

Plant-Specific OE

- In December 2021, the NRC suggested that CPNPP take the opportunity to perform internal visual inspections of sprinkler deluge piping on feed pump(s) while the system is disassembled for outage maintenance, to evaluate any corrosion that may build up in the piping. Internal visual inspections were performed and noted moderate corrosion and mineral buildup present on the interior surfaces of the piping. No major deposits that would significantly reduce the flow or effectiveness of the system were noted during the inspection, and threaded connections were in good condition. The condition of the piping was as expected for the system.

- In July 2020, inspection of fire protection piping within the turbine building identified six corroded sprinklers and a corroded/rusted gate valve. The system remained operable and in service with a fire impairment for the portions of the affected system. The corroded sprinklers were replaced to ensure they will continue to perform their intended function.

- In November 2019, during inspection of the start-up transformer suppression system, a deluge strainer blowdown valve was identified with external rust and corrosion. It was recommended that the valve be cleaned or replaced. The suppression system was determined operable as the valve was not leaking. The external rust and corrosion were subsequently removed from the valve.

- In March of 2018, a concern was noted related to identified fire protection sprinkler head fouling for fire protection systems located in portions of the AB. As part of an immediate response, fire impairments and a compensatory revolving fire watch were initiated. The cause of fouling was determined to be improper application of thermo-lag, in which thermo-lag topcoat was splattered on nearby sprinkler heads (not an aging issue). A lessons learned was issued for onsite personnel involved in thermo-lag work, and sprinkler heads were replaced.

- In June of 2017, it was determined that loop flow testing of the underground fire protection piping did not flow test portions of the underground loop that feed into the main power block buildings. Similar issues were previously identified by Diablo Canyon and River Bend in 2016. Based upon the possible discrepancy in the current testing procedure and fire protection handbook requirements, CPNPP issued new branch line flow testing procedures to flow test the identified portions of the underground loop not previously tested.

- In May of 2013, the appearance of rust on the FWSTs was questioned. Site documentation was reviewed, and it was determined that there was currently no open documentation tracking the noted condition of the FWST. For the rust identified, the most notable location is on top of one of the tanks. The tanks are vented to atmosphere and as such, there is no pressure on the top/roof area to challenge the tank integrity even if a through wall hole existed in this area. The tanks were walked down for a closer inspection. The rust on the side walls of the tanks is minimal surface-type rust/oxidation with no noted pitting or depth. This issue was discussed with the site coatings engineer. The engineer inspected the FWSTs and concurred that the rust is superficial surface rust which does not affect the integrity of the tanks. It was determined that the FWSTs remained functional. Work is planned to re-coat the FWST exteriors in 2023.

The review of plant-specific OE during the development of this AMP was broad and detailed enough to detect instances of aging effects that have occurred repeatedly. The review did not identify instances of recurring internal corrosion within the fire protection systems.

The above OE provides objective evidence that the Fire Water System AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Fire Water System AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Fire Water System AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.17. Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry AMP is an existing mitigative and condition monitoring AMP that manages loss of material in tanks, piping, and piping components exposed to an environment of diesel fuel oil. This is accomplished by verifying the quality of fuel oil and controlling fuel oil contamination as well as periodic draining, cleaning, and inspection of tanks. The Fuel Oil Chemistry AMP includes surveillance and maintenance procedures to mitigate corrosion of components exposed to a fuel oil environment, including the periodic removal of accumulated water found in tanks.

Components within the scope of the Fuel Oil Chemistry AMP are the diesel fuel oil storage tanks, piping, and piping components subject to AMR that are exposed to an environment of diesel fuel oil. The tanks within the scope of this AMP are listed below:

- Emergency Diesel Generator Fuel Oil Storage Tanks
- Emergency Diesel Generator Fuel Oil Day Tanks
- Diesel Driven Fire Pump Fuel Oil Storage Tanks

The Fuel Oil Chemistry AMP accomplishes objectives by sampling and testing of new fuel oil and periodic sampling (from the lowest point of the tank) and chemical analysis of the stored fuel oil. The AMP will also perform periodic draining, cleaning, internal visual inspections of fuel oil storage tanks (if physically possible), and, if evidence of degradation is observed during inspections, or if visual inspection is not possible, these diesel fuel tanks will be volumetrically inspected.

The Fuel Oil Chemistry AMP includes surveillance and maintenance procedures to mitigate corrosion. Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the TSs and TRM for Emergency Diesel Generator Fuel Oil. Fuel oil quality requirements for the diesel driven fire pumps are from industry standards and the equipment manufacturer. Guidelines of the ASTM Standards are also used for all diesel fuel oil. Exposure to fuel oil contaminants, such as water and microbiological organisms, is minimized by periodic draining and/or cleaning of tanks and by verifying the quality of new fuel oil before its introduction into the storage tanks. However, corrosion may occur at locations in which contaminants may accumulate, such as tank bottoms. The effectiveness of the fuel oil chemistry controls is verified to provide reasonable assurance that significant degradation is not occurring in accordance with the One-Time Inspection (B.2.3.19) AMP.

NUREG-1801 Consistency

The Fuel Oil Chemistry AMP, with enhancements, will be consistent with exceptions to NUREG-1801, Section XI.M30, “Fuel Oil Chemistry”.

Exceptions

Exception 1 to Element 4, Detection of Aging Effects

The EDG DFOSTs are drained, cleaned, visually inspected, and ultrasonically inspected on a 20-year frequency per PMs. NUREG-1801, Rev. 2 guidance recommends draining, cleaning and visually inspecting each diesel fuel tank at least once during the 10-year period prior to the PEO, and on a 10-year frequency during the PEO.

Justification for Exception 1

- Draining, cleaning, visual inspection, and ultrasonic inspection have been periodically performed for the EDG DFOSTs (twice for the 1-01, 1-02, and 2-01 tanks, and three times for the 2-02 tank). All four tanks have been found in exceptional condition with minimal sludge and required very little cleaning. The tanks are maintained between approximately 85 percent and 97 percent full, thus very little of the interior surface area is exposed to oxygen. The exteriors of the tanks are coated and properly backfilled. The tank foundations are located above the groundwater elevation, and the site cathodic protection system is regularly surveyed and maintained. Additionally, each tank is sampled monthly for accumulated water and sediment with any accumulated water removed in a timely manner.

- Prior to being placed in service, each EDG DFOST was inspected, and UT readings were taken. The UT readings were taken using a 42-point gridded inspection plan. Re-inspections on a 10-year interval after being place in service have been completed with satisfactory results. Using the available UT data, the projected remaining life of each tank before reaching the minimum allowable tank wall thickness was calculated. The projected time to minimum wall thickness values have been found to be all over 60 years with the exception of a single location on the 2-01 tank where the estimate time to min wall is at 36.8 years. With an inspection frequency of 20 years, this limiting wall measurement will be bounded and the time to reach minimum wall thickness reassessed during the next inspection. Based on each new set of UT results, tank inspection frequencies will be assessed to assure that the intended function of the EDG DFOSTs will continue to be maintained during the PEO.

- An additional consideration is that each buried fuel tank holds over 100,000 gallons of fuel which must be offloaded into temporary storage tanks to provide access for cleaning and inspection. While precautions and barriers are put in place during fuel transfer, this presents unnecessary environmental risk in moving this volume of fuel to temporary storage tanks more frequently than necessary.

Exception 2 to Element 4, Detection of Aging Effects

The Fuel Oil Chemistry AMP collects fuel oil samples from the lower portion (6-in from the bottom) of the EDG DFOSTs on a 31-day frequency. NUREG-1801 Rev. 2 guidance recommends periodic multilevel sampling to provide assurance that fuel oil contaminants are below unacceptable levels. If tank design features do not allow for multilevel sampling, a sampling methodology that includes a representative sample from the lowest point in the tank is allowed.

Justification for Exception 2

Originally, multi-level samples were obtained from each of the 21-ft 4-in diameter horizontally buried EDG DFOSTs. An assessment was completed that compared multi-level sampling to a single, lower level sample. An analysis of the three-level sampling was performed to ensure that the differences were not statistically significant. As a conservative measure, the lowest and the highest sample points were compared, and no statistically significant differences were found. Additionally, contaminants such as water and particulates normally accumulate at the bottom of the tank, and the NUREG-1801 Rev. 2 guidance allows for a "representative sample from the lowest point in the tank" as an acceptable alternative to multilevel sampling.

Enhancements

The Fuel Oil Chemistry AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M30. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
2. Preventive Actions 4. Detection of Aging Effects	Drain, clean, and visually inspect the internal surfaces of the EDG Day Tanks and the DDFP Fuel Oil Storage Tanks. Volumetrically inspect the tanks if evidence of degradation is observed during visual inspection, or if visual inspection is not possible. Perform the maintenance activities and the inspections at least once during the 10-year period prior to the PEO, then periodically on a 10-year frequency during the PEO.
3. Parameters Monitored or Inspected	Revise procedure(s) to test for microbiological organisms in new fuel prior to acceptance for use.
3. Parameters Monitored or Inspected 5. Monitoring and Trending	Revise sampling procedures to specifically monitor and trend the following parameters quarterly: water content, sediment content, biological activity, and total particulate concentration for the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks.
3. Parameters Monitored or Inspected 6. Acceptance Criteria	Provide acceptance criteria, consistent with industry standards, for the testing requirement and approach used to detect the microbiological activity in diesel fuel used in the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks.

Operating Experience

The following OE provides objective evidence that the Fuel Oil Chemistry AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

Industry OE has included identification of water in the fuel, particulate contamination, and biological fouling. In addition, when a diesel fuel oil storage tank at one plant was cleaned and visually inspected, the inside of the tank was found to have unacceptable pitting corrosion, which was repaired in accordance with American Petroleum Institute (API) 653 standard by welding patch plates over the affected area.

The industry OE above forms the basis for the Fuel Oil Chemistry AMP, as this AMP is based off of the GALL Fuel Oil Chemistry AMP, which considers this industry OE.

Plant-Specific OE

- In June 2020, an offsite analysis of a diesel fuel oil delivery for the EDG DFOSTs determined the Cloud Point was higher than the acceptance criterion. The other TS and procedural criteria were met. An evaluation was performed based on the initial volume of the EDG DFOST and the new fuel oil volume added from the new delivery, which determined that the mixed fuel oil volume Cloud Point was below the acceptance criterion and the new fuel oil was added to the EDG DFOST.

- In February 2020, a statistical analysis found no statistically significant differences in samples found in three-level sampling. Thus, bottom sampling of the EDG DFOSTs were recommended in lieu of multilevel sampling, and applicable procedures were updated to discontinue three-level sampling in favor of bottom-only sampling.

- In 2019, the feasibility of extending the EDG DFOST internal inspections from every 10 years to every 20 years was evaluated. The results of cleaning/inspections performed every 10 years have been satisfactory, and all four EDG DFOSTs were in exceptional condition with minimal sludge requiring very little cleaning. The tanks were kept full and therefore minimally exposed to oxygen. The exteriors of the tanks are coated, excavated areas surrounding the tanks are properly backfilled, groundwater elevation is below the elevation of the tank foundations, and the site cathodic protection system is regularly surveyed and maintained. The available UT data indicates that the shortest time remaining to reach the minimum allowable thickness was over 35 years for the 2-01 tank. Even with the measurement frequency extended to 20 years, measurements would still be collected prior to the shortest time remaining to reach the minimum allow thickness. Information reviewed for the evaluation indicated that extension of the EDG DFOSTs is technically acceptable.

- In September 2012, a delivery of diesel fuel oil was tested, and water was found. Due to the water detected in the sample, the diesel fuel oil delivery was rejected prior to being added to the storage tank in accordance with site procedures.

- In October 2011, water was found in the clearance dimple (a depression in the bottom of the storage tank) while sampling the EDG DFOST. Approximately 2 gallons of water was immediately removed with the sampler, and the remaining water was then removed separately.

The above OE provides objective evidence that the Fuel Oil Chemistry AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Fuel Oil Chemistry AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Fuel Oil Chemistry AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.18. Reactor Vessel Surveillance

Program Description

The Reactor Vessel Surveillance AMP is an existing condition monitoring AMP that manages loss of fracture toughness for reactor vessels as a consequence of neutron irradiated embrittlement of the ferritic RPV beltline materials in a reactor coolant and neutron flux environment. The program meets the requirements of 10 CFR Part 50, Appendix H. The program evaluates neutron irradiation embrittlement by projecting USE and PTS for reactor materials and impact on ART for the development of P-T limit curves. Neutron irradiation embrittlement evaluations are performed in accordance with RG 1.99, Revision 2. The Reactor Vessel Surveillance program provides sufficient material and dosimetry data to monitor irradiation embrittlement at the end of the PEO and determine the need for operating restrictions on the irradiation temperature (i.e., cold leg operating temperature), neutron spectrum, and neutron fluence.

There were six (6) specimen capsules installed in each CPNPP RPV prior to plant startup. The capsules contain representative RPV material specimens, neutron dosimeters, and thermal monitors (eutectic alloy). All six (6) specimen capsules have been withdrawn from each of the CPNPP RPVs. Three (3) specimen capsules from each RPV were tested in accordance with ASTM E185-82 and the remaining three (3) untested specimen capsules from each RPV are currently stored in the SFP.

The latest capsule withdrawn and tested from CPNPP, Unit 1, Capsule X, was pulled with a fluence value of 3.18×10^{19} n/cm^2 (E >1.0 MeV), which is equivalent to a peak projected reactor vessel fluence after 50 EFPY of operation. This falls short of the fluence projected to be experience after 60 years of operation, i.e., a projected fluence of 3.59×10^{19} n/cm^2 (E >1.0 MeV), which is equivalent to a peak projected reactor vessel fluence after 56 EFPY of operation. Capsule Z currently has the most fluence of the remaining untested capsules at 3.17×10^{19} n/cm^2. This is less than 3.59×10^{19} n/cm^2 (E >1.0 MeV); therefore, a capsule will be reinserted into the RPV to achieve a fluence in excess of one-times the projected EOLE vessel fluence and less than two-times the projected EOLE vessel fluence. Capsule Z will be re-inserted prior to 36 EFPY to be exposed to at least a vessel equivalent fluence of 80 EFPY (5.23×10^{19} n/cm^2). This capsule will be removed and tested at the outage nearest to but following an additional 9 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule W or V can be reinserted for an additional 13 EFPY of operation.

The latest capsule withdrawn and tested from CPNPP, Unit 2, Capsule W, was pulled with a fluence value of 3.30×10^{19} n/cm^2 (E >1.0 MeV), which is equivalent to a peak projected reactor vessel fluence after 55 EFPY of operation. This falls short of the fluence projected to be experienced after 60 years of operation, i.e., a projected fluence of 3.37×10^{19} n/cm^2 (E >1.0 MeV), which is equivalent to a peak projected reactor vessel fluence after 56 EFPY of operation. Capsule Z currently has the most fluence of the remaining untested capsules at 3.30×10^{19} n/cm^2. This is less than 3.30×10^{19} n/cm^2 (E >1.0 MeV); therefore, a capsule will be reinserted into the RPV to achieve a fluence in excess of one-times the projected EOLE vessel fluence and less than two-times the projected EOLE vessel fluence. Capsule Z will be re-inserted prior to 36 EFPY to be exposed to at least a vessel equivalent fluence of 80 EFPY (4.83 x 10^{19} n/cm^2). This capsule will be removed and tested at the outage nearest to but following an additional 8 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule Y or V can be reinserted for an additional 14 EFPY of operation.

Ex-core dosimetry has been installed at CPNPP Units 1 and 2. The ex-core dosimetry provides a method to verify the fast neutron exposure distribution. Using the ex-core dosimetry data in conjunction with in-vessel specimen analysis results and neutron transport calculations reduces the uncertainty in the projection of neutron irradiation embrittlement gradients through the RPV wall in accordance with RG 1.190.

These measures and frequencies are effective in monitoring the extent of loss of fracture toughness of the RPV beltline material due to neutron irradiation embrittlement to prevent significant age-related degradation of the RPV during the PEO.

NUREG-1801 Consistency

The Reactor Vessel Surveillance AMP, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M31, “Reactor Vessel Surveillance”.

Exceptions to NUREG-1801

None.

Enhancements

The following enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
4. Detection of Aging Effects	• A capsule in each unit will be reinserted prior to 36 EFPY in order to achieve at least a vessel equivalent fluence of 80 EFPY. • The AMP documents will be modified to require that all pulled and tested specimens will be retained unless the NRC approval has approved the discard of the pulled and tested samples.
4. Detection of Aging Effects 5. Monitoring and Trending	The AMP documents will be modified to establish operating restrictions to ensure that the plant is operated within the material aging OE, i.e., the cold leg operating temperature during normal operation will be limited to 525°F (minimum) to 590°F (maximum).

Element Affected	Enhancement
4. Detection of Aging Effects 7. Corrective Actions	The capsule withdrawal schedule will be documented in the PTLR and note that changes require NRC approval per 10 CFR 50, Appendix H.

Operating Experience

The following OE provides objective evidence that the Reactor Vessel Surveillance AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

NRC RIS 2014-11 (Reference ML14149A165*)* specifies that any reactor vessel materials that are predicted to experience a neutron fluence exposure greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) at the end of the licensed operating period should be considered to experience neutron embrittlement. The materials that exceed this fluence threshold are referred to as the "beltline" materials. The materials that need to be considered as a result of LR are referred to as the "extended beltline" materials. RIS 2014-11 also specifies that the P-T limit curves account for the higher stresses in the nozzle corner region due to the potential for more restrictive P-T limits, even if the RT_{NDT} for these components are not as high as those of the reactor vessel beltline shell materials that have simpler geometries. WCAP-18630-NP (Reference 1.7.41) identifies all RV materials with a neutron fluence exposure greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) and consider them in all neutron irradiation embrittlement TLAAs (e.g., upper-shelf energy, pressurized thermal shock and pressure-temperature limits evaluations, etc.) for 60 years. This resulted in the Upper Shell Plates and Weld becoming extended beltline material. These will not become limiting during the period of extended operation. WCAP-18630-NP also credits Pressurized Water Reactor Owners Group Report PWROG-15109-NP-A (Reference ML20024E573) for demonstrating that P-T limit curves developed with current NRC-approved methods bound the generic nozzle P-T limit curves.

Plant-Specific OE

- In August 2021, the Reactor Vessel Integrity Database was reviewed to identify any discrepancies with the initial material properties used in WCAP-18630-NP. The review identified that the CPNPP Unit 1 beltline plates' chemistry data have been updated since the development of the Reactor Vessel Integrity Database . The Cu and Ni weight percent for all Unit 1 intermediate and lower shell plates were calculated from the average of all data points listed in the Certified Material Test Report (CMTR). The revised chemistry values produce an equal or more conservative CF. In addition, the initial USE value of the Unit 1 beltline welds was also updated from 125 ft-lb in the Reactor Vessel Integrity Database to 133 ft-lb in WCAP-18630-NP. The difference is that 125 ft-lb is based on the Charpy data with 100% shear from the baseline testing documented in WCAP-9475 (Reference 1.7.42), whereas 133 ft-lb is the average of all available Charpy data with 100% shear from the baseline testing, the CMTR, and the weld records files.

- In July 2019, a condition was identified where the CPNPP Units 1 and 2 PTLR needed to be updated to account for the latest test results from the Reactor Vessel Surveillance AMP. These results are for Capsule X for Unit 1 (WCAP-16610-NP) (Reference ML063050187) and Capsule W for Unit 2 (WCAP-17269-NP) (Reference ML102920154). The P-T limit curves and PTS were reviewed and determined to be unaffected and the USE were determined to remain greater than 50 ft-lb throughout the end of the current license period. Therefore, this is considered administrative for the purpose of tracking the revision of the PTLR to incorporate the results from the Capsule X (Unit 1) and Capsule W (Unit 2) analysis. An updated PTLR was subsequentially sent to the NRC in ML21075A112.

- In 2009, at the end of Cycle 11, the latest surveillance capsule removed from CPNPP Unit 2 was Capsule W, which was removed with an exposure of 14.5 EFPY and 3.30 x 10^{19} n/cm^2 (E > 1.0 MeV). The results of the Capsule W and fluence analyses were submitted to the NRC as required by 10 CFR Part 50 Appendix H by WCAP-17269-NP (Reference ML102920154). This report summarizes results from all three capsules (“U”, “X”, and “W”) and the initial un-irradiated mechanical tests for comparison. All surveillance materials exhibited adequate USE. The report was incorporated into the PTLR and evaluated that beltline material properties remain acceptable to support continued safe plant operations through 36 EFPY.

- In 2005, at the end of Cycle 11, the latest surveillance capsule removed from CPNPP Unit 1 was Capsule X with an exposure of 13.1 EFPY and 3.18 x 10^{19} n/cm^2 (E > 1.0 MeV). The results of the Capsule X and fluence analyses were submitted to the NRC as required by 10 CFR Part 50 Appendix H by WCAP-16610-NP (Reference ML063050187). This report summarizes results from all three capsules (“U”, “Y”, and “X”) and the initial un-irradiated mechanical tests for comparison. All surveillance materials exhibited adequate USE. The report was incorporated into the PTLR and evaluated that beltline material properties remain acceptable to support continued safe plant operations through 36 EFPY.

- In April 2004 and March 2008, CPNPP implemented Ex-Vessel Neutron Dosimetry on Units 1 and 2. Ex-Vessel Neutron Dosimetry is designed to verify fast neutron exposure distributions within the RV wall. The program also enables long-term monitoring of those portions of the RV and vessel support structure that could experience significant radiation-induced increases in reference nil-ductility transition temperature (RT_{NDT}) over the service lifetime of the plant. When used together with dosimetry from internal surveillance capsules and with the results of neutron transport calculations, the ex-vessel neutron measurements allow the projection of embrittlement gradients through the RV wall with a minimum uncertainty.

The above OE provides objective evidence that the Reactor Vessel Surveillance AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Reactor Vessel Surveillance AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Reactor Vessel Surveillance AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.19. One-Time Inspection

Program Description

The One-Time Inspection AMP is a new condition monitoring AMP that will verify the system-wide effectiveness of the Water Chemistry (B.2.3.2), Fuel Oil Chemistry (B.2.3.17) AMP, and Lubricating Oil Analysis (B.2.3.25) AMPs which are designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the PEO. The One-Time Inspection AMP will manage the aging effects of loss of material, cracking, and reduction of heat transfer for heat exchangers, pumps, piping, piping components, tanks, and specific RV and steam generator internals, in fuel oil, lubricating oil, reactor coolant, and treated water environments. Additionally, the One-Time Inspection AMP, in conjunction with the Lubricating Oil Analysis (B.2.3.25) AMP, will be used to manage the loss of coating or lining integrity of the interior of the SI pump lube oil cooler reservoirs.

The elements of the One-Time Inspection AMP include: (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and OE, (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined, and (d) an evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the PEO. The inspection sample includes locations where the most severe aging effect(s) would be expected to occur. Inspection methods may include visual (or remote visual), surface or volumetric examinations, or other established NDE techniques.

The inspection includes a representative sample of each population (defined as components having the same material, environment, and aging effect combination) and, where practical, focuses on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. A representative sample size is 20 percent of the population or a maximum of 25 components. Otherwise, a technical justification of the methodology and sample size used for selecting components for one-time inspection is included as part of the program documentation. Factors that will be considered when choosing components for inspection are time in service, severity of operating conditions, and OE. Identification of inspection locations is based on the potential for the aging effect to occur. Examination techniques are established NDE methods with a demonstrated history of effectiveness in detecting the aging effect of concern, including visual, ultrasonic, and surface techniques. Acceptance criteria is based on applicable ASME or other appropriate standards, design basis information, or vendor-specified requirements and recommendations. The need for follow-up examinations is evaluated based on inspection results if age-related degradation is found that could jeopardize an intended function before the end of the PEO.

The One-Time Inspection AMP will verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage loss of material due to erosion in stainless steel SI and CCP minimum flow recirculation orifices exposed to treated borated water in the SI and CVCSs. A one-time inspection will be performed on one orifice on each unit associated with the CCP minimum flow recirculation orifice prior to entering the PEO.

The One-Time Inspection AMP will also verify the effectiveness of the Water Chemistry (B.2.3.2) AMP to manage cracking of the stainless steel non-regenerative (Letdown) heat exchangers exposed to treated borated water greater than 60°C (140°F) by performing volumetric inspections.

The acceptance criteria for this program considers both the results of observed degradation during current inspections and the results of projecting observed degradation of the inspections for each material, environment, and aging effect combinations. Acceptance criteria are based on applicable ASME Code or other appropriate standards, design basis information, or vendor-specified requirements and recommendations (e.g., ultrasonic thickness measurements are compared to predetermined limits).

The One-Time Inspection AMP will be performed within the 10 years prior to the PEO. Situations in which additional confirmation is appropriate include: (a) an aging effect is not expected to occur, but the data is insufficient to rule it out with reasonable confidence; or (b) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than generally expected. For these cases, confirmation demonstrates that either the aging effect is not occurring or that the aging effect is occurring very slowly and does not affect the component or structure intended function during the PEO based on prior OE data.

The components to be inspected will be selected from the systems within the scope of the Water Chemistry (B.2.3.2) AMP, the Fuel Oil Chemistry (B.2.3.17) AMP, and the Lubricating Oil Analysis (B.2.3.25) AMP. The One-Time Inspection AMP will also include other components where the environment in the PEO is expected to be equivalent to that during the initial licensing period and for which no aging effects have been identified. From these component populations, a sample will be selected for inspection under the One-Time Inspection AMP. The inspections will be scheduled as close to the end of the current operating license as practical with margin provided to ensure completion prior to commencing the PEO. Any corrective actions will be implemented through the CAP.

The One-Time Inspection AMP will not be used for structures or components with known age-related degradation mechanisms or when the environment in the PEO is not expected to be equivalent to that in the prior operating period. In these cases, periodic plant-specific inspections will be performed.

NUREG-1801 Consistency

The One-Time Inspection AMP will be consistent with NUREG-1801, Section XI.M32, "One-Time Inspection".

Exceptions

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the One-Time Inspection AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- Recent industry OE was reviewed from the Byron and Braidwood, and Waterford LR Safety Evaluation Reports; and Turkey Point, Peach Bottom, and Surry SLR Safety Evaluation Reports. Lessons learned include ensuring that the One-Time Inspection AMP is not used for managing aging of systems or components with known age-related degradation issues and ensuring that one-time inspections are completed on SG components, as necessary. The SG inspection locations of interest for the One-Time Inspection AMP are the divider plate assemblies as addressed in the Water Chemistry (B.2.3.2) AMP. The Unit 2 SG divider plate assemblies are bounded under EPRI 3002002850 and therefore a one-time inspection of the divider plate assemblies is not warranted.

Plant-Specific OE

- Routine inspections during maintenance activities have been performed on in-scope components applicable to the One-Time Inspection AMP. OE related to the AMPs whose effectiveness is verified by the One-Time Inspection AMP is summarized below.
    - The Water Chemistry (B.2.3.2) AMP mitigates the aging effect of loss of material in components exposed to a treated water and treated borated water environment. Relevant OE for chemistry parameters above normal reading such as sulfates, and aluminum have been found, but no age-related degradation has been identified.
    - The Fuel Oil Chemistry (B.2.3.17) AMP minimizes the introduction and presence of contaminants in the plant fuel oil systems that could cause degradation of components. Relevant OE was found for out of spec new fuel oil and sediment/water content found in the in-scope tanks. Each issue was addressed in a timely manner to minimize impact to in-scope components.
        - In October 2011, a routine cleaning and inspection was performed on an emergency diesel generator fuel oil storage tank. There was no accelerated corrosion, and the measured tank wall thickness and the expected wall thickness calculated for the next inspection were both satisfactory. Minor corrosion near the manway above the fuel level was found with no corrective actions required.

- The Lubricating Oil Analysis (B.2.3.25) AMP identified instances where water and particulate contamination were found in lubricating oil. Relevant OE for bearing/lubricating oil having an abnormal color was found; however, there was no OE specific to age-related degradation.

The above OE provides objective evidence that the One-Time Inspection AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Conclusion

The new One-Time Inspection AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.20. Selective Leaching

Program Description

The Selective Leaching AMP is a new condition monitoring AMP which will ensure the integrity of components that may be susceptible to loss of material due to selective leaching by demonstrating the absence of selective leaching in components within the scope of LR. The Selective Leaching Program will be effective at identifying and managing the aging effects of loss of material due to selective leaching for components subject to raw water, treated water, closed-cycle cooling water, soil, and waste water. Components include piping and piping components, valve bodies, pump casings, heat exchanger components, and bolting. The materials of construction for these components that are susceptible to selective leaching are gray cast iron, ductile iron, and copper alloy with greater that 15 percent zinc or greater than 8 percent aluminum. One-time inspections for loss of material due to selective leaching will include visual examinations, supplemented by hardness tests or other mechanical examination techniques such as destructive testing, scraping, or chipping of a representative sample of selected components that are susceptible to selective leaching. The goal is to determine if selective leaching is occurring.

A sample size of 20 percent of susceptible components will be subjected to a one-time inspection with a maximum of 25 inspections for each of the susceptible material and environment combination groups. If selective leaching is found, the program will require an evaluation of the aging effect on the ability of the affected components to perform their intended function(s) during the PEO. The sample size for each material and environment combination group may be expanded based on the results of the evaluation and laboratory testing. This confirmatory condition monitoring program will provide adequate inspection methods that are effective in demonstrating the absence of selective leaching.

The selective leaching process involves the preferential removal of one of the alloying elements from the material, which leads to the increased concentration of the remaining alloying elements. Dezincification (loss of zinc from brass) and graphitization (removal of iron from cast iron) are examples of such a process. Susceptible materials, high temperatures, stagnant-flow conditions, and a corrosive environment, such as acidic solutions for brasses with high zinc content and dissolved oxygen, are conducive to selective leaching. These environmental and material conditions are considered when choosing samples for inspection. The Selective Leaching AMP will be implemented prior to the PEO. One-time inspections will be performed within the five (5) year period prior to entering the PEO.

NUREG-1801 Consistency

The Selective Leaching AMP will be consistent with NUREG-1801, Section XI.M33, “Selective Leaching”, as amended by LR-ISG-2011-03 and LR-ISG-2015-01.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Selective Leaching Program will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

The NRC issued IN 2020-04 “Operating Experience Related to Failure of Buried Fire Protection Main Yard Piping” dated December 17, 2020. The IN was issued to inform the addressees of OE involving the loss of function of buried cast iron fire water main yard piping due to multiple factors, including graphitic corrosion, overpressurization, low-cycle fatigue, and surface loads. OE has indicated that multiple failures of the buried cast iron fire water main yard piping have occurred due to aging effects, including graphitic corrosion (i.e., selective leaching), corrosion buildup, low-cyclic fatigue, and general wall thinning or localized loss of material. CPNPP evaluated this IN for applicability and determined no actions were necessary. The CPNPP buried fire protection piping is constructed of ductile iron, is buried in a low corrosive material (sand) and is cathodically protected.

Plant-Specific OE

A review of operating experience did not identify any occurrences of selective leaching. Therefore, a one-time inspection to confirm that selective leaching is not occurring in susceptible components is appropriate. The review of plant-specific operating experience has confirmed that the operating experience described in the NUREG-1801 Chapter XI.M33 Selective Leaching program is bounding and, therefore, the inspection techniques recommended are adequate to ensure that selective leaching is not occurring on susceptible components within the scope of LR. Appropriate guidance for evaluation, repair, or replacement is provided for locations where selective leaching is found.

The above OE provides objective evidence that the Selective Leaching AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Selective Leaching AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Selective Leaching AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.21. One-Time Inspection of ASME Code Class 1 Small-Bore Piping

Program Description

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP is a new condition monitoring AMP that will inspect a sample of Code Class 1 piping less than NPS 4 and greater than or equal to NPS 1. The AMP will provide assurance that the aging effect of cracking of ASME Code Class 1 small-bore piping is not occurring, or that the aging is not significant. The inspections will be either a volumetric, opportunistic destructive examination, or another approved inspection method and will be conducted on locations susceptible to cracking. The sample location will be based on susceptibility, inspectability, dose considerations, OE, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations.

Volumetric examination, or another approved inspection method, will be used to detect cracking resulting from thermal and mechanical loading or intergranular stress corrosion of full penetration welds. Volumetric examination will be performed using demonstrated techniques that are capable of detecting the aging effects in the examination volume of interest. For socket welds, opportunistic destructive examinations or volumetric examinations will be performed. Because more information can be obtained from a destructive examination than from NDE, CPNPP will take credit for each weld destructively examined equivalent to having volumetrically examined two welds.

Since CPNPP has not experienced a failure in its ASME Code Class 1 piping and Unit 1 and Unit 2 have approximately 32 years and 29 years of operation, respectively, the inspection sample size will be at least 3 percent of the weld population or a maximum of 10 welds of each weld type for each operating unit. The one-time inspection will be completed within the six-year period prior to the PEO. Weld population and sample sizes are provided below.

CPNPP Unit 1		
Weld Type	**Number of Welds**	**Inspection Sample**
Butt	88	3
Socket	352	10

CPNPP Unit 2		
Weld Type	**Number of Welds**	**Inspection Sample**
Butt	85	3
Socket	351	10

CPNPP will apply the requirements of 10 CFR Part 50 Appendix B to the One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP through use of the CAP. Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material, and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the condition is determined, and that corrective action is taken to preclude recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented is documented and reported to appropriate levels of management.

NUREG-1801 Consistency

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will be consistent with NUREG-1801, Section XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping".

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

Through-wall cracking in ASME Code Class 1 small-bore piping has occurred at a number of plants. Causes include SCC and thermal and vibratory fatigue loading as described in the NRC IN 97-46, Unisolable Crack in High-Pressure Injection Piping. Below is a sample of LERs related to cracking in ASME Code Class 1 small-bore piping. CPNPP has not experienced cracking of ASME Code Class 1 small-bore piping.

LER 259/2008-002-00, ASME Code Class 1 Pressure Boundary Leak on an Instrument Line Connected to the Reactor Vessel: During the performance of the Browns Ferry Unit 1 vessel hydrostatic test, ASME Section XI System Leakage Test of the RPV and Associated Piping a reactor pressure boundary leak was discovered on an unisolable instrument line connected to the reactor vessel. This instrument line is an ASME Code Class 1 equivalent component, 2-inch pipe, near pressure vessel nozzle N11B. Unit 1 was in mode 4 at the time of discovery; it remained in mode 4 until the repairs were completed. The root cause of the event was residual stress introduced to the safe end inside diameter during initial fabrication. The N11B safe end was examined ultrasonically (UT). The through wall leak was repaired by weld overlay.

LER 387/2012-007-00, Unplanned Shutdown due to Unidentified Drywell Leakage: At Susquehanna, while operating at 100 percent rated thermal power, unidentified drywell leakage was slowly rising over a three-day period. Primary containment was entered to identify the source of the leak. The direct cause of the leak was a crack in the weld joining the 4 inch diameter chemical decontamination connection to the 1A reactor recirculation pump suction line. Metallurgical examinations determined that the crack occurred due to cyclic fatigue.

Plant-Specific OE

- In May 2016, a Class 2 socket weld in a Unit 1 SI line had been examined with phased array ultrasonics as a non-ASME code exam performed in response to a similar weld that leaked the previous year in Unit 2. The exam concluded there was a relevant indication in the weld. The indication was 0.2 inches long in the circumferential axis and in the vicinity of the fusion line between the root and toe. The socket weld and associated vent pipe were replaced. Failure analysis did not detect any cracking.

- In July 2015, a potential through wall leak was found in a SI pipe segment in the Unit 2 SI pump room. A small through-wall leak was identified coming from a socket weld connection between the six-inch suction piping and ¾-inch vent piping. The affected piping was ASME Class 2. The initial assessment determined likely cause of the leakage to be vibration-induced weld failure. An attempted repair utilizing ASME Code Case N-666 was made. In the course of the welding activity, a small pinhole leak was created in the vent piping. The cause was deemed to be a flaw and eventual failure of the socket weld. The failed socket weld was replaced with an improved weld leg ratio.

Although these conditions are associated with ASME Code Class 2 piping, these examples demonstrate that ASME Code piping deficiencies are entered into the CAP and appropriate actions are taken to evaluate the deficiencies and determine the root cause.

Review of plant-specific OE indicates that cracking of ASME Code Class 1 piping has not occurred. The CPNPP OE provides objective evidence that the measures in place to prevent cracking of ASME Code Class 1 small-bore piping have been effective.

The above OE provides objective evidence that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.22. External Surfaces Monitoring of Mechanical Components

Program Description

The External Surfaces Monitoring of Mechanical Components AMP is an existing condition monitoring AMP that manages aging effects of components fabricated from metallic, elastomeric, and polymeric materials through periodic visual inspection of external surfaces for evidence of loss of material, cracking, change in material properties (i.e., hardening and loss of strength), and reduction of heat transfer (i.e. cooling coil fouling). When appropriate for the component and material, physical manipulation, such as pressing, flexing, and bending, is used to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. External Surfaces Monitoring of Mechanical Components AMP is also credited for situations where the material and environment combinations are the same for the internal and external surfaces such that the external surfaces are representative of the internal surfaces. When credited, the program will describe the component internal environment and the similar credited external environment inspected, as well as provide justification for crediting the condition of the internal environment. Inspections are performed at least once every refueling cycle by personnel qualified through a plant-specific program. Deficiencies are documented and evaluated under the CAP. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the component's intended functions are maintained.

ASME Code inspections are conducted in accordance with the applicable code requirements. Non-ASME Code inspections and tests follow site procedures that include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings.

Periodic representative surface inspections of the in-scope mechanical indoor components under insulation (with process fluid temperature below the dew point) and outdoor components under insulation will be performed.

For polymeric materials, the visual inspection will include 100 percent of the accessible components. The sample size of flexible polymeric components that receive physical manipulation is at least 10 percent of the available surface area.

Acceptance criteria are defined to ensure that the need for corrective action is identified before a loss of intended function. For stainless steel, a clean shiny surface is expected. For flexible polymeric materials, a uniform surface texture (no cracks) and no change in material properties (e.g., hardness, flexibility, physical dimensions, color unchanged from when the material was new) are expected. For rigid polymeric materials, acceptable conditions are no surface changes affecting performance, such as erosion, cracking, crazing, checking, and chalking.

Inspection parameters for metallic components include the following:

- Cracking
- Corrosion (loss of material).

- Leakage from or onto external surfaces (loss of material).
- Worn, flaking, oxide coated surfaces (loss of material).
- Corrosion stains on thermal insulation (loss of material).
- Protective coating degradation (cracking, flaking, and blistering).
- Fouling of unit coolers (reduction of heat transfer).

Inspection parameters for polymer components include the following:

- Surface cracking, crazing, scuffing, and dimensional change (e.g., ballooning and necking).
- Discoloration.
- Exposure of internal reinforcement for reinforced elastomers.
- Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.
- Shrinkage, or loss of strength.

NUREG-1801 Consistency

The External Surfaces Monitoring of Mechanical Components AMP, with enhancements, will be consistent to the program described in NUREG-1801, Section XI.M36, “External Surfaces Monitoring of Mechanical Components”, as modified by LR-ISG-2012-02.

Exceptions to NUREG-1801

None.

Enhancements

The External Surfaces Monitoring of Mechanical Components AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M36. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
1. Scope	• The program will be enhanced to include elastomeric and polymeric components in the scope of the program. • The program will be enhanced to include outdoor insulated components and indoor insulated components exposed to condensation in the scope of the program to monitor for degraded conditions under insulation.

Element Affected	Enhancement
	• The program will be enhanced to clarify that below-grade components that are accessible during normal operations or refueling outages for which access is not restricted are managed by this program. • The program will be enhanced to allow external examinations to be credited to manage the aging effects of the internal surfaces of components when external conditions are representative of internal conditions.
3. Parameters Monitored or Inspected	• The program will be enhanced to include monitoring for discoloration, surface cracking, crazing, scuffing, dimensional change and hardening for polymeric and elastomeric components as well as exposure of internal reinforcement for reinforced elastomers. • The program will be enhanced to include monitoring metallic components for loss of material due to material wastage; leakage; worn, flaking or oxide coated surfaces; and corrective coating degradation; as well as corrosion stains on thermal insulation. • The program will be enhanced to include examples of components inspected, such as piping, piping components, ducting, polymeric components, insulation jacketing. • The program will be enhanced to inspect unit coolers for reduction of heat transfer. The inspection will consist of the heat transfer surfaces of unit coolers that are exposed to external condensation and are credited with a heat transfer function.
4. Detection of Aging Effects	• The program will be enhanced to ensure the inspections of surfaces readily visible during plant operations and refueling outages are performed once per refueling cycle. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. • The program will be enhanced, when non ASME Code inspections and tests are required, to ensure inspections follow site procedures that include inspection parameters for items such as lighting, distance, offset, surface coverage, and presence of protective coatings. • The program will be enhanced to include inspection for elastomeric and polymeric components through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections will cover 100 percent of accessible component surfaces. Manual or physical manipulation of flexible polymeric

Element Affected	Enhancement
	material includes touching, pressing on, flexing, bending, or otherwise manually interacting with the material in order to reveal changes in material properties, such as hardness, and to make the visual examination process more effective in identifying aging effects such as cracking. The sample size for manipulation will be at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include the following: o Surface cracking, crazing, scuffing, and dimensional change (e.g., "ballooning" and "necking"); o Loss of thickness; o Discoloration (evidence of a potential change in material properties that could be indicative of polymeric degradation); o Exposure of internal reinforcement for reinforced elastomers; and o Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.
4. Detection of Aging Effects (Cont.)	• The program will be enhanced to include inspecting insulated components in an outdoor environment or in an indoor environment that may be exposed to condensation, once every 10 years during the PEO. The population and sample sizes used for inspections will be determined based on the material type and environment combination. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank) will be inspected after the insulation is removed. Alternatively, any combination of a minimum of twenty-five 1-foot axial length sections and components from each material type is inspected, with a maximum of 25 inspections required for each material environment in each population. • The program will be enhanced to include the following alternatives to removing insulation after the initial inspection: o Subsequent inspections may consist of examination of the exterior surface of the insulation with sufficient acuity to detect indications of damage to the jacketing or protective outer layer (if the protective outer layer is waterproof) of the insulation when the results of the initial inspections meet the following criteria:

Element Affected	Enhancement
	▪ No loss of material due to general, pitting, or crevice corrosion beyond that which could have been present during initial construction is observed during the first set of inspections, and ▪ No evidence of SCC is observed during the first set of inspections. If: (a) the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or jacketing, (b) there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams/joints), or (c) the protective outer layer (where jacketing is not installed) is not waterproof, then periodic inspections under the insulation should continue as conducted for the initial inspection. o Removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. If the moisture barrier is intact, the likelihood of corrosion under insulation (CUI) is low for tightly adhering insulation. Tightly adhering insulation is considered to be a separate population from the remainder of insulation installed on in-scope components. The entire population of in-scope piping that has tightly adhering insulation is visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections are not credited towards the inspection quantities for other types of insulation. • The program will be enhanced to require selection of bounding or lead components most susceptible to CUI in an outdoor environment or in an indoor environment that may be exposed to condensation. This could be due to time in service, severity of operating conditions (e.g., amount of time that condensate would be present on the external surfaces of the component), and lowest design margin for inspection under insulation.
6. Acceptance Criteria	• The program will be enhanced to include the following acceptance criteria: o For metallic surfaces, any indications of degradation are evaluated. o For stainless steel surfaces, a clean, shiny surface is expected, and any deviation is evaluated. o For flexible polymers, a uniform surface texture and uniform color with no dimension change is expected and any deviation is evaluated.

Element Affected	Enhancement
	○ For flexible materials, changes in physical properties (e.g., the hardness, flexibility, physical dimensions, and color. of the material are unchanged from when the material was new) are evaluated. ○ For rigid polymers, surface changes affecting performance, such as erosion, cracking, crazing, and chalking, are evaluated.

Operating Experience

The following OE provides objective evidence that the External Surfaces Monitoring of Mechanical Components AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

In 2020, at the Diablo Canyon Unit 2, a leak was discovered in the AFW pipe, which resulted in inoperability of two trains of AFW. The source of the leak was an approximate 1/16-inch diameter hole in the AFW pipe. The cause was attributed to cold AFW piping that had damaged insulation, which allowed moisture and contaminants to penetrate the aluminum jacket and become absorbed by the calcium interior. These conditions led to CUI which caused an accelerated localized external corrosion. The root cause was a failure to learn from the industry with regards to the concept of CUI.

The CPNPP External Surfaces Monitoring of Mechanical Components AMP takes CUI into consideration and will be enhanced to include inspections for CUI.

Plant-Specific OE

- In 2019, surface corrosion was identified on CW piping within the SWIS. The surface corrosion was determined to be minor and resulted in no significant metal loss and no loss of structural integrity. The pipe surface corrosion was cleaned, prepared, and re-painted in accordance with site procedures.
- In 2016, degraded conditions involving corrosion on piping and supports in the FB Service Water pipe tunnel were identified. The wet, humid environment in the tunnel was a contributing factor to the degraded conditions. Sandblasting was performed on the affected piping and supports to clean and prepare the surfaces prior to being re-painted in accordance with site procedures. Sump pumps and dehumidifiers were also installed to ensure standing water is removed and to dehumidify the environment.
- In 2015, an engineering walkdown found corrosion on a condensate valve. This corrosion was determined not to compromise the structural integrity of the valve. The surface corrosion was removed, and the valve was repainted.
- In 2013, water was found under insulation in a segment of class 3 piping. The water was found to be condensation and the pipe was pitted in the area

of the trapped water. There was no through wall leakage or loss that would affect the integrity of the pipe, however there was surface corrosion. Based on the visual inspection, the system remained operable; however, a follow-up ultrasonic test (UT) was performed to confirm wall thickness. The follow-up UT confirmed the wall thickness was greater than the required minimum wall thickness. The surface corrosion was removed, and the pipe was repainted.

- In 2012, a walkdown of the SSW pipe tunnel identified piping with blistered paint and the appearance of corrosion products. The indications were random and scattered. Approximately 24 square inches of piping was observed to have corrosion product present. Visual inspection identified the two limiting indications, which were subsequently measured ultrasonically. Wall thickness in both locations exceeds the nominal wall thickness, and the piping was determined to be operable and capable of performing its intended function.

The above OE provides objective evidence that the External Surfaces Monitoring of Mechanical Components AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the External Surfaces Monitoring of Mechanical Components AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The External Surfaces Monitoring of Mechanical Components AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.23. Flux Thimble Tube Inspection

Program Description

The Flux Thimble Tube Inspection AMP is an existing condition monitoring AMP that manages loss of material due to wear of the flux thimble tubes that form part of the RCPB. This program implements the recommendations of NRC IEB 88-09, "Thimble Tube Thinning in Westinghouse Reactors," in regard to NDE such as eddy current testing or other justified and NRC-approved method used to monitor flux thimble tube wear and will continue to be used during the PEO.

The scope of the program includes the flux thimble tubes that form part of the RCPB. Wall thickness measurements are compared to previously calculated wear rates to ensure there is sufficient wall thickness in the flux thimble tubes to meet their intended function through the time period until reinspection is performed. The acceptance criteria are consistent with those previously documented in the response to NRC IEB 88-09 and its amendments. Examination frequency is based upon actual plant-specific wear data and wear predictions that have been technically justified based on conservative estimates of flux thimble wear. The interval between inspections is established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. Flux thimble tubes that do not meet the acceptance criteria are isolated, capped, plugged, withdrawn, replaced, or otherwise removed from service to ensure the integrity of the RCPB. Where appropriate, analyses are used to allow repositioning of flux thimble tubes that are approaching the acceptance criteria limit. Flux thimble tubes that cannot be inspected over the tube length of interest or that are subject to wear due to restrictions or other defects and cannot be shown to be satisfactory for continued service are removed from service.

Inspection results (including wall loss) are reported using the CPNPP CAP and are provided to the appropriate engineering personnel who evaluate, disposition, and recommend any necessary corrective actions. The evaluation determines the need for repositioning, capping or replacement of the applicable damaged flux thimble tube or may provide justification to retain the original configuration of the existing flux thimble tube if it remains within the acceptance criteria.

NUREG-1801 Consistency

The Flux Thimble Tube Inspection AMP is consistent with the program described in NUREG-1801, Section XI.M37, “Flux Thimble Tube Inspection”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

Industry OE

BMI flux thimble tube thinning caused by flow induced vibration was first reported in 1981 in three flux thimble tubes at the Salem plant. Subsequent inspections at the Salem plant and other plants identified additional worn flux thimble tubing, some with significant wall loss.

In 1987, the NRC issued IN 87-44, Thimble Tube Thinning in Westinghouse Reactors. In July of 1988, the NRC issued IEB 88-09, Thimble Tube Thinning in Westinghouse Reactors.

Due to the potential thinning of flux thimble tubes as reported in NRC IEB 88-09 CPNPP commenced examinations of the flux thimble tubes at CPNPP Unit 1 and Unit 2 using eddy current examination in 1991. Flux thimble tubes are presently examined each refueling outage.

Plant-Specific OE

Eddy current inspection results of flux thimble tubes for the last two outages of each unit were reviewed. Unit 1 inspection results were found to be satisfactory with no unexpected indication of abnormal wear on the flux thimble tubes. The previous Unit 2 inspection found wear on five thimble tubes that indicated that the projected wear during future operating cycles might exceed acceptance criteria limits. Two of the flux thimble tubes were capped and the other three were repositioned. The most recent Unit 2 inspection found wear on four thimble tubes that indicated that the projected wear during future operating cycles might exceed acceptance criteria limits. One flux thimble tube was capped and the other three were repositioned. Additionally, two flux thimble tubes were not inspected during the last Unit 2 outage inspection due to them being capped.

The above OE provides objective evidence that the Flux Thimble Tube Inspection AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Flux Thimble Tube Inspection AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Flux Thimble Tube Inspection AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.24. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components is a new condition monitoring AMP that will manage loss of material, cracking, hardening and loss of strength, and reduction of heat transfer using representative sampling and opportunistic visual inspections of the internal surfaces of metallic and elastomeric (including polymeric) components in environments of air–indoor (uncontrolled), air–outdoor, condensation, diesel exhaust, lubricating oil, R-12 gas, raw water, steam, treated water, or waste water. Internal inspections will be performed during periodic system and component surveillances or during the performance of maintenance activities when the surfaces are accessible for visual inspection.

Where practical, the inspections will focus on the components most susceptible to aging because of time in service and severity of operating conditions. At a minimum, in each 10-year period during the PEO, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) up to a maximum of 25 components per population will be inspected per Unit. Opportunistic inspections will continue in each period even if the minimum sample size has been inspected.

This AMP will also be used to manage cracking due to SCC in stainless steel components exposed to aqueous solutions. Periodic visual inspections or surface examinations may be conducted to manage cracking every 10 years during the PEO. Visual inspections will be conducted in lieu of surface examinations only when the visual inspection methods have been shown to be capable of detecting cracking.

For metallic components, visual inspection will be used to detect evidence of loss of material and reduction of heat transfer due to fouling. For non-metallic components, visual inspections and physical manipulation or pressurization will be used to detect surface irregularities. Visual examinations of elastomeric components will be accompanied by physical manipulation such that changes in material properties are readily observable. The sample size for physical manipulation will be at least 10 percent of accessible surface area.

Specific acceptance criteria will be as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Elastomers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.

Conditions that do not meet the acceptance criteria will be entered into the CAP for evaluation. Any indications of relevant degradation will be evaluated using design standards, procedural requirements, CLB, and industry codes or standards.

This AMP does not manage components in which recurring internal corrosion is a known issue. OE has not identified instances of recurring internal corrosion for components within the scope of this program.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be consistent with NUREG-1801, Section XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", as modified by LR-ISG-2012-02.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is based on the program description in NUREG-1801 Section XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, which in turn is based on industry OE that demonstrates that the activities applied in this program are effective for managing the relevant aging effects.

As discussed in element 10 to NUREG-1801, Section XI.M38, inspections of internal surfaces during the performance of periodic surveillance and maintenance activities have been in effect at many utilities in support of plant component reliability programs. These activities have proven effective in maintaining the material condition of plant SSCs. The elements that comprise these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice.

Plant-Specific OE

- The fourth quarter of 2020 Vents & Drains system health report identified a material condition within the system. A pipe segment located within the AB was identified with multiple pin hole leaks in various locations. Previous attempts to patch leaks were unsuccessful, as welding the degraded pipe was not possible. Engineering recommended a full replacement of the piping. Replacement is in progress and is tracked via corrective action and system health.

- In February of 2019, a pinhole leak downstream of a Unit 2 Vents & Drain valve within the Safeguards Building was identified. The pinhole leak was determined to not be an operability concern. The pinhole leak was due to sludge and rust buildup, and the piping was replaced.

- In January of 2017, a leak by of a Waste Processing System boundary valve was observed during cleaning of a floor drain tank strainer. A work order was issued to replace/repair the valve. The work order determined the cause of the leak was due to system sludge and pitting on the valve. The valve was repaired to prevent the leak.

A review of plant OE has not identified instances of recurring internal corrosion, for components within the scope of LR.

The above OE provides objective evidence that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.25. Lubricating Oil Analysis

Program Description

The Lubricating Oil Analysis AMP is an existing mitigative and condition monitoring AMP. The Lubricating Oil Analysis AMP manages loss of material and reduction of heat transfer in components exposed to lubricating oil within the scope of LR by maintaining the required oil quality to prevent or mitigate age-related degradation. The Lubricating Oil Analysis AMP maintains lubricating and hydraulic oil system contaminants (water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Testing activities include sampling and analysis of lubricating oil and hydraulic oil for contaminants which could be indicative of in-leakage and corrosion product buildup.

Verification of the effectiveness of the Lubricating Oil Analysis AMP will be conducted by the One-Time Inspection (B.2.3.19) AMP on selected components at susceptible locations in oil environments.

The Lubricating Oil Analysis AMP maintains oil system contaminants within acceptable limits and performs sampling for water, particle count, and other parameters to detect evidence of contamination by moisture or excessive corrosion. Water and particle concentration are not to exceed limits based on equipment manufacturer's recommendations or industry standards. Any amount of water present that would cause cloudy appearance is undesirable. Equipment with oil sample results exceeding parameter limits may be subjected to actions including, but not limited to resampling, increased sampling frequency, and additional monitoring and trending of select parameters.

NUREG-1801 Consistency

The Lubricating Oil Analysis AMP will be consistent, with enhancement, to the program described in NUREG-1801, Section XI.M39, "Lubricating Oil Analysis".

Exceptions to NUREG-1801

None.

Enhancements

The Lubricating Oil Analysis AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M39. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
6. Acceptance Criteria	Revise procedure(s) and/or PM(s) to clarify that phase-separated water in any amount is not acceptable for any component within the scope of LR.

Operating Experience

The following OE provides objective evidence that the Lubricating Oil Analysis AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

OE at some plants has identified water in the lubricating oil and particulate contamination.

This OE is considered in the development of this AMP. The Lubricating Oil Analysis AMP performs sampling for water, particle count and other parameters to detect evidence of contamination by moisture or excessive corrosion.

Plant-Specific OE

- In March 2021, the Main Feedwater Pump Turbine tripped due to particulate, water, and contamination from excessive water resulting in failure of the servo valve. Actions to clean the sump, flush the servo control loop, clean coolers, replace filters, replace the seal water controller, replace the servo valve, and fill the system with new clean oil were performed to ensure the feedwater pump turbine would operate reliably as designed upon its return to service. In addition, plant procedures were revised to improve trending and monitoring of the equipment.

- In October 2020, the Main Feedwater Pump Turbine failed to trip for the outage due to binding in a lockout solenoid valve or hydraulic trip relay. Varnish, particulate, water or stagnant oil in the solenoid valve or the stop valve hydraulic trip relay did not allow one or both valves to the correct position to trip the feedwater pump turbine. The combination of less frequent cycling and poor oil quality were the cause of the failure to trip. The lockout solenoid valve cycling frequency was increased. The oil quality issue is being addressed with a seal water controller upgrade modification and new oil conditioner modification to improve oil quality for reliable operation.

- In August 2018, increased wear particle concentration was found in the Containment Spray Pump lubricating oil sample. Bearing temperatures and the available vibration data showed no indication of abnormal operation. Due to the increasing trend, the lubricating oil was replaced.

- In February 2018, indications of increased particulates in the oil sample were found on a CCW pump during routine sampling. The angular contact thrust bearings were not tight against the shaft shoulder, and the loose fit generated increased wear particulates in the oil sample. This finding was identified while the bearings and pumps were functional. The CCW pump rotating assemblies were replaced.

- In December 2014 and December 2015, indications of water contamination on the feedwater pumps during routine oil sampling and analysis were found. The water was removed to ensure continued reliable operation of the components, and the lubricating oil for the components were sampled periodically to ensure no further adverse conditions were found.

- In May 2013, oil samples from the CCW pump outboard bearing had an elevated water particle concentration. A bearing housing flush and a final flush with approved lubricant were performed to ensure continued long-term reliability.

The above OE provides objective evidence that the Lubricating Oil Analysis AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Lubricating Oil Analysis AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Lubricating Oil Analysis AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.26. Monitoring of Neutron-Absorbing Materials Other than Boraflex

Program Description

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP is an existing condition monitoring AMP that periodically inspects and analyzes test coupons of the BORAL material in the spent fuel storage racks to determine if the neutron-absorbing capability of the material has degraded over time. This program ensures that a five (5) percent sub-criticality margin in the SFP is maintained during the PEO by monitoring for loss of material, changes in dimension, and loss of neutron-absorption capacity of the BORAL material.

The acceptance criteria for coupon surveillances are for neutron-attenuation results to show that no more than a five (5) percent decrease in boron-10 areal density has occurred, and that dimensional measurements show that an increase in thickness at any point does not exceed 25 percent of the initial thickness at that point. These criteria are established with the intent of being indicators of potential degradation that could lead to challenges to the five (5) percent sub-criticality margin. Failure to meet the established criteria results in the condition being entered in the CAP.

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP monitors changes in condition of the BORAL material in the spent fuel storage racks through visual inspections, dimensional measurements, neutron-attenuation testing, and weight and specific gravity measurements of representative test coupons. The primary measurements used to characterize performance of the BORAL coupons are dimensional measurements (to detect bulging or swelling) and neutron-attenuation testing (to confirm the boron-10 areal density). Results of each coupon surveillance are documented and retrievable for purposes of trending. Acceptance criteria thresholds are established as indicators of potential adverse trends in the condition of the BORAL material to ensure corrective actions are taken prior to compromising the five (5) percent sub-criticality margin as contained within the SFP criticality analysis.

The existing coupon inspection frequency ensures at least one (1) coupon is examined every 10 years, regardless of OE.

NUREG-1801 Consistency

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP, with enhancements, will be consistent with NUREG-1801, Section XI.M40, “Monitoring of Neutron-Absorbing Materials Other Than Boraflex”.

Exceptions to NUREG-1801

None.

Enhancements

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.M40. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
7. Corrective Actions	Update procedures to ensure the required corrective action to address failed acceptance criteria includes a comparison of current and future predicted parameters to the assumptions of the SFP criticality analysis.

Operating Experience

The following OE provides objective evidence that the Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- A response to GL 2016-01 was generated to demonstrate that credited neutron-absorbing materials in the SFP of power reactors and the fuel storage pool, reactor pool, or other wet locations designed for the purpose of fuel storage, as applicable, for non-power reactors, are in compliance with the licensing and design basis. CPNPP staff stated that for the Region I spent fuel storage racks, the neutron-absorbing material monitoring program at CPNPP Units 1 and 2 has been incorporated into the licensing basis through an NRC-approved TS change. Therefore, CPNPP Units 1 and 2 satisfies the GL-2016-01 requirements to submit a “Category 3” response.

- Industry OE related to this program is documented in NUREG-1801, Revision 2. The OE that noted blistering being reported from Seabrook and Beaver Valley is applied to the program at CPNPP with the inclusion of visual examinations for blistering as part of the detection of aging effects element of the program. The OE discussing loss of material and loss of neutron-absorbing capacity from Vogtle and Palisades is considered by the program by including both density and areal density measurements in the detecting of aging affects element of the program.

- Additional industry OE is captured in NUREG-2191 Section XI.M40. CPNPP addresses the OE of observed weight loss of coupons in Calvert Cliffs Unit 1 and Crystal River Unit 3 by including weight and density measurements in the detection of aging affects and monitoring and trending sections of the program. CPNPP addresses the OE from Kewaunee in a similar fashion, by including areal density measurements in the detection of aging affects and monitoring and trending sections of the program.

Plant-Specific OE

- In 2013, 2015, and in 2018, SFP coupons were tested, measured, and photographed to document the condition of the coupons. The coupons were found in good condition with no visible signs of degradation, blistering, warping, pitting or general corrosion. Neutron Attenuation testing of four of the six coupons showed a greater than 5 percent decrease below the initially reported value, which is outside the acceptance criteria of 5 percent. Further investigation concluded that the measured results demonstrate no measurable loss of boron material from the test coupons. This was based on comparison of the test coupon results to similar testing performed on archived test coupons which have been stored in a dry stable environment. The initial baseline tests were performed using a less accurate chemical test methodology, and it has been demonstrated that the difference in recent test results and the baseline values are the result of measurement uncertainty. The minimum B-10 measurement was well above the conservative value utilized in the Region I criticality analysis.

The above OE provides objective evidence that the Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Monitoring of Neutron-Absorbing Materials Other than Boraflex AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.27. Buried and Underground Piping and Tanks

Program Description

The Buried and Underground Piping and Tanks AMP is an existing preventive, mitigative, and condition monitoring AMP that manages the aging effects associated with the external surfaces of buried and underground piping and tanks for loss of material and loss of coating integrity. The AMP addresses piping and tanks constructed of metallic (carbon steel, cast iron, and cement lined ductile iron) materials for the in-scope systems (SSW, emergency diesel generator (fuel oil), and fire protection).

This AMP treats cast iron and cement lined ductile iron as “steel.” There are no polymeric, cementitious, or metallic materials other than those metals previously stated for the in-scope systems, therefore, the aging management of these materials is not applicable.

The objective of this program is accomplished through the use of preventive, mitigative, condition monitoring, and in some cases, performance monitoring activities. The Buried and Underground Piping and Tanks AMP includes (a) preventive and mitigative measures to address degradation (e.g., external coatings, proper backfill, cathodic protection), (b) visual inspections of external surfaces of buried components for evidence of coating/wrapping damage, and (c) visual inspections of external surfaces of buried components for evidence of degradation, if the coating or wrapping is damaged or the pipe is uncoated or unwrapped, to manage the effects of aging. Opportunistic inspections are performed when components are excavated during scheduled maintenance work. Periodic inspections will also be performed based on plant OE and the performance of the plant cathodic protection system. Annual cathodic protection surveys are conducted. For steel components, the acceptance criteria for the effectiveness of the cathodic protection is less than or equal to -850 mV. Periodic inspections will occur once prior to the PEO and at least every 10 years during the PEO. If an opportunistic inspection occurs prior to a scheduled periodic inspection, the opportunistic inspection can be credited for satisfying that inspection.

The Buried and Underground Piping and Tanks AMP manages applicable aging effects of loss of material and loss of coating integrity. Components addressed by this program, fabricated of steel, use preventive and mitigative techniques including external coatings, cathodic protection, and quality backfill. Program activities include periodic surveys of cathodic protection, nondestructive evaluation of pipe and tank wall thicknesses, and visual inspections of the pipe or tank coatings from the exterior.

NUREG-1801 Consistency

The Buried and Underground Piping and Tanks AMP, with enhancements, will be consistent with one exception to the program described in NUREG-1801, as modified by LR-ISG-2015-01, Section XI.M41, “Buried and Underground Piping and Tanks”.

Exceptions to NUREG-1801

Exception to Element 4, Detection of Aging Effects

The DGFOSTs are inspected internally every 20 years through visual inspection and ultrasonic thickness measurements. The current wall thickness is evaluated for acceptability of the expected wall thickness at the next scheduled inspection based upon historical corrosion rates.

Justification for the Exception

Draining, cleaning, and visual inspection have been performed multiple times for the EDG fuel oil storage tanks (twice for 1-01, 1-02, and 2-01 tanks, and three times for the 2-02 tank), and all four tanks were found to be in exceptional condition each inspection with minimal sludge and have required very little cleaning. The tanks are maintained between approximately 85% and 97% full, thus very little of the interior surface area is exposed to oxygen. The exteriors of the tanks are coated, excavated areas surrounding the tanks are properly backfilled, ground water elevation is below the elevation of the tank foundations, and the site cathodic protection system is regularly surveyed and maintained. Recent cathodic protection performance (within the 10-yr period prior to the PEO) was reviewed based on pipe to soil potentials taken during annual surveys, which indicates the FOSTs are being satisfactorily protected by the system. Additionally, each tank is sampled monthly for accumulated water and sediment with any accumulated water removed in a timely manner.

Soil corrosivity samples around the site were taken in 2010. The soil sample analysis indicated the corrosion potential of buried systems was mitigated to minimal levels by sufficient cathodic protection.

Prior to being placed in service, each EDG fuel oil storage tank was inspected, and UT readings were taken. The UT readings were taken using a 42-point gridded inspection plan. Re-inspections, on a 10-year interval after being place in service, found the tanks with satisfactory results. Using the available UT data, the projected remaining life of each tank before reaching the minimum allowable tank wall thickness was calculated. The projected time to min wall values have been found to be all over 60 years with the exception of a single location on the 2-01 tank where the estimated time to min wall is at 36.8 years. With an inspection frequency of 20 years, even this most restricting wall measurement will be bounded and the time to reach min wall reassessed during the next inspection. Based on each new set of UT results, tank inspection frequencies will be assessed to assure that the intended function of the EDG fuel oil storage tanks are maintained during the period of extended operation.

The scheduled inspection of each EDG fuel oil storage tank will occur within the first 10 years of the PEO.

Enhancements

The Buried and Underground Piping and Tanks AMP will be enhanced as follows, for alignment with NUREG-1801, as amended by LR-ISG-2015-01. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
1. Scope of Program	Revise procedures to manage loss of material due to corrosion of piping system bolting within the scope of this program.
2. Preventive Actions	Revise cathodic protection procedures to implement the requirements of NACE SP0169-2007 or NACE RP0285-2002.
3. Parameters Monitored and Inspected	Ensure pit depth gages or calipers used for measuring wall thickness have been demonstrated to be effective for the material, environment, and conditions (e.g., remote methods) during the examination, and they are capable of quantifying general wall thickness and the depth of pits.
4. Detection of Aging Effects	• Revise procedures to state that inspections of buried and underground piping and tanks within the fire protection, SSW, and emergency diesel generator and auxiliary systems will be conducted in accordance with LR-ISG-2015-01 Table XI.M41-2 for steel. The inspections will be distributed evenly among the units. Since CPNPP is a two-unit site, the inspection quantities are 50% greater than LR-ISG-2015-01 Table XI.M41-2 and are rounded up to the nearest whole inspection. When the inspection for a given material type is based on percentage of length and results in an inspection quantity of less than 10 feet, then 10 feet of piping is inspected. If the entire run of piping of that material type is less than 10-feet in total length, then the entire run of piping is inspected. • Revise procedures to ensure a minimum of 25% of the internal surface of the diesel generator fuel oil storage tank, including the upper and lower portion of the tank and tank endbells, is inspected volumetrically.
5. Monitoring and Trending	• Revise cathodic protection procedures to trend potential difference and current measurements to identify changes in the effectiveness of the systems and/or coatings. • Revise procedures to trend the fire pump activity (or similar parameter) to identify concerns with buried fire water yard loop header leakage.

Element Affected	Enhancement
6. Acceptance criteria	• Ensure type and extent of coating degradation is evaluated by evaluators who: (a) possesses a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) who has completed the Electric Power Research Institute (EPRI) Comprehensive Coatings Course and completed the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training Course; or (c) a coatings specialist qualified in accordance with an ASTM standard endorsed in RG 1.54, Rev. 2, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." • Where loss of material is identified, the measured wall thickness is projected to the end of the period of extended operation such that minimum wall thickness requirements are maintained. • Revise acceptance criteria to ensure there is no evidence that backfill caused damage to the respective component coatings or the surface of the component (if not coated), and changes in fire pump activity (or similar parameter) that cannot be attributed to causes other than leakage from buried piping are not occurring.
7. Corrective Actions	• Revise procedures to conduct an extent of condition evaluation when damage to a coating has been evaluated as significant and the damage was caused by nonconforming backfill to determine the extent of degraded backfill in the vicinity of the observed damage. • Revise procedures to state unacceptable cathodic protection survey results are entered into the plant corrective action program. • Revise procedure to state when using the option of monitoring the activity of a fire pump instead of inspecting buried fire water system piping, a flow test or system leak rate test is conducted by the end of the next refueling outage or as directed by the current licensing basis, whichever is shorter, when unexplained changes in fire pump activity (or equivalent equipment or parameter) are observed. • If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. This may include

Element Affected	Enhancement
	different values for large area minimum wall thickness and local area wall thickness. If the wall thickness extrapolated to the end of the period of extended operation meets minimum wall thickness requirements, recommendations for expansion of sample size, below do not apply. • Revise procedures to state where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired, or the affected component is replaced. In addition, where the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the period of extended operation, an expansion of sample size is conducted. The number of inspections within the affected piping categories are doubled or increased by 5, whichever is smaller. If the acceptance criteria are not met in any of the expanded samples, an analysis shall be conducted to determine the extent of condition and extent of cause. The timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. However, in all cases, the expanded sample inspection is completed within the 10-year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. These additional inspections conducted during the four years following the end of an inspection interval cannot also be credited towards the number of inspections in Table XI.M41-2 for the following 10-year interval. The number of inspections may be limited by the extent of piping or tanks subject to the observed degradation mechanism. The expansion of sample inspections may be halted in a piping system or portion of system that will be replaced within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval.

Operating Experience

The following OE provides objective evidence that the Buried and Underground Piping and Tanks AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

OE shows that buried and underground piping and tanks are subject to corrosion. The following examples of industry experience are noted:

- In August 2009, a leak was discovered in a portion of buried aluminum alloy pipe where it passed through a concrete wall. The piping is in the condensate transfer system. The failure was caused by vibration of the pipe within its steel support system. This vibration led to coating failure and eventual galvanic corrosion between the aluminum alloy pipe and the steel supports. (Reference ML093160004).
- In June 2009, an active leak was discovered in buried piping associated with the CST. The leak was discovered because elevated levels of tritium were detected. The cause of the through-wall leaks was determined to be the degradation of the protective moisture barrier wrap that allowed moisture to come in contact with the piping, resulting in external corrosion. (Reference ML093160004).
- In April 2010, while performing inspections as part of its buried pipe program, a licensee discovered that major portions of its auxiliary feedwater piping were substantially degraded. The licensee's cause determination attributes the cause of the corrosion to the failure to properly coat the piping "as specified" during original construction. The affected piping was replaced during the next refueling outage. (Reference ML103000405).
- In November 2013, minor weepage was noted in a 10-inch service water supply line to the emergency diesel generators while performing a modification to a main transformer moat. Coating degradation was noted at approximately ten locations along the exposed piping. The leaking and unacceptable portions of the degraded pipe were clamped and recoated until a permanent replacement could be installed. (Reference ML13329A422).

The above industry OE is included within the GALL AMP guidance, which has been applied for CPNPP.

Plant-Specific OE

- In September 2015, a self-assessment identified an area for improvement in the Underground Piping Program. A cathodic protection system modification was completed in December 2013 and had shown a decline in performance over time. The vendor provided a recommendation to ‘hydrate’ the anode wells in order to increase current output and improve performance of the system. A PM was written to hydrate the anode wells every 121 days (4 months). After completion of the annual inspection, the frequency of the

PM was increased. Since this action there has been a general improvement in the cathodic protection system.

- In April of 2015, an opportunistic inspection was performed during the excavation process for a potable water leak which exposed Fire Protection piping. The inspection noted coating (coal tar wrap) damage. The inspection noted construction dunnage still in place under the pipe, which is not in compliance with the requirements of 2323-SS-008, CPSES Excavation and Backfill Specification. The wood dunnage was removed, and the coatings and pipe were inspected for pitting and corrosion. The pipe metal was found to be in good shape. The damaged coatings were removed, and the pipe was re-wrapped in coal tar wrapping. A -910 mV Pipe-to-Soil reading was taken and determined that the Cathodic Protection System had been protecting the pipe.
- Program health reports and performance indicators are periodically issued to management to determine the condition of the program. Attributes included in the health reporting include program personal proficiency, program documentation health and corrective action, asset management plan adherence, and failure of in-scope and out of scope piping and tanks. A program notebook is also maintained to provide an easy reference for program information, documentation, and OE. Health reports for 2016 identified that the cathodic protection system had a small percentage of test points not achieving performance acceptance criteria. Improvement of the system is tracked via corrective action. The 2018 and 2019 health reports identified some issues with potable water leaks. The 2020 plant health report did not identify any pipe leaks for piping within a twelve month period.

The above OE provides objective evidence that the Buried and Underground Piping and Tanks AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Buried and Underground Piping and Tanks AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Buried and Underground Piping and Tanks AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.28. Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

Program Description

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is an existing condition monitoring AMP that has the principal objective to manage the aging effects of loss of material and loss of coating/lining integrity.

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP manages degradation of internal coatings/linings exposed to raw water, treated water, and air that can lead to loss of material of base materials or downstream effects such as reduction in flow, reduction in pressure or reduction of heat transfer when coatings/linings become debris. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is not used to manage loss of coating integrity for external coatings. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP performs inspections of coatings/linings applied to components which are managed by the Open-Cycle Cooling Water AMP, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP, and the Fire Water System (B.2.3.16) AMP.

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP manages these aging effects for internal coatings by conducting periodic visual inspections of coatings/linings applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component's or downstream component's CLB intended function(s). Where visual inspection of the coated/lined internal surfaces determines the coating/lining is deficient or degraded, physical tests may be performed, where physically possible, in conjunction with the visual inspection. The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP uses the following acceptance criteria:

- Indications of peeling and delamination are not acceptable.
- Acceptance criteria for adhesion testing, when performed, is contained in plant procedures specific to the coating/lining and substrate.
- Blisters, cracking, flaking, and rusting are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections.
- Minor cracking and spalling of cementitious coatings/linings is acceptable provided there is no evidence that the coating/lining is debonding from the base material.
- As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements.

For heat exchangers, all accessible surfaces are inspected. The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in RG 1.54 including guidance from the staff associated with a particular standard. Peeling and delamination is not acceptable. Blisters are evaluated by a coatings specialist with the blisters being surrounded by sound material and with the size and frequency not increasing. All other degraded conditions are evaluated by a coatings specialist. For coated/lined surfaces determined to not meet the acceptance criteria, physical testing may be performed in conjunction with repair or replacement of the coating/lining.

NUREG-1801 Consistency

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, with enhancements, will be consistent with exceptions to the program described in NUREG-1801, Section XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”, as added by LR-ISG-2013-01.

Exceptions to NUREG-1801

Exception 1 to Element 1, Scope of Program

The scope of the program is internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, fuel oil, and lubricating oil where loss of coating or lining integrity could prevent satisfactory accomplishment of any of the component’s or downstream component’s CLB intended functions identified under 10 CFR 54.4(a)(1), (a)(2), or (a)(3). The Internal Coatings AMP includes the environment of air.

Justification for Exception 1

NUREG-1801 Section XI.M42 identifies the environments of water, fuel oil, and lubricating oil for internal coated environments. The Internal Coatings AMP has included air as an environment as the EDG combustion air subsystem contains an internally coated component that requires aging management. The additional environment does not alter any of the remaining ten elements in regard to inspection or requirements for addressing degradation.

Exception 2 to Element 3, Parameters Monitored or Inspected and Element 4, Detection of Aging Effects

NUREG-1801 Section XI.M42 recommends baseline inspections as well as on-going visual periodic inspections to detect coating degradation along with physical testing to determine extent of coating damage. The SI Pump Lube Oil Cooler Reservoirs are not inspected in accordance with these elements due to physical limitations.

Justification for Exception 2

The SI Pump Lubricating Oil Reservoirs are internally lined. CPNPP samples the lubricating oil quarterly, and the system includes an oil filter to remove debris and particulates prior to oil reaching the bearings. The oil filter is cleaned quarterly as part of the lubricating oil sampling activities. The combination of quarterly oil sampling and the use of an oil filter which is periodically cleaned provides reasonable assurance that coating/lining degradation will be detected prior to loss of intended function of the SI pumps. This alternate approach has been identified and accepted in an early LRA where that facility had a similar arrangement for SI pump lube oil reservoirs. (Reference ML1582A051). The Lubricating Oil Analysis (B.2.3.25) and One-Time Inspection (B.2.3.19) AMPs are used to manage aging effects.

Exception 3 to Element 4, Detection of Aging Effects

NUREG-1801 Section XI.M42 recommends baseline coating/lining inspections to occur in the 10-year period prior to the period of extended operation. Subsequent inspections are based on an evaluation of the effect of a coating/lining failure on the in-scope component's intended function, potential problems identified during prior inspections, and known service life history. The Internal Coatings AMP will perform periodic flow testing as well as opportunistic inspections of the cement lining applied to the internal surface of buried fire protection piping based on the guidance in SLR-ISG-2021-02-MECHANICAL.

Justification for Exception 3

Flow testing to detect flow restrictions due to deterioration of the internal lining will occur at intervals specified by NFPA 25, as required by the Fire Water System (B.2.3.16) AMP. Opportunistic inspections will be performed whenever the piping system is accessed for maintenance activities. Through-wall flaws in piping will be detected through continuous monitoring of system pressure monitoring through a main control room alarm in accordance with the CPNPP Fire Protection Report, Section II, Subsection 6.3.3. CPNPP OE has been reviewed and has not found evidence of leaks due to age-related degradation of representative internal coatings (cement lining) used in the buried in-scope fire water system components. This alternative is supported by guidance found in SLR-ISG-2021-02-MECHANICAL.

Exception 4 to Element 7, Corrective Actions

Regardless of physical constraints, lightly tapping the coating/lining surrounding a blister may be performed as an alternative to adhesion testing in order to determine whether the remaining coating/lining is tightly bonded to the base metal.

Justification for Exception 4

Adhesion testing using ASTM international standards endorsed in RG 1.54 is destructive to the coating/lining. These adhesion testing methods are based on using tape tests (ASTM D 3359-09), portable adhesion testers (ASTM D 4541-09), or a knife (ASTM D 6677-07). Therefore, there is no potential for a blister to remain in service after adhesion testing. Lightly tapping the coating/lining is an appropriate alternative for testing blisters in a non-destructive manner and determining whether the coating/lining is tightly bonded to the base metal.

Enhancements

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP will be enhanced as follows, for alignment with LR-ISG-2013-01. Pre-PEO inspections and program enhancements are to be completed no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
1. Scope	Include the following internal coatings/linings in the scope of the AMP: • Emergency Diesel Generator Intercoolers • Fire Protection Cement-lined Piping • Internally Coated Four Inch Service Water Piping within the SWIS
3. Parameters Monitored or Inspected	Perform visual inspections capable of identifying flaking, peeling, delamination, and spalling.
4. Detection of Aging Effects	• Perform baseline inspections of coatings/linings in the 10-year period prior to the PEO for the: o Emergency Diesel Generator Intercoolers o Internally Coated Four Inch Service Water Piping within the SWIS • Perform subsequent inspections based on an evaluation of the effect of a coating/lining failure on the in-scope component's intended function, potential problems identified during prior inspections, and known service life history. Subsequent inspection intervals are established by a coating specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Inspection intervals should not exceed those in LR-ISG-2013-01 Table 4a, "Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers." • Perform inspections of all accessible internally coated surfaces of in-scope heat exchangers. • Establish qualifications for cementitious coatings/linings inspectors to have a minimum of 5 years of experience inspecting or testing concrete structures or cementitious coatings/linings, or a degree in the civil/structural discipline and a minimum of 1 year of experience. • Perform opportunistic inspections of the cement lining applied to the internal surface of buried fire protection piping.

Element Affected	Enhancement
5. Monitoring and Trending	• Perform a pre-inspection review of the previous two inspections, when available that includes reviewing the results of inspections and any subsequent repair activities. • Prepare post-inspection reports, by a coatings specialist, to include: a list and location of all areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. When corrosion of the base material is the only issue related to coating/lining degradation of the component and external wall thickness measurements are used in lieu of internal visual inspections of the coating/lining, the corrosion rate of the base metal is trended.
6. Acceptance Criteria	Include the following acceptance criteria: • Indications of peeling and delamination are not acceptable. • Blisters, cracking, flaking, and rusting are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections. • Minor cracking and spalling of cementitious coatings/linings is acceptable provided there is no evidence that the coating/lining is debonding from the base material. • As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements.
7. Corrective Actions	Revise corrective actions to include the following: • As an alternative to repair/replacement, coatings exhibiting indications of peeling and delamination may be returned to service if: (a) physical testing is conducted to ensure that the remaining coating is tightly bonded to the base metal; (b) the potential for further degradation of the coating is minimized, (i.e., any loose coating is removed, the edge of the remaining coating is feathered); (c) adhesion testing using ASTM International standards endorsed in RG 1.54 is conducted at a minimum of 3 sample points adjacent to the defective area; (d) an evaluation is conducted of the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component; and (e) follow-up visual inspections of the degraded coating are conducted within 2 years from detection of the degraded condition, with a re-inspection within an additional 2 years, or until the degraded coating is repaired or replaced.

Element Affected	Enhancement
	• If coatings/linings are credited for corrosion prevention (e.g., corrosion allowance in design calculations is zero, the "preventive actions" program element credited the coating/lining) and the base metal has been exposed or it is beneath a blister, the component's base material in the vicinity of the degraded coating/lining will be examined to determine if the minimum wall thickness is met and will be met until the next inspection. • If a blister is not repaired, physical testing may be conducted to ensure that the blister is completely surrounded by sound coating/lining bonded to the surface. Physical testing consists of adhesion testing using ASTM International standards endorsed in RG 1.54. An alternative means of determining that the remaining coating/lining is tightly bonded to the base metal may be conducted such as lightly tapping the coating/lining. Acceptance of a blister to remain in-service should be based both on the potential effects of flow blockage and degradation of the base material beneath the blister.

Operating Experience

The following OE provides objective evidence that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, And Tanks AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

The inspection techniques and training of inspection personnel associated with this program are consistent with industry practice and have been demonstrated effective at detecting loss of coating or lining integrity. Not-to-exceed inspection intervals have been established that are dependent on the results of previous plant-specific inspection results. The following examples describe OE pertaining to loss of coating or lining integrity for coatings/linings installed on the internal surfaces of similar in-scope components to those at CPNPP:

- In June 2014, as part of a fire valve replacement project at Peach Bottom Atomic Power Station, point indications on the internal concrete lining of main fire piping were identified. The condition was entered into the CAP. To further assess the condition of the concrete lining, a section of the piping was removed and sent to Exelon Power Labs for evaluation. The piping was sectioned into two pieces to investigate the condition of the concrete lining. Visual examination found the lining to be in good condition. The concrete was tightly adhered to the pipe inner surface with no evidence of degradation. The concrete was then removed from the piping to perform metallurgical evaluation of the base metal. The piping inner surface was found to be in excellent condition. Dimensionally, the piping was found to be in the expected thickness range, and hardness was consistent with that expected for grey cast iron material. The concrete was uniform in thickness. Chemical analysis of the concrete was performed. Alkalinity and pH were found to be typical for concrete material. (Reference ML18193A773)

- In July 2011, during routine surveillance testing at Seabrook Station, Service Water flow through the Train 'B' DG heat exchanger was identified as degraded. At that time, the apparent cause of the flow degradation was postulated to be macrofouling of the heat exchanger or flow orifice. A corrective action document was initiated to inspect the heat exchanger and flow orifice during the next outage. In October 2011, Seabrook entered a forced outage for unrelated reasons and the Train 'B' DG heat exchanger downstream flow orifice was inspected. Inspection revealed that pieces of Plastisol polyvinyl chloride (PVC) lining of sufficient size so as to partially restrict flow through the orifice had become detached from the pipe. Damaged lining was removed or remediated, and the remainder scheduled for replacement with a corrosion resistant, unlined material during the next refueling outage. This piping was installed in 1994 to manage corrosion of a previous piping type discovered in 1992. At the time that the design change was initiated, the liner material was noted to have an anticipated service life of 15–20 years. Inspections at Seabrook from 1996–2003 found some minor defects and was effective in managing the internal coating until periodic inspection of the Plastisol PVC lined piping was discontinued in favor of a new long-term inspection strategy. (Reference ML18113A146)

The industry OE above forms the basis for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, And Tanks AMP, as this AMP is based off of the GALL Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, And Tanks AMP, which considers this industry OE.

<u>Plant-Specific OE</u>

- In October 2017, a Unit 1 CCW heat exchanger was found with coating defects and pitting at the inlet and outlet manway sealing flanges. The pits were evaluated by a coatings engineer and determined to not require repair as they were located on a sealing surface at the edge of the coating where a gasket is placed between the two flanges (manway cover flange and heat exchanger flange).

- In April 2014, discoloration on the lower section of a Unit 2 EDG right bank intercooler shell was found during a borescopic inspection. The discoloration was noted to be a sign of jacket water leakage (chemical residue) from the tube side of the intercooler which did not affect the operation of the intercooler. The intercooler was subsequently replaced, and periodic maintenance was initiated to clean/replace the intercoolers going forward. This OE item is not directly related to loss of coating or lining integrity; however, the intercooler replacement in 2014 is relevant to future inspections to note the age of the 2-01 EDG right bank intercooler coating.

- In October 2012, a Unit 2 CCW Heat Exchanger was found with blistering in the coating applied to the heat exchanger outlet end bell (service water side). The coating on the outlet end bell was subsequently removed and was not replaced. The CCW Heat Exchangers continue to be inspected routinely under the PM program.

- SI pump lubricating oil is sampled quarterly, and the system includes an oil filter to remove debris and particulates prior to oil reaching the bearings. A review of OE since 2011 indicates that no evidence of coating degradation has been found in the internally coated SI pump lubricating oil reservoirs.

The above OE provides objective evidence that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.29. ASME Section XI, Subsection IWE

Program Description

The ASME Section XI, Subsection IWE AMP is an existing AMP based on ASME Section XI, Subsection IWE requirements and complies with the provisions of 10 CFR 50.55a "Codes and Standards."

The ASME Section XI, Subsection IWE AMP is a condition monitoring AMP that provides for periodic examination of the Containment Structure surfaces and components, including bolting for containment closure, containment liner, containment penetrations (electrical, instrumentation, and control assemblies), mechanical penetrations, penetration bellows at the containment boundary, penetration sleeves at the containment boundary, personnel airlock and equipment hatch, and the moisture barrier for cracking, loss of leak-tightness, loss of material, loss of preload, and loss of sealing.

The inspection methods specified in this AMP include periodic visual, surface, and volumetric examinations, where applicable, of the steel liner of each concrete containment and their integral attachments for signs of degradation, damage, irregularities including discernable liner plate bulges, and for coated areas distress of the underlying metal shell or liner, and corrective actions. The AMP addresses the E-A, E-C, and E-G examination categories described in Table IWE-2500-1 and as approved per 10 CFR 50.55a. The AMP specifies examinations of accessible surfaces to detect aging effects as addressed in IWE-3500. The frequency and scope of examinations specified are in accordance with ASME Section XI, Subsection IWE-2400. Acceptability of inaccessible areas of steel containment shell or concrete containment steel liner is evaluated when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation in inaccessible areas.

Final reports are generated for engineering evaluations in accordance with Code Case N-532-4. Inspections that reveal evidence of degradation exceeding the acceptance standards shall be subjected to additional inspections to determine the nature and extent of the condition. The degraded condition will be addressed through an engineering evaluation, repair, replacement, or an analytical evaluation in accordance with IWE-3300. Repair/Replacement Activities are performed in accordance with 10 CFR 50.55a and IWA-4000.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE AMP, with enhancements, will be consistent with NUREG-1801, Section XI.S1, “ASME Section XI, Subsection IWE”.

Exceptions to NUREG-1801

None.

Enhancements

The ASME Section XI, Subsection IWE AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.S1. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
2. Preventive Actions	Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR 104213 with the existing procedures and practices for structural bolting.
2. Preventive Actions	Prohibit the use of molybdenum disulfide or other sulfur containing lubricants for structural bolts.
4. Detection of Aging Effects	Monitor cracking due to cyclic loading of non-piping penetrations and DMWs between the stainless steel piping and the steel sleeve/forging by periodic supplemental surface examinations consistent with the frequency of this AMP and the 10 CFR Part 50, Appendix J AMP.
4. Detection of Aging Effects	Implement pre-PEO supplemental one-time inspections, performed by qualified personnel using methods capable of detecting cracking due to SCC, comprising (a) a representative sample (4 penetrations and 1 transfer tube) of the stainless steel penetrations or DMWs associated with high-temperature (temperatures above 140°F) stainless steel piping systems use on each unit; and (b) the stainless steel fuel transfer tube on each unit. These inspections are intended to confirm the absence of SCC.

Operating Experience

The following OE provides objective evidence that the ASME Section XI, Subsection IWE AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- In May 2016, the NRC issued RIS 2016-07, Containment Shell or Liner Moisture Barrier Inspection. CPNPP performed a pre-implementation compliance review and concluded that CPNPP had no gaps for the CISI program plan. The CISI program plan ensures that the containment shell or liner moisture barrier materials are properly inspected in accordance with ASME Code Section XI, Table IWE-2500-1, Item E1.30.

- In May 2014, the NRC issued IN 2014-07, "Degradation of Leak Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner." The purpose of this IN 2014-07 was to inform plants of issues identified concerning the degradation of floor weld leak-chase channel systems of steel containment shell and concrete containment metallic liner that could affect leak-tightness and aging management of containment structures. IN 2014-07 was evaluated by CPNPP and concluded that they are not vulnerable to degradation of leak chase channel systems for floor welds of MC shell and concrete containment metallic liner. CPNPP does not have the same configuration of leak chase channel vents as described in the industry events. Access to the compartmented air chamber is through ¼" diameter schedule 80 pipes with threaded caps and these stand above the containment floor elevation.

- NRC IN 2011-15, "Steel Containment Degradation and Associated License Renewal Aging Management Issues," is not applicable to CPNPP as the IN dealt with Torus and Drywell degradation and CPNPP is a PWR plant with no drywell or torus.

- NRC IN 97-10, "Liner Plate Corrosion in Concrete Containments," IN 2004-09, "Corrosion of Steel Containment and Containment Liner," and IN 2010-12, "Containment Liner Corrosion," identified specific locations where concrete containments are susceptible to liner plate corrosion. Based on the OE, it was concluded that there were no degradations reported to the CPNPP Unit 1 or Unit 2 containment liners, penetrations, hatches, and pressure retaining bolting. A bulge to the Unit 1 liner was documented and evaluated. UT measurements obtained at the area in question established that there was no degradation to the containment liner. It was concluded that CPNPP Programs and procedures to inspect the containment liner would identify any potential areas subject to corrosion.

- NRC IN 92-20, "Inadequate Local Leak Rate Testing," describes OE of inadequate local leak rate testing of two-ply steel expansion bellows that were used on some piping penetrations. This is not applicable to CPNPP in that installed bellows assemblies, which are also containment isolation barriers, are of the single ply design.

These examples provide objective evidence that industry OE is being reviewed and evaluated to confirm that station testing procedures are effective to maintain containment integrity.

<u>Plant-Specific OE</u>

- Per the requirements of ASME Code Section XI, IWA 6000, CPNPP submits an Owner's Activity Report (OAR) summarizing ISIs performed for each outage. To date, these examinations have been effective in managing the effects of aging. There is no documented evidence of degraded conditions like bulges in the liner plate, etc.; therefore, it is concluded that CPNPP has no liner corrosion issues that originated on the concrete inaccessible side of the liner.

- In April 2011, ISI visual examination of the Unit 2 Containment Personnel Emergency Airlock found a loose bolt on the handwheel gear box. The loose bolt was reported as an indication. The bolt was tightened, and reinspection was completed during the Unit 2 Spring 2011 outage (2RF12).

The above OE provides objective evidence that the ASME Section XI, Subsection IWE AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the ASME Section XI, Subsection IWE AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The ASME Section XI, Subsection IWE AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.30. ASME Section XI, Subsection IWL

Program Description

The ASME Section XI, Subsection IWL AMP is an existing condition monitoring AMP that manages aging of the reinforced concrete containments and is performed in accordance with ASME Code Section XI, Subsection IWL, and consistent with 10 CFR 50.55a "Codes and Standards."

The primary inspection methods specified in this AMP are general visual examinations of accessible concrete surfaces for evidence of deterioration and distress that may affect the structural integrity of the containment concrete and detailed visual examinations for suspect areas or areas involved in repair/replacement activities to determine the magnitude and extent of deterioration or distress. The ASME Section XI, Subsection IWL AMP manages the aging effects of cracking, increase in porosity and permeability, loss of bond, loss of material, and loss of strength. Acceptability of inaccessible areas is evaluated when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation in inaccessible areas.

The frequency of examination is consistent with IWL-2410. Final reports are generated for engineering evaluations. Inspections that reveal evidence of degradation exceeding the acceptance standards shall be subjected to additional inspections to determine the nature and extent of the condition. The degraded condition will be addressed through an engineering evaluation, repair, replacement, or an analytical evaluation in accordance with IWL-3300. Repair/Replacement Activities are performed in accordance with approved procedures or instructions in accordance with 10 CFR 50.55a and IWL-4000.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL AMP, with enhancements, will be consistent with NUREG-1801, Section XI.S2, “ASME Section XI, Subsection IWL”.

Exceptions to NUREG-1801

None.

Enhancements

The ASME Section XI, Subsection IWL AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.S2. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Clarify that deterioration and distress includes damage or degradation, such as those described in ACI 201.1 and ACI 349.3R.

Element Affected	Enhancement
4. Detection of Aging Effects	Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R.
5. Monitoring and Trending	Specify that inspection results are to be compared to previous results to identify changes from prior inspections, and that quantitative measurements and qualitative information are recorded and trended for applicable parameters monitored or inspected.
6. Acceptance Criteria	Include a statement that quantitative acceptance based on the “Evaluation Criteria” provided in Chapter 5 of ACI 349.3R shall be used to augment the qualitative assessment of the Responsible Engineer.

Operating Experience

The following OE provides objective evidence that the ASME Section XI, Subsection IWL Program will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

NRC IEB 2013-04 (Reference ML15148A489) was issued as a result of laminar subsurface cracks in the reinforced concrete shield building (SB) of the containment system at the Davis-Besse Nuclear Power Station caused by moisture intrusion and freezing. Based on the evidence for the causes of laminar crack propagation, First Energy Nuclear Operating Company (FENOC) concluded the apparent cause of the crack to be ice wedging. CPNPP is located in a moderate climate zone. Therefore, ice-wedging is not a concern.

Plant-Specific OE

A review of plant-specific OE identified the following work orders and CRs have been issued as a result of the ASME Section XI, Subsection IWL AMP:

- In December 2018, during the 5-year ISI General Visual Examination of the Unit 1 Concrete Containment, an area on the east side of the containment dome was noted for FE due to concrete spalling. The indicated concrete spalling was a small fraction of the design thickness of the concrete containment structure. The areas of spalling did not indicate exposed steel reinforcing or rust staining from degraded rebar. Evaluation included review of the structural drawing of the containment dome, pictures of the spalling, and discussion with the ISI Engineer. The areas of spalling concrete met the criteria for designation as “non-structural defects” per the concrete specification. As such, these non-structural defects had no adverse effect on the ability of the containment dome to perform its design function.

- In December 2018, during the 5-year ISI General Visual Examination of the Unit 2 Concrete Containment two areas on the east side of the containment dome were noted for FE due to concrete spalling. The indicated concrete spalling was a small fraction of the design thickness of the concrete containment structure. The areas of spalling did not indicate exposed steel reinforcing or rust staining from degraded rebar. Based on review of the structural drawing of the containment dome, pictures, and discussion with the ISI Engineer, the areas of spalling concrete met the criteria for designation as "non-structural defects" per the concrete specification. As such, these non-structural defects had no adverse effect on the ability of the containment dome to perform its design function.

The above OE provides objective evidence that the ASME Section XI, Subsection IWL AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the ASME Section XI, Subsection IWL AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The ASME Section XI, Subsection IWL AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.31. ASME Section XI, Subsection IWF

Program Description

The ASME Section XI, Subsection IWF AMP is an existing AMP that consists of a periodic visual examination of ASME Code Section XI Class 1, 2, and 3 supports for ASME piping and components for signs of degradation such as corrosion; cracking, deformation; misalignment of supports; missing, detached, or loosened support items; loss of integrity of welds; improper clearances of guides and stops; and improper hot or cold settings of spring supports, and constant load supports. Support bolting for ASME Class 1, 2, and 3 piping and component is also included and inspected for corrosion, loss of integrity of bolted connections due to self-loosening, and material conditions that can affect structural integrity. This program will use the edition and addenda of ASME Section XI required by 10 CFR 50.55a, as reviewed and approved by the NRC staff for aging management under 10 CFR 54. Alternatives to these requirements that are aging management related will be submitted to the NRC in accordance with 10 CFR 50.55a prior to implementation.

The ASME Section XI, Subsection IWF AMP provides inspection and acceptance criteria and meets the requirements of the ASME B&PV Code, Section XI, and 10 CFR 50.55a(b)(2) for Class 1, 2, and 3 piping and components and their associated supports. The primary inspection method employed is a visual examination. NDE indications are evaluated against the acceptance standards of ASME Code Section XI. Examinations that reveal indications are evaluated. Examinations that reveal flaws or relevant conditions that exceed the referenced acceptance standard and require corrective measures or repair/replacement are expanded to include additional examinations during the same outage. The scope of inspection for supports is based on the sampling of the total support population. The sample size varies depending on the ASME Code Class. The largest sample size is specified for the most critical supports (ASME Code Class 1). The sample size decreases for the less critical supports (ASME Code Class 2 and 3).

This AMP emphasizes proper selection of bolting material, lubricants, and installation torque or tension to prevent or minimize loss of bolting preload of structural bolting and cracking of high-strength bolting. As noted below in the enhancement discussion, the AMP also includes the preventive actions for storage requirements of high-strength bolts.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWF AMP, with enhancements, will be consistent with one exception to NUREG-1801, Section XI.S3, “ASME Section XI, Subsection IWF”.

Exceptions to NUREG-1801

Exception to Element 1, Scope of Program

The ISI Program Plan does not include the requirements for the examination of ASME Class MC components and Class MC component supports. These requirements are included in a separate Containment ISI Program Plan. This is an exception to the AMP described in Section XI.S3 of NUREG-1801, whose scope of program addresses Class MC supports.

Justification for Exception

Inspection of the steel containment liner and its integral attachments (as well as penetrations) is included in the scope of the ASME Section XI, Subsection IWE (B.2.3.29) AMP. The fuel transfer tube for each unit is classified as safety class 2 and code class MC inside the Containment and, along with its support, included in the scope of the ASME Section XI, Subsection IWE (B.2.3.29) AMP. Applicable portions of the containment polar crane rail supports, including those attachments to the containment liner, are also inspected under the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13) AMP. Structural supports other than ASME Class 1, 2, and 3 supports, such as for ladders or platforms attached to the liner, are also inspected under the Structures Monitoring (B.2.3.34) AMP. Therefore, other AMPs provide for inspection of the supports for Class MC components.

Enhancements

The ASME Section XI, Subsection IWF AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.S3. The following enhancements will be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
2. Preventive Actions	• Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR-104213 with the existing procedures and practices for structural bolting. • Ensure that the preventive actions for storage, lubricants, and SCC potential in RCSC publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts” Section 2 are considered in specifications and procedures for ASTM A325 and A490 bolts. • Prohibit the use of molybdenum disulfide or other sulfur-containing lubricants for structural bolts.
6. Acceptance Criteria	Revise procedures to specify that the following conditions are also unacceptable: • Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. • Cracked or sheared bolts, including high-strength bolts, and anchors.

Operating Experience

The following OE provides objective evidence that the ASME Section XI, Subsection IWF AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

Degradation of threaded bolting and fasteners has occurred from BAC, SCC, and fatigue loading (NRC IEB 82-02, “Degradation of Threaded Fasteners in the Reactor Coolant Pressure Boundary of PWR Plants,” NRC GL 91-17, “Generic Safety Issue 79, Bolting Degradation or Failure in Nuclear Power Plants”). SCC has occurred in high-strength bolts used for nuclear steam supply system component supports (EPRI NP-5769). NRC IN 2009- 04, ”Age-Related Constant Support Degradation,” describes deviations in the supporting forces of mechanical constant supports, from code allowable load deviation, due to age-related wear on the linkages and increased friction between the various moving parts and joints within the constant support, which can adversely affect the analyzed stresses of connected piping systems. CPNPP concluded this was not an adverse condition at CPNPP as the load deviations were not found to be outside CPNPP Specification tolerance for pipe supports and the piping vibrations in the system are within acceptable levels with no adverse condition on pipe supports including spring cans. Routine walkdown inspections are practiced at CPNPP to monitor and inspect for degradation and the need for engineering evaluation.

NRC IN 80-36, “Failure of Steam Generator Support Bolting,” notified utilities of the potential for SCC of high-strength component support bolts. High-strength (> 150 ksi yield) component support bolting is used at CPNPP in supports associated with NSSS components (i.e., Steam Generator, RCP, and RV supports). CPNPP uses the ISI program to evaluate and monitor crack initiation and growth due to SCC, if present, in high-strength low alloy steel bolts used in NSSS component supports.

Industry OE described an event where CRDM Supports were not added to the ISI Program, and IWF exams were not being performed. This OE was reviewed at CPNPP and found to apply to both CPNPP Units. Examinations of the CPNPP CRDM supports were performed in the Spring 2019 Outage for Unit 1 and the Fall 2015 Outage for Unit 2. Exams of the CRDM supports were added to the ISI database to ensure they would be examined in future intervals. Similarly, Industry OE was evaluated to address the issue of the RV supports not being included in the ISI program. An evaluation used an exemption in ASME Section XI IWF-1230 to justify the historical classification of the RV supports as inaccessible for examination in accordance with ASME Section XI Table IWF-2500-1 requirements. A subsequent review determined the use of the exemption to be inappropriate, and best-effort exams are now performed. A remote VT-3 visual examination of the Unit 2 Cold Leg 1, Hot Leg 2, Cold Leg 3, and Hot Leg 4 RV supports was conducted during the 2RF19 Fall 2021 Outage. During this inspection, the supports were found to be acceptable with minor issues noted. Protective coatings were found to be peeling and flaking from the two hot leg supports, and surface corrosion and evidence of pre-existing boric acid was observed on the two cold leg supports. Additionally, the Cold Leg 1 and Hot Leg 2 supports were reinspected after a failure of the MSIP hardware, with no apparent change from previous inspections. Similarly, a remote

VT-3 visual examination of the Unit 1 Hot Leg 1, Cold Leg 2, Hot Leg 3, and Cold Leg 4 RV supports was conducted during the 1RF22 Spring 2022 Outage. During this inspection, the supports were found to be acceptable with minor issues noted. Minor corrosion on RV support shoes was observed, and evidence of pre-existing boric acid were identified on the Cold Leg 4 support.

Plant-Specific OE

- In December 2018, during a LLRT for Unit 2, it was noticed that a snubber support was missing a cotter pin. The structural engineer performed an evaluation and concluded that the support was acceptable for service in the as-found condition. The cotter pin was replaced, and the support was re-examined.

- In December 2018, during the scheduled 10 year visual inspection of snubbers, it was noted that a pipe support was missing a load pin on the clamp side of the snubber. The condition was reviewed by a structural engineer and determined that the support had failed. The impact of the failed support on the piping system was evaluated. It was determined that the failed support was a restraint for dynamic loads. The piping system was found acceptable as Unit 2 had not experienced any dynamic loading during that load cycle. The degraded condition was eliminated by replacing the failed support with a new snubber per the original design.

- In April 2016, during a VT-3 examination for Unit 1, a strut support was found to be bent. An engineering evaluation concluded that the strut was acceptable for service in the existing condition and was determined not to be a non-conforming condition. An EOC was performed which resulted in no other strut supports found in a non-conforming condition.

The above OE provides objective evidence that the ASME Section XI Inservice Inspection, Subsection IWF AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the ASME Section XI Inservice Inspection, Subsection IWF AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The ASME Section XI Inservice Inspection, Subsection IWF AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.32. 10 CFR Part 50, Appendix J

Program Description

The 10 CFR Part 50, Appendix J AMP is an existing performance monitoring AMP that consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B; RG 1.163, "Performance-Based Containment Leak-Testing Program"; NEI 94-01, "Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J"; and ANSI/ANS 56.8, "Containment System Leakage Testing Requirements." The Containment Leak Rate Program provides for detection of pressure boundary degradation due to aging effects such as loss of leakage tightness, loss of material, cracking, loss of sealing, or loss of preload in various systems penetrating containment. The program also provides for detection of age-related degradation in material properties of gaskets, seals, expansion bellows, and flexible seal assemblies for the containment pressure boundary access points.

Three types of tests are performed under Option B. Type A tests are performed to determine the overall primary containment integrated leakage rate at the LOCA peak containment pressure. Performance of the integrated leakage rate test (ILRT) per 10 CFR Part 50, Appendix J, Option B demonstrates the leak-tightness and structural integrity of the containment. A general visual examination of the accessible interior and exterior areas of the steel containment vessel is performed prior to any ILRT during a period of reactor shutdown (refueling outages) and periodically between ILRTs. Containment inspections are performed in accordance with the ASME Section XI, Subsections IWE and IWL. The ILRT is performed at the frequency specified in 10 CFR Part 50, Appendix J, Option B. Type B and Type C containment LLRTs, as defined in 10 CFR Part 50, Appendix J, are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. LLRTs are performed at frequencies in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B.

The parameters monitored are leakage rates of the steel-lined, reinforced concrete containment vessel, and associated welds, penetrations, fittings, and other access openings. The leakage rate acceptance criteria are established in accordance with 10 CFR Part 50, Appendix J, Option B.

The Containment Leak Rate Program provides measures to detect degradation prior to loss of intended function. The Containment Leak Rate Program detects degradation of the containment shell and components that may compromise the containment pressure boundary, including seals and gaskets. The use of pressure tests verifies the pressure-retaining integrity of the containment. The containment leakage rate tests demonstrate the leak-tightness of containment isolation barriers. While satisfactory performance of containment leakage rate tests demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information that would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced. This is achieved with implementation of a containment inservice inspection program as described in ASME Section XI, Subsections IWE and IWL.

In addition, some components are excluded from local leak rate testing under the CLB. In those cases, aging effects associated with those components are managed by the following AMPs:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.2.3.1)
- ASME Section XI, Subsection IWE (B.2.3.29)
- Water Chemistry (B.2.3.2)
- Closed Treated Water Systems (B.2.3.12)
- One-Time Inspection (B.2.3.19)
- External Surfaces Monitoring of Mechanical Components (B.2.3.22)
- Boric Acid Corrosion (B.2.3.4)
- Flow-Accelerated Corrosion (B.2.3.8)
- Fatigue Monitoring (B.2.2.1)

The Containment Leak Rate Program documents and trends test results in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B. The Containment Leak Rate Program demonstrates that the test results meet the acceptance criteria. Evaluations are performed for test or inspection results that do not satisfy established criteria and a CR is initiated to document the issue in accordance with plant administrative procedures.

The 10 CFR Part 50, Appendix B CAP ensures that conditions adverse to quality are promptly corrected. Corrective actions are performed in accordance with applicable procedures that meet the requirements of 10 CFR Part 50, Appendix J.

NUREG-1801 Consistency

The 10 CFR Part 50, Appendix J AMP is consistent with the program described in NUREG-1801, Section XI.S4, “10 CFR Part 50, Appendix J”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the 10 CFR Part 50, Appendix J AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

- To date, the 10 CFR Part 50, Appendix J, LRT program, in conjunction with the containment inservice inspection program, has been effective in preventing unacceptable leakage through the containment pressure boundary. CPNPP's implementation of Option B for testing frequency is consistent with CPNPP plant-specific OE.

- NUREG-2191 contains additional OE which is considered. Specifically, NUREG-2191 Section XI.S4 notes that NRC IN 92-20, "Inadequate Local Leak Rate Testing," describes OE of inadequate local leak rate testing of two-ply steel expansion bellows that were used on some piping penetrations. This is not applicable to CPNPP in that installed bellows assemblies, which are also containment isolation barriers, are of the single ply design.

- In 2015, CPNPP reviewed industry OE related to reverse testing equivalency. A containment airlock missed surveillance due to the inability to establish reverse testing equivalency at Beaver Valley. Beaver Valley determined their airlock equalization valve testing was lacking because the containment interior equalization valve was not being tested in the accident direction (from containment interior to airlock interior). CPNPP determined that its interior equalizing valves are not tested in the accident direction. However, the valves are considered to be an integral part of the associated airlock and are not required to be tested in the accident direction. The testing direction is specified in the CPNPP FSAR. Design documents note that CPNPP equalization valves are ball valves where leakage is the same in either direction due to the symmetrical design. Further OE review and consultation with an independent testing expert verified that testing results would be equivalent in either direction, for the model of ball valve used.

- In 2012, CPNPP reviewed industry OE related to a fire in containment during a pressurization test. In May of 2011, Ringhals Generating Station Unit 2 experienced a fire inside the RCB during a refueling outage containment air pressurization test (Integrated leak rate test). Inadequate management expectations for cleanliness resulted in allowances for combustible materials to remain inside containment. The test procedures pre-test inspection did not identify these deviations. CPNPP reviewed this industry OE and determined that contingency plans should be developed before the start of containment pressurization tests and address containment depressurization methods, containment access protocols, and possible fire-fighting strategies. Related to integrated and local leak rate tests (LLRTs), CPNPP revised procedures to ensure that tools and equipment are removed from containment prior to ILRTs, and that personnel are trained on cleanliness expectations prior to leak rate tests.

Plant-Specific OE

A review of plant-specific OE indicates that the 10 CFR Part 50, Appendix J AMP is effective in monitoring containment leak rates. Program health reports are updated periodically. For both units, the program is found to be in good condition, with acceptable As-Found minimum and As-Left maximum pathway leakages. There have been no recent repeat LLRTs in excess of administrative limits in successive outages.

- In December of 2018, a compressed air valve failed its LLRT. The valve could not reach test pressure. Therefore, the valve failed to provide containment isolation capabilities within acceptable leakage limits. The leak rate was greater than the administrative limit and the valve was declared inoperable. Overall containment leak rate was found to be within acceptable limits, and containment operability was maintained. The cause was minor debris on the check valve seating surface. Immediate corrective actions were taken to open, inspect, and clean the check valve. The frequencies for the Unit 1 and 2 routine test surveillance were increased from 30 months to 18 months. A separate PM activity was generated to rework/clean the valve on an 18-month frequency.

- In December of 2017, during the performance of Appendix J leak rate testing of a penetration, it was discovered that two test connection valves had seat leakage. The seat leakage was due to scored seats and discs. The valves were repaired, which resolved the seat leakage.

- In September of 2017, during the performance of a LLRT, elevated leakage was noted for an outer door seal. After reseating the outer door, leakage was reduced, but still elevated. A snoop test was performed, which identified the leakage source in the seal. The leakage rate was determined to be within acceptance criteria and the seals were re-worked.

- In June of 2015, while entering containment, a 6-inch portion of an inner door seal fell out. The control room was notified, with the inner door remaining open until the seal was re-installed. Upon investigation, it was identified that the door seal was bulging out of the sealing surface. An inner door seal leak rate test was performed, and the seal was put back into place.

- In July of 2011, a CR was closed before an evaluation for total containment leakage was performed after a containment isolation valve exceeded its administrative limit during its LLRT. A new CR was issued to track the actions to address the recurring leakage and corrective maintenance of the containment isolation valve. While the containment isolation valve exceeded its administrative limit, total containment leakage acceptance criteria was not exceeded. A review of historical data concluded that there were previous failures of the valve since start-up. Surveillance testing of the penetration associated with the isolation valve was confirmed to not be on an extended interval. Inspection of the valve identified rust debris as the cause for valve leakage. The valve was re-worked and retested satisfactorily.

- In April of 2011, a series of LLRTs were identified as not including instructions for filling and venting the tested volume when air is used as the test medium. Procedure guidance was inadequate as it only covered larger sections of the system and did not include generic guidance for smaller drained sections or sufficient guidance for other possible drained volumes. LLRT procedures were revised to include fill and vent guidance and component control to resolve the issue.

The above OE provides objective evidence that the 10 CFR Part 50, Appendix J AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the 10 CFR Part 50, Appendix J AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The 10 CFR Part 50, Appendix J AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.33. Masonry Walls

Program Description

The Masonry Walls AMP is an existing condition monitoring AMP consisting of inspection activities to detect aging and age-related degradation for masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Masonry walls that perform a fire barrier intended function are also managed by the Fire Protection (B.2.3.15) AMP.

The Masonry Walls AMP is implemented as part of the Structures Monitoring (B.2.3.34) AMP.

Aging effects identified within the scope of the Masonry Walls AMP are detected by visual inspection of external surfaces prior to the loss of the structure's or component's intended function(s). Masonry walls are visually examined at a frequency selected (frequency of 5 years or less) to ensure there is no loss of intended function between inspections and that the evaluation basis established for each masonry wall within the scope of LR remains valid through the PEO.

NUREG-1801 Consistency

The Masonry Walls AMP, with the specified enhancements, will be consistent with NUREG-1801, Section XI.S5, "Masonry Walls".

Exceptions to NUREG-1801

None.

Enhancements

The Masonry Walls AMP will be enhanced as follows for alignment with NUREG-1801, Section XI.S5. The enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
1. Scope 4. Detection of Aging Effects	The program will be enhanced to include the bricks and mortar near the silencer for each emergency diesel generator and perform a baseline inspection.
4. Detection of Aging Effects	Enhancement of inspector and reviewer qualifications for Masonry Walls and other structural components to match current ACI 349.3R requirements through the Structures Monitoring (B.2.3.34) AMP.

Operating Experience

The following OE provides objective evidence that the Masonry Walls AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

In May of 1980, IEB 80-11 identified some masonry walls at Trojan Nuclear Plant did not have adequate structural strength to sustain the required piping system support reactions. These deficiencies were attributable to error in engineering judgement, lack of procedures and procedural detail, and inadequate design criteria. The resulting action was that the NRC requested the following items to be addressed:

1. Identify all masonry walls that are in proximity to or that have attachments from nuclear safety related piping or equipment such that wall failure could affect a nuclear safety related system.

2. Provide a re-evaluation of the design adequacy of the walls identified to determine whether the masonry walls will perform their intended function under all postulated loads and load combinations.

3. Describe in detail the actions planned and their schedule to justify the re-evaluation criteria used.

IN 87-67 noted the following lessons learned from IEB 80-11 responses:

1. Indian Point, Unit 2, on September 16-20, 1985: NRC Inspectors observed mortar joint cracking in the west and south walls of the fan house.

2. Calvert Cliffs, Unit 1 and 2, on January 17, 1986: inspectors determined that two of the masonry walls included in the sample group had boundary conditions deviating from those assumed in the reevaluation analyses.

3. Maine Yankee on March 10-14, 1986: survey identified 10 masonry walls that were classified as nuclear safety related by the bulletin definitions but had not been included in actions.

4. Oyster Creek on May 5-9, 1986: approximately 200 masonry walls exist throughout the plant and that 45 of these walls had been addressed by bulletin responses.

5. Similar deficiencies to those specified above at Yankee Rowe (January 26-30, 1987), Salem Units 1 and 2 (April 7-10, 1987) and Peach Bottom Units 2 and 3 (June 15-19, 1987)

The Masonry Walls AMP was developed using the lessons learned provided in NRC IN 87-67 (follow-up to IE Bulletin 80-11) and in accordance with the requirements of NUREG-1522; therefore, the Masonry Walls AMP is consistent with industry guidance and experience. There are no SLR-ISGs or other SLR guidance document(s) that reflect new Industry OE applicable to any element of the Masonry Walls AMP.

Plant-Specific OE

- In January 2015 during a firewall inspection, a CR was written to document cracks and missing grout on a cinder block wall in TB Unit 2 room 2-283. The inspections also identified exposed metal (lack of fire retardant material) in two places. Inspection reviews concluded that the cracks were small and did not propagate to the floor or to adjacent walls and ceiling. It was concluded that the cracks were localized, and the functionality of the wall was not impaired. Repair of fire retardant material was performed where the exposed metal was found.

- In October 2015 a condition of leaking rainwater through the seals of the removable concrete blocks was identified in U1 SGB El. 832-ft. The condition was identified as a minor leakage around the seals and had no impact on structural integrity of the building. The condition of the leakage around the Safeguards Building floor plug and the instrument tubing seal was determined to be acceptable with no impact to SSC functions.

- In April 2021, a condition of multiple leaks around the removable block above two SSW pumps was identified in SWIS. The report of rainwater leakage in the SWIS was investigated, and was not leaking onto any electrical equipment, motors, or pumps. Sealant was applied to the outer edges of the gasket areas around the removable block, and no leakage was confirmed during rainfall. The gaskets and sealant associated with the removable blocks are periodically inspected.

The above OE provides objective evidence that the Masonry Walls AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Masonry Walls AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Masonry Walls AMP provides reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.34. Structures Monitoring

Program Description

The Structures Monitoring AMP is an existing AMP based on the requirements of 10 CFR 50.65 (the Maintenance Rule) and NRC RG 1.160. This document provides guidance for the development of a site-specific program to monitor the condition of structures and structural components within the scope of LR, such that there is no loss of structure or structural component intended function.

The Structures Monitoring AMP consists primarily of periodic visual inspections of plant structures and components (SCs) for evidence of deterioration or degradation, such as described in the American Concrete Institute (ACI) Standards 349.3R and ACI 201.1R. Quantitative acceptance criteria for concrete inspections are based on ACI 349.3R.

Inspections and evaluations are performed by personnel qualified in accordance with industry codes and standards contained in the plant CLB including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, and the American Institute of Steel Construction (AISC) specifications, as applicable. The AMP includes preventive actions to ensure structural bolting integrity. The program also includes periodic sampling and testing of groundwater and the need to assess the impact of any changes in its chemistry on below grade concrete structures. The frequency of monitoring groundwater chemistry (pH, chlorides, and sulfates) is once every 5 years.

Included in the program is: inspection of structures including nuclear safety related buildings and the internal structures within containment; inspection of non-safety related structures; inspection of structural steel elements; inspection of elastomers in Structural Isolation Gap elements; and inspection of the component supports commodity group.

Coatings minimize corrosion by limiting exposure to the environment. However, coatings are not credited in the determination of aging effects requiring management. Coatings are not credited for LR but are used to indicate the aging effects of the base material.

NUREG-1801 Consistency

The Structures Monitoring Program, with enhancements, will be consistent with NUREG-1801, Section XI.S6, “Structures Monitoring”.

Exceptions to NUREG-1801

None.

Enhancements

The Structures Monitoring AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.S6. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
1. Scope	• Include the Diesel Generator Buildings, Switchgear Buildings, Transmission Towers associated with Startup Transformers, Spare Start-up Transformers, and Seismic Category I Manholes, Handholes, and Duct Banks in the scope of the Structures Monitoring AMP. • Perform periodic sampling and testing of groundwater chemistry at a frequency once every 5 years. • Inspect structural members of crane supports, HELB and spray shields, stairs, and platforms, industrial and HELB doors. • Include exposed steel embedment's in the "Steel Structural Elements" group
2. Preventive Actions	• Reconcile the preventive actions in NUREG-1339, EPRI NP-5769, and EPRI TR104213 with the existing procedures and practices for structural bolting. • Ensure that the preventive actions for storage, lubricants, and SCC potential in RCSC publication Section 2 are considered in specification and procedures for ASTM A325 or A490 bolts. • Prohibit the use of molybdenum disulfide (MoS_2) or other sulfur containing lubricants for structural bolts.
3. Parameters Monitored or Inspected	• Inspect concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. • Visually inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel.
4. Detection of Aging Effects	• Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. • Update the qualification requirements for inspection of structures and components as well as requirements for the reviewer to match ACI 349.3R current code requirements.
5. Monitoring and Trending	Provide guidance for documenting significant findings of the inspection, consistent with ACI 349.3R Section 3.5.5 to monitor and trend the extent of degradation.

Element Affected	Enhancement
6. Acceptance Criteria	• Provide guidance for documentation and archival requirements in accordance with ACI 349.3R Section 3.5. • Provide guidance for inspection reports to be completed in accordance with ACI 349.3R Section 3.5.5.

Operating Experience

The following OE provides objective evidence that the Structures Monitoring Program will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

In May of 1980, IEB 80-11 identified some masonry walls at Trojan Nuclear Plant did not have the adequate structural strength to sustain the required piping system support reactions. These deficiencies were attributable to an error in engineering judgment, lack of procedures and procedural detail, and inadequate design criteria. IN 87-67 was issued to inform addressees of lessons learned from NRC inspections of certain activities related to the reevaluation work conducted and plant modifications made in response to IEB 80-11. Deficiencies discovered during inspections for IEB 80-11 include improper assumptions, improper classification (safety related vs non-safety related), and a lack of procedural controls. This IEB was issued prior to CPNPP start-up and was addressed in the design and construction of the plant. CPNPP has structural design criteria/requirements and specifications in place to evaluate similar engineering changes. The design modification and review process prevents such inadequate designs from being implemented.

NUREG-1522 documents the results of a survey sponsored in 1992 to obtain information on the types of distress in the concrete and steel structures and structural components, the type of repairs performed, and the durability of the repairs. Licensees who responded to the survey reported cracking, scaling, and leaching of concrete structures. The degradation was attributed to drying shrinkage, freeze-thaw, and abrasion. The NUREG also describes the results of NRC staff inspections at six plants. The staff observed concrete degradation, corrosion of component support members and anchor bolts, cracks and other deterioration of masonry walls, and groundwater leakage and seepage into underground structures. IN 2011-20 discusses an instance of groundwater infiltration leading to alkali-silica reaction degradation in below-grade concrete structures at Seabrook while IN 2004-05 and IN 2006-13 discusses instances of through-wall water leakage from SFPs. NUREG/CR–7111 provides a summary of the aging effects of nuclear safety related concrete structures. Many LR applicants have found it necessary to enhance their Structures Monitoring AMPs to ensure that the aging effects of structures and structural components within the scope of LR are adequately managed during the PEO. The Structures Monitoring AMP incorporates the findings in NUREG-1522 through site procedures. There is reasonable assurance that implementation of the structures monitoring AMP described above will be effective in managing the aging of the in-scope structures and structural components through the PEO.

Plant-Specific OE

- In June 2020, a tracking report was created to track further review and possible rework due to the results of the Structural Monitoring walkdown of the Unit 1 Turbine Building. The inspection identified spalled/chipped concrete on the southeast vertical corner of the wall where the condenser discharge changeout pit area was extended. The upper chipped area had evidence of a single vertical run of exposed rebar. Historical reviews of similar TB walkdowns for this area does not reveal previous identification of this issue. The last walkdown was conducted in August 2015. There was no evidence of extended wall cracking stemming from these chipped areas, suggesting wall degradation is stable and not progressing. Structural integrity was determined to be sound, and the function of the wall was maintained. The area will be monitored during future Structures Monitoring walkdowns.

- In June 2020, water was dripping from the ceiling onto the Control Room emergency lighting battery cells. The dripping water onto the associated batteries stopped once the rain abated. The rain leak in the ceiling was subsequently repaired.

- In October 2019, the Unit 1 Emergency Diesel Building roof showed signs of possible rain-related leakage into the equipment room on EL. 844'-0". The residue that had built up around metal plates on the ceiling had dripped down on the top of the Unit 1 Starting Air Receivers. Rust-type residue had continued down the side of each receiver and accumulated on the floor. In January of 2021, the roof top coating was replaced, which resolved the rain-related leakage.

- In March 2019, the Safeguard Units 1 and 2 roofs began leaking water during rain. A walkdown was performed which determined the condition exists during heavy rain, and that some roof plugs and seals need to be reworked. The Unit 1 SG roof top coating was replaced in January of 2021.

  Repairs to the power block roofs are currently in progress. Similar conditions were previously identified in the 2006 through 2017 timeframe. The Unit 2 Safeguards Building, Control Building, and FB roofs are currently scheduled for replacement.

- In October 2017, concrete from the ceiling of the SWIS fell onto a walkway and into the bay. Based on the available margin in the slab, the condition of the concrete and rebar was determined to be acceptable. NDE inspections of the slab determined that the concrete deterioration was due to exposure to chemicals used when cleaning the trash racks and due to improper drainage. The exposed rebar was coated in 2017 and the condition continues to be monitored. The slab was inspected in 2019 and the concrete was found to be dry with no new deterioration observed. The rebar coating was intact with small rust areas indicative of moisture penetration to the rebar. New coating was applied over the existing coating to prevent additional localized corrosion of the rebar.

The above OE provides objective evidence that the Structures Monitoring AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Structures Monitoring AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Structures Monitoring AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.35. RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing AMP and is implemented as part of the Structures Monitoring (B.2.3.34) AMP. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is evaluated separately in the LRA and is compared to the NUREG 1801, Section XI.S7 program.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is a condition monitoring program that addresses age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program is implemented in association with the existing implementing procedure for the Structures Monitoring (B.2.3.34) Program. The structures within the scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP include the SSI and Dam, portions of the Service Water Intake structure exposed to water-flowing, the Service Water Intake Channel, debris and fish barrier system and the discharge canal. Structural steel and bolts associated with the trash rack, building structures, and flood protection features are managed by the Structures Monitoring (B.2.3.34) Program. The SSI is inspected yearly, and the Service Water Intake Structure underwater exterior inspections occur at least once every five years so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner. Areas covered by silt, vegetation, or marine growth are not considered inaccessible and are cleaned and inspected in accordance with the standard inspection frequency. Inspection of the underwater portion of the SSI Dam is performed by divers under the scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP.

The NRC RG 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants,” provides detailed guidance for an inspection program for water-control structures, including guidance on engineering data compilation, inspection activities, technical evaluation, inspection frequency, and the content of inspection reports. NRC RG 1.127 delineates current NRC practice in evaluating in-service inspection program for water-control structures.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, with enhancement, will be consistent with NUREG-1801, Section XI.S7, RG 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP”.

Exceptions to NUREG-1801

None.

Enhancements

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.S7. The enhancements are to be implemented no later than 6 months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Affected	Enhancement
3. Parameters Monitored or Inspected	• Inspect concrete structures for an increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. • Inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel.
4. Detection of Aging Effects	Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.
5. Monitoring and Trending	Include guidance for documenting and trending all significant findings of the inspection, consistent with ACI 349.3R Section 3.5.5.

Operating Experience

The following OE provides objective evidence that the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

NUREG-1522 documents the results of a survey sponsored in 1992 to obtain information on the types of distress in the concrete and steel structures and structural components, the type of repairs performed, and the durability of the repairs. Licensees who responded to the survey reported cracking, scaling, and leaching of concrete structures. The degradation was attributed to drying shrinkage, freeze-thaw, and abrasion. The NUREG also describes the results of NRC staff inspections at six plants. The staff observed concrete degradation, corrosion of component support members and anchor bolts, cracks and other deterioration of masonry walls, and groundwater leakage and seepage into underground structures. IN 2011-20 discusses an instance of groundwater infiltration leading to alkali-silica reaction degradation in below-grade concrete structures at Seabrook while IN 2004-05 and IN 2006-13 discusses instances of through-wall water leakage from SFPs. NUREG/CR–7111 provides a summary of the aging effects of nuclear safety related concrete structures. Many LR applicants have found it necessary to enhance their Structures Monitoring (B.2.3.34) AMP to ensure that the aging effects of structures and structural components within the scope of LR are adequately managed during the PEO. Implementation of the RG 1.127, Inspection of

Water-Control Structures Associated with Nuclear Power Plants AMP, and Structures Monitoring (B.2.3.34) AMP in accordance with NUREG-1801 guidance is based on industry OE and will provide reasonable assurance that the AMPs will be effective in managing the aging of the in-scope structures and structural components through the PEO.

Silt level in the Main Intake Structure of the Beaver Valley Power Station exceeded the allowable limits and resulted in insufficient ultimate heat sink capabilities. CPNPP reviewed this incident and created PM activities to clean and inspect the SWIS pump bay to manage silt buildup as a result of this industry OE.

Plant-Specific OE

- In October 2017, concrete from the ceiling of the SWIS fell onto a walkway and into the bay. Based on the available margin in the slab, the condition of the concrete and rebar was determined to be acceptable. NDE inspections of the slab determined that the concrete deterioration was due to exposure to chemicals used when cleaning the trash racks and due to improper drainage. The exposed rebar was coated in 2017 and the condition continues to be monitored. The slab was inspected in 2019 and the concrete was found to be dry with no new deterioration observed. The rebar coating was intact with small rust areas indicative of moisture penetration to the rebar. New coating was applied over the existing coating to prevent additional localized corrosion of the rebar.

- In June 2015, the CPNPP Dam Safety Inspection Report (performed by the NRC) concluded that the maintenance of the dam and impoundment areas appeared to be satisfactory. The NRC inspection included the SSI Dam, the equalization canal, and the portions of the SSI visible from the dam. It was also documented that there were no conditions observed that would adversely affect the safety of the dam, canal, or SSI.

- In September 2014, additional maintenance actions were created as part of the SSI 2014 annual inspection report which was submitted to the Texas Commission on Environmental Quality (TCEQ). The additional maintenance actions were to remove the trees and brush that encroached the upstream and downstream groins and the slopes of the dam, the equalization channel, and the return channel in order to return the channel to design dimensions. Riprap (rock) was to be placed next to the concrete equalization weir to repair wave erosion. The repairs were completed prior to the 2015 SSI dam inspection.

- In July 2013, based on the NRC CPNPP Units 1 and 2 – Dam Safety Inspection Report for SSI Dam, it was decided that the rock deterioration on the slopes of the SSI Dam will be inspected each year by an outside vendor. A PM was created to monitor the vegetation maintenance along the SSI dam periodically or more often as required.

- In April 2014, site procedures were revised to include the criteria and inspection methods for the SSI booms. A PM was created to complete the inspection of the primary and the secondary booms and the anti-intrusion net.

The inspections areas, necessary precautions, requirements, and the inspection methods and criteria were defined to accomplish this task.

- In May 2014, a superficial concrete degradation of approximately a 1 square foot area on the south side of the SWIS deck was identified. An evaluation determined that the identified non-structural deficiencies have no impact on the SWIS design performance. The concrete repairs were completed during regular maintenance.

The above OE provides objective evidence that the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.36. Protective Coating Monitoring and Maintenance

Program Description

The Protective Coating Monitoring and Maintenance AMP is an existing condition monitoring AMP that provides for aging management of Service Level I coatings inside of CPNPP Units 1 and 2 containments. CPNPP is not committed to the NRC RG 1.54 however, the Protective Coating Monitoring and Maintenance AMP, with an enhancement, satisfies the requirements of RG 1.54, Section C4, regarding maintenance of coatings and will remain committed to using ASTM D 5144 and EPRI Guide 1003102 as guides for the program. The failure of the Service Level I coatings could adversely affect the operation of the ECCS suction strainers; however, proper maintenance of the Service Level I coatings ensures that coating degradation will not impact the operability of the ECCS. The program includes visual examination of all reasonably accessible Service Level I coatings inside of containment during every refueling outage and includes assessments and repair for conditions identified that adversely affect the intended function of Service Level I coatings.

The Protective Coating Monitoring and Maintenance AMP also provides controls over the amount of unqualified coatings which are defined as the coatings inside Containment that have not passed the required testing, including irradiation and simulated DBA conditions. Unqualified coatings may fail in a way that affects the intended function of the ECCS suction strainers and therefore, the unqualified coatings must be monitored and controlled to ensure that the amount of unqualified coatings in Containment is kept within acceptable limits.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance AMP, with enhancement, will be consistent with NUREG-1801, Section XI.S8, “Protective Coating Monitoring and Maintenance Program”.

Exceptions to NUREG-1801

None.

Enhancements

The Protective Coating Monitoring and Maintenance AMP will be enhanced as follows, for alignment with NUREG-1801, Section XI.S8. The changes and enhancements are to be implemented no later than six months prior to entering the PEO or no later than the last refueling outage prior to the PEO.

Element Effected	Enhancement
5. Monitoring and Trending	Implementing documents will be enhanced to ensure that the inspection report prioritizes repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.

Operating Experience

The following OE provides objective evidence that the Protective Coating Monitoring and Maintenance AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

NUREG-1801 describes industry experience pertaining to coatings degradation inside containment and the consequential clogging of sump strainers including NRC IN 88-82, NRC IEB 96-03, NRC GL 04-02, and NRC GL 98-04. NRC RG 1.54, Revision 1, was issued in July 2000. Monitoring and maintenance of Service Level I coatings conducted in accordance with Regulatory Position C4 is expected to be an effective program for managing degradation of Service Level I coatings.

SLR-ISG-2021-03 updates GALL-SLR Element 10 with an update to the revision number for NRC RG 1.54 as well as an updated issuance date.

Plant-Specific OE

- In October 2020 (1RF21), a revision was completed on the Unit 1 electronic unqualified coatings log (EUCL) to reflect unqualified coating areas that were reworked, inspected, and could then be considered qualified. The EUCL was also updated to reflect other defects/deficiencies that were identified during the performance of the 1RF21 containment coatings monitoring report (CCMR) that required remediation in future outages. Steel deficiencies of 37 ft^2 and concrete deficiencies 0.5 ft^2 were documented. The conclusion from the EUCL reflected a numerical increase in the ECCS debris categories but remained below the acceptable test/bounding criteria. Some examples of identified deficiencies included corrosion at a floor drain in the ceiling, corrosion on valves and pipe supports, cracking below grating, and degraded coatings. These deficiencies are tracked in the EUCL for continued monitoring and/or repair/replacement through the corrective action process.

- In February 2020 (2RF18), a revision was completed on the Unit 2 EUCL to reflect unqualified coating areas that were reworked, inspected, and could then be considered qualified. The EUCL was updated to reflect other defects/deficiencies that were identified during the performance of the CCMR that require remediation in future outages. Steel deficiencies of 6.35 ft^2 and concrete deficiencies of 0.70 ft^2 were documented. The conclusion from the EUCL reflected a numerical increase in the ECCS debris categories but remained below the acceptable test/bounding criteria. Some examples of identified deficiencies included checking/cracking on liners, degraded coatings, and zinc and primer cohesion deficiencies. These deficiencies are tracked in the EUCL for continued monitoring and/or repair/replacement through the corrective action process.

- In March 2014, a self-assessment was initiated for a review of the Protective Coatings AMP. Identified deficiencies were administrative in nature related to retrieval of qualification records and scheduling of coating repairs.

- In April 2013, a work order was not completed in the outage in which it was written, nor the following outage. The work order was written in April 2010 because the required coating activity for the radial arm and hoist assembly (RAHA) in 1RF14 was not completed. This work was not completed in 1RF15 or 1RF16. A Self-Assessment of the Protective Coatings AMP also identified a deficiency for not completing the required coating work. The work order was set to work the coating activity during 1RF17 if it was justified for the amount of doses picked up during scaffold erection and coating work. The coating rework activity was completed for RAHA work on Unit 1.

- In July 2011, a self-assessment was initiated for an overall review of the Protective Coating Monitoring and Maintenance AMP. Deficient areas identified on the CCMRs were not being scheduled in the appropriate timeframe for repairs. Some identified areas had gone multiple outages without being repaired. Actions were completed to address and repair the deficiencies in each unit.

The above OE provides objective evidence that the Protective Coating Monitoring and Maintenance AMP has been and will continue to be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Protective Coating Monitoring and Maintenance AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The Protective Coating Monitoring and Maintenance AMP, with enhancement, will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.37. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a new AMP. This new program will provide reasonable assurance that the intended functions of the insulation materials used for non-EQ electrical cables and connections within the scope of LR and are exposed to ALEs caused by temperature, radiation or moisture will be maintained consistent with the CLB through the PEO.

This AMP is a condition monitoring program. This AMP applies to accessible non-EQ electrical cable and connection electrical insulation material within the scope of LR and subject to ALEs caused by temperature, radiation, or moisture. An ALE is an environment that exceeds the most limiting environment (e.g., temperature, radiation, or moisture) for the electrical insulation of cables and connectors. ALEs will be identified through the use of an integrated approach which may include, but is not limited to, a review of relevant plant-specific and industry OE, a review of EQ zone maps, real-time infrared thermographic inspections, conversations with plant personnel cognizant of specific area and room environmental conditions, etc. To facilitate the identification of an ALE, a temperature threshold and a radiation threshold will be identified in the plant implementing procedure for cable and connection insulation materials within the scope of this program.

Accessible non-EQ insulated cables and connections within the scope of LR and installed in ALEs will be visually inspected at least once every 10 years for cable jacket and connection insulation surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination, that could indicate conductor insulation aging degradation from temperature, radiation, or moisture. If an unacceptable condition or situation is identified for a cable or connection, corrective actions may include, but are not limited to, testing, shielding, or otherwise changing the environment or relocation or replacement of the affected cables or connections. The CAP will also evaluate if the same condition or situation is applicable to inaccessible cables or connections. EOC inspections will be initiated as appropriate.

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be implemented, with the first inspections completed, prior to the PEO.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, will be consistent with NUREG-1801, Section XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

OE has identified cable and connection insulation aging effects due to ALEs caused by elevated temperature, radiation, or moisture. For example, insulated cables and connections routed next to or above (within 3 feet) steam generators, pressurizers, or hot process pipes (such as feedwater lines) may be subjected to an ALE. These environments have been found to cause degradation of electrical cable and connection electrical insulation that are visually observable, such as color changes or surface abnormalities. These visual indications along with cable condition monitoring can be used as indicators of cable and connection insulation degradation.

This industry OE resulted in the development and need for this program to ensure that insulated cables and connections, located inside and outside of containment, that are exposed to ALEs are identified and periodically inspected to ensure that component intended functions will be maintained consistent with the CLB throughout the PEO.

There are no SLR-ISGs or other SLR guidance document(s) that reflect new OE since the issuance of GALL Rev. 2 that are applicable to any element of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP considers the technical information and guidance provided in NUREG/CR-5643, IEEE Std. 1205-2000, SAND96-0344, and EPRI TR-109619.

Plant-Specific OE

- The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a program that is not well encompassed by an individual or small set of system health reports because ALE aging degradation of electrical cable and connection insulation could potentially occur in any plant system. A review of the 118V and 240V System, 480V Switchgear System, 480V Motor Control Center System, and 6.9 kV Switchgear System health reports was performed to identify health report items that showed cable and connection insulation degradation in electrical distribution systems. There were no electrical cable or connection insulation degradation issues noted.

- In May of 2019, during a corrosion monitoring inspection, it was noticed that electrical cables going to what appear to be thermocouples under the Unit 1 high-pressure turbine between the MS lines had sustained high heat damage to the outer insulation jackets. A conduit underneath an extraction steam line appeared to have been overheated, potentially damaging the cables inside. This conduit supplies the level switch and is approximately 5 feet from the level switch. The damaged conduit was repaired, and the level switch leads were replaced.

- In October of 2015, during performance of a WO to remove instrumentation from the Unit 2 generator to support vendor work, it was discovered that the cables had damage. The field cable's conductor insulation was degraded to the point that the insulation was brittle and exposing the wire conductor. The issue appeared to be due to excessive heat in the area during operation. Termination points were added in a junction box near the level probes, and new cables were pulled and connected.

- In October of 2014, during performance of a level switch mechanism replacement, the conductors were found damaged with the outer conductor jacket flaking off and discolored due to heat. The flexible conduit that routes into the switch was found to be hard and needed replacement. The flexible conduit was replaced with stainless steel flexible conduit.

- In July of 2011, during the performance of a preventative maintenance (PM) work order (WO) on a diesel driven fire pump, a vendor jumper cable inside the jacket water heater connection box was discovered with insulation damaged and degraded from heat. This jumper was replaced with a new jumper. Also, a plastic termination box with a stripped cover bolt hole was discovered. The box was also replaced.

The above OE provides objective evidence that the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.38. Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP is a new AMP. This AMP manages the aging effects of the applicable cables and connections in the Radiation Monitoring (RM) system.

Note that the RM system detectors that are either included in the Environmental Qualification of Electric Components (B.2.2.2) AMP or that do not perform or support a system level intended function were eliminated from the scope of this program. The Nuclear Instrumentation System (NI) was screened out of scope of this AMP because the NI System source, intermediate, and power range detectors (and their associated instrument cables) are included in the Environmental Qualification of Electric Components (B.2.2.2) AMP.

In most areas within a nuclear power plant the actual operating environment (e.g., temperature, radiation, or moisture) is less severe than the plant design bases environment. However, in a limited number of localized areas, the actual environment may be more severe than the plant design bases environment. These localized areas are characterized as ALEs that represent a limited plant area where the operating environment is significantly more severe than the plant design basis environment. An ALE is based on the most limiting environment (e.g., temperature, radiation, or moisture) for the cable or connection insulation.

Exposure of electrical insulation to ALEs caused by temperature, radiation, or moisture can cause age degradation resulting in reduced electrical insulation resistance, moisture intrusion-related connection failures, or errors induced by thermal transients. Reduced electrical insulation resistance causes an increase in leakage currents between conductors and from individual conductors to ground. A reduction in electrical insulation resistance is a concern for all circuits, especially those with sensitive, high-voltage, low-level current signals, such as radiation monitoring circuits, because a reduced insulation resistance may contribute to signal inaccuracies.

In this AMP, either of two methods can be used to identify the existence of electrical insulation aging effects for cables and connections. In the first method, calibration results or findings of surveillance testing programs are evaluated to identify the existence of electrical cable and connection insulation aging degradation. In the second method, direct testing of the cable system is performed.

Results from the calibrations or surveillances of components within the scope of LR will be reviewed. The parameters monitored will be determined from the specific calibration, surveillances or testing performed based on the specific instrumentation circuit under surveillance or being calibrated, as documented in plant procedures. The first reviews will be completed prior to the PEO and at least every 10 years thereafter. Reviewing the data obtained during normal calibrations or surveillances will allow the detection of severe aging degradation prior to the loss of the cable and connection intended function. Calibrations or surveillances that fail to meet acceptance criteria will be reviewed at the time of the calibration or surveillance.

Cable testing will be performed on cables in the scope of the program that are disconnected during instrument calibration using a proven method for detecting deterioration for the insulation system (such as insulation resistance tests or time domain reflectometry tests). The parameters for cable testing will be specified in plant procedures. The first test for LR, using a proven method for detecting deterioration of the insulation system, will be completed prior to the PEO with ensuing tests occurring at least once every 10 years thereafter.

In accordance with the CAP, an engineering evaluation will be performed when test acceptance criteria are not met and corrective actions, including potential increased frequency of review of calibration or surveillance results or cable testing, will be implemented to ensure that the intended functions of the cables can be maintained consistent with the CLB through the PEO.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP will be consistent with NUREG-1801, Section XI.E2, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

<u>Industry OE</u>

OE has identified that a change in temperature across a high range radiation monitor cable in containment resulted in a substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the circuit cable or connection electrical insulation, resulting in a possible indication of electrical cable degradation.

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation

Circuits AMP considers the technical information and guidance provided in NUREG/CR-5643, IEEE Std. 1205-2000, SAND96-0344, EPRI TR-109619, NRC IN 97-45, and NRC IN 97-45, Supplement 1.

There are no SLR-ISGs or other SLR guidance document(s) that reflect new OE applicable to any element of the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP.

Plant-Specific OE

- The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP program health report is presently ascertained through the existing Radiation Monitoring health reports.

  Recent health reports do not contain issues with the electrical cable and connections used in instrumentation circuits.

- In August of 2017, the spare triaxial cable for a detector was disabled due to oxidation exposure on the center conductor. A substitute cable was identified, and a WO is in process to replace the existing spare triaxial cable.

- In December of 2013, while performing channel calibration of the AB Ventilation Exhaust Radiation Detector, the battery was found to be failed. It was expected to read over 3 volts and only read 0.13 volts. The battery was changed out per procedure. In addition, the power switch for the RM80 did not work. The switch seemed to be broken as the device was not powering down. The fuse on the power switch was replaced, and the broken switch was repaired. In addition, the detector calibration was out of the low calibration range on 2 of the 3 measurements. An evaluation was performed, and history showed that the detector was out of calibration range in 2008. A detector alignment was performed with all values in calibration range.

- In September of 2013, the MS line radiation monitor was cycling in and out of alert status and tracking near the alert setpoint. Trends indicated an increase in activity on this monitor. The detector was serviced and replaced.

- In May of 2013, channel calibration showed high-voltage power supply failure low reading of 2.222 vdc compared to an expected reading of 18.0 vdc for the radiation detector. The power supply was replaced to resolve the issue.

- In February of 2012, an intermediate range detector failed due to a loss of detector voltage. An alarm was received. The medium range NI detector pegged low and on the instrument drawer the Loss of Detector Volt light was lit, and the amp meter was pegged low. The power supply was replaced and returned the channel to service. Although the Nuclear Instrumentation system is not in the scope of this AMP, this shows that the CPNPP CAP documents and evaluates issues with high-voltage, low level signal circuits.

The above OE provides objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.39. Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP is a new condition monitoring AMP. This AMP applies to all inaccessible or underground (e.g., in conduit, duct bank, or direct buried) power cables (greater than or equal to 400 volts) within the scope of LR exposed to adverse environments, primarily significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water). This AMP will provide reasonable assurance that the intended functions of inaccessible or underground power cables that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to wetting or submergence are maintained consistent with the CLB through the PEO. Submarine or other cables designed for continuous wetting or submergence are not included in this AMP. CPNPP does not have any submarine or other cables designed for continuous wetting.

The cables within the scope of this AMP will be tested using a proven test for detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence, such as Dielectric Loss (Dissipation Factor or Power Factor), AC Voltage Withstand, Partial Discharge, Step Voltage, Time Domain Reflectometry, Insulation Resistance and Polarization Index, Line Resonance Analysis, or other testing that is state-of-the-art at the time the test is performed. One or more tests may be used to determine the condition of the cables so they will continue to meet their intended function during the PEO. The acceptance criteria for each test will be defined by the specific type of test performed and the specific cable tested. Test results that are trendable will be used to provide additional information on the rate of cable insulation degradation. The cables will be tested at least once every 6 years. The first tests will be completed prior to the PEO.

This is a condition monitoring AMP; however, periodic actions will be taken to prevent inaccessible cables from being exposed to significant moisture, such as identifying and inspecting in-scope accessible cable conduit ends and cable manholes for water collection, and draining the water, as needed. The inspection will also include direct observation or indication that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and, if installed, dewatering/drainage systems (i.e., sump pumps) and associated alarms operate properly. The inspection for water collection will be performed based on plant-specific OE with water accumulation in the manhole. Acceptance criteria for inspections of manholes are defined by the observation that the cables and support structures are not submerged or immersed in standing water at the time of the inspection and that dewatering/drainage systems (i.e., sump pumps) and associated alarms operate properly. Inspection results that are trendable will be used to optimize manhole inspection frequencies. The first inspection for LR will be completed prior to the PEO and at least annually thereafter. In addition, operation of dewatering devices (if installed) will be inspected, and their operation verified, prior to any known or predicted heavy rain or flooding events. If manholes are not equipped with dewatering devices, an inspection for water accumulation and pump out following heavy rain or flooding will be performed.

Corrective actions will be taken, and an engineering evaluation will be performed if test or inspection acceptance criteria are not met. Such an evaluation will consider the significance of the test or inspection results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes for not meeting the test or inspection acceptance criteria, the corrective actions required, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination will be made as to whether the same condition or situation is applicable to other in-scope power cables. If water is found during inspection (i.e., cable exposed to significant moisture), corrective actions are taken to keep the cable dry and to assess cable degradation. Corrective actions may include, but are not limited to, installation of permanent drainage systems, installation of sump pumps and alarms, more frequent cable testing or manhole inspections, or replacement of the affected cable.

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be implemented prior to the PEO. The first inspections and tests will be completed prior to the PEO.

NUREG-1801 Consistency

The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP, will be consistent with NUREG-1801, Section XI.E3, “Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

OE has shown that inaccessible power cable electrical insulation materials undergo increased degradation either through water tree formation or other aging mechanisms when subjected to significant moisture. Inaccessible or underground power cables subjected to significant moisture may experience a reduction of electrical insulation resistance or degraded dielectric strength. Minimizing exposure to significant moisture mitigates this aging effect. The Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP is based on the program description in NUREG-1801 XI.E3, which in turn is based on industry OE.

The following OE provides objective evidence that the Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- NRC IN 2002-12, issued March 21, 2002, informed licensees of observed submergence in water of electrical cables that feed nuclear safety related equipment. The IN detailed accounts of leaking ductbanks, cable jacket tears, and multiple instances of submerged cables in manholes. NRC GL 2007-01, issued February 7, 2007, further cited NRC IN 2002-12 and informed licensees of these cable failures and asked them to provide information on the monitoring of inaccessible or underground electrical cables. CPNPP submitted a revised response to NRC GL 2007-01, under Luminant letter dated December 9, 2010. This letter detailed two (2) cable related issues as follows:
    - One cable failure was identified. A 6.9 kV Okonite cable (#EO100010-Station Service Water Pump) experienced a phase C short to ground in October 2005 after 25 years of service. The cable was subsequently replaced. This cable is included within the scope of the Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP.
    - CPNPP committed to address buried cable issues and other cable aging issues in a complete and comprehensive manner under the collaborative efforts described below:
        - CPNPP inspects for and removes water (if required) from manholes. CPNPP performs periodic monitoring of certain underground electric cables. Activities are currently performed to inspect and remove water as necessary from electrical cable vaults associated with the Service Water and CWSs.
        - CPNPP personnel are actively involved with industry organizations with the goal of producing a comprehensive proceduralized buried cable program in alignment with industry practices and regulatory expectations. In response to GL-2007-01 and NRC inspection report communications on buried cable issues dated November 19, 2010, CPNPP plans to develop a buried cable management program in accordance with the EPRI cable management guides.
- NRC IN 2010-26: Submerged Electrical Cables: provided observations of protracted cable submergence in water, results of recent NRC inspection findings and the results of licensees' responses to GL 2007-01, "Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients," dated February 7, 2007. The IN also provides additional clarification to IN 2002-12, "Submerged Safety-Related Electrical Cables," dated March 21, 2002, through the NRC's observations of the submergence in water of electrical cables that feed nuclear safety related equipment at certain facilities. In response to IN 2010-26, CPNPP initiated

the following action items to ensure that cables that could become submerged are adequately monitored:

- A site Cable AMP procedure was developed and issued with an effective date of July 18, 2011.
- An Operability Evaluation was developed to assess potential plant impacts to IN 2010-26. Evaluation results are summarized as follows:
  - As a result of plant-specific corrective actions, CPNPP cable vaults housing safety related low and medium voltage cables are inspected and dewatered on a quarterly basis.
  - Since initial dewatering, water has not been found in sufficient quantities to submerge medium voltage cables. Trending has indicated a slow seepage of water into the vault, and as such it is reasonable to conclude that the safety related medium voltage cables in CPNPP have not been submerged or in prolonged submergence to water since their initial inspection in late 2009.
  - CPNPP nuclear safety related medium voltage cables are periodically monitored, which has proven to be effective at maintaining the environment the cables are housed in. In doing so, active water trees that may have been present in the cables are no longer capable of propagating because there is not water on the jacket to polarize and draw through the insulation. This gives reasonable assurance to continued operability and alleviates any immediate operability concerns presented in IN 2010-26.

- In addition to NRC IN 2002-12, NRC GL 2007-01, and NRC IN 2010-26, this AMP considers the technical information and generic communication guidance provided in NUREG/CR-5643; IEEE Std. 1205-2000; SAND96-0344; EPRI 109619; EPRI 103834-P1-2; NRC IN 2002-12; NRC GL 2007-01; NRC GL 2007-01 Summary Report; NRC Inspection Procedure, Attachment 71111.06, Flood Protection Measures; NRC Inspection Procedure, Attachment 71111.01, Adverse Weather Protection; RG 1.211 Rev 0; DG-1240; and NUREG/CR-7000.

<u>Plant-Specific OE</u>

- Health reports for the existing 118V and 240V System, 480V Switchgear System, 480V Motor Control Center System, and 6.9 kV Switchgear System health reports were reviewed. No electrical wetted cable issues were noted.
- In October of 2016, a targeted self-assessment of the Cable Reliability Program was performed. The following improvement opportunities were made:
  - Cable circuits required to support critical functions should be considered for inclusion in the scope of the medium-voltage cable system AMP. Medium-voltage cable circuits critical to power

generation, or that may result in outage length extension should they fail, may be added to the scope of the program at management option. Potential Value of Implementation: Added conservatism into the program to reduce outage extensions. CPNPP issued a revision to site Cable AMP procedure to incorporate this improvement opportunity.

- Remove control and instrument cables from the program scope, reference INPO Good Practice – EPG-16 (March 2009) Engineering Program Guide. Potential Value of Implementation: Reduce database/scope and cost benefit. CPNPP issued a revision to site Cable AMP procedure to incorporate this improvement opportunity.

- In December of 2015, two vaults contained water above the upper tier cable trays. The cables were identified as medium voltage Service Water Pump Motor Power cables. Two vaults also contained water above the bottom two tier cable trays. The cables were identified as instrumentation cable and low voltage cables. After pumping the water out of the manhole, there was no visible cable jacket damage. It should be noted that these manholes are within the scope of this AMP. The cause for these findings was excessive rain. It is anticipated that the program requirement to inspect manholes for water accumulation and pump out manholes following heavy rain or flooding, if manholes are not equipped with dewatering devices, will prevent this type of recurrence.

- In June of 2015, two vaults contained water above the bottom two tier cable trays. The cables identified are instrumentation cable and low voltage cables. After pumping the water out the manhole, there was no visible cable jacket damage. It should be noted that although these manholes are within the scope of this AMP, the cables noted are not within scope. The cause for these findings was excessive rain. It is anticipated that the program requirement to inspect manholes for water accumulation and pump out manholes following heavy rain or flooding, if manholes are not equipped with dewatering devices, will prevent this type of recurrence.

- In March of 2011, a CR was created to track key initiatives for the CPNPP Cable program that will satisfy EPRI guidelines and INPO expectations for an effective program. The results from these initiatives are summarized below:

    - The identification of underground cables in possible wet conditions has been addressed under several documents. Quarterly PMs were created for manhole inspections and dewatering activities. Also, the site Cable program procedure was issued which addresses the potential aging issues involved with underground medium and low voltage cables.

    - CPNPP conducted its adverse environmental walkdown in other adverse conditions (beyond wet) such as heat, and has issued work orders to remedy and correct conditions that impact medium and low voltage power cables in adverse conditions.

  - The existing Cable Reliability Program developed a Cable Reliability Strategic Plan (in 2012) which includes a contingency plan to replace the high risk safety and non-safety related cables that are not able to be tested. The Strategic plan provides a schedule to when each cable will be tested. Additionally, all non-safety related CW cables have been satisfactorily tested.

  - The existing Cable Reliability Program has developed a site procedure for "Tan Delta Cable Insulation Resistance Testing," to test medium-voltage power cables. Low voltage cables are evaluated during walkdowns as well as during the review of thermal insulation and its effect from the hot pipe to power cables.

- In April of 2010, a CR was created to adjust the scope of a PM activity to only cover a single unit-train of cable vault inspections. This CR also generated new PMs to cover cable vault inspections on the three remaining unit-trains. The work requires the removal of missile shields; therefore, the inspections were placed in different PMs by unit and train.

The above OE provides objective evidence that the Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.40. Metal Enclosed Bus

Program Description

The Metal Enclosed Bus AMP is a new condition monitoring AMP. The purpose of the Metal Enclosed Bus AMP is to provide reasonable assurance that the intended functions of metal enclosed buses in scope of LR are maintained consistent with the CLB through the PEO.

The Metal Enclosed Bus AMP will provide for the inspection of the internal and external portions of the MEB to be completed prior to the PEO and conducted every 10 years thereafter. Internal portions (bus enclosure assemblies) of the MEB will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus electrical insulation material will be inspected for signs of reduced insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, discoloration, or swelling, which may indicate overheating or aging degradation. The internal bus insulating supports will be inspected for structural integrity and signs of cracks. The external MEB surfaces and structural supports will be inspected prior to the PEO and conducted every 10 years thereafter under the Structures Monitoring AMP (Section B.2.3.34). The external portions of the MEB, including accessible gaskets, boots, and sealants, are also inspected for hardening or loss of strength due to elastomer degradation that could permit water or foreign debris to enter the bus.

A sample of accessible MEB bolted bus connections will be tested prior to the PEO and every 10 years thereafter to ensure the connections are not experiencing increased resistance due to loosening of bolted bus duct connections caused by repeated thermal cycling of connected loads. Testing will be implemented by thermography or by measuring connection resistance using a micro ohmmeter. A sample of 20 percent with a maximum sample of 25 constitutes a representative bolted bus connection sample size. If an unacceptable condition or situation is identified in the selected sample, a determination is made as to whether the same condition or situation is applicable to other connections not tested. The CAP will be used to evaluate the condition and determine appropriate corrective action.

As an alternative to thermography or measuring connection resistance of bolted connections, for accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., CPNPP may use visual inspection of insulation material to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. If an alternative visual inspection is used to check MEB bolted connections, the first inspection will be completed prior to the PEO and every 5 years thereafter.

NUREG-1801 Consistency

The Metal Enclosed Bus AMP will be consistent with NUREG-1801, Section XI.E4, “Metal Enclosed Bus”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Metal Enclosed Bus AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

- Industry experience has shown that failures have occurred on MEBs caused by cracked electrical insulation and moisture or debris buildup internal to the MEB. Experience also has shown that bus connections in the MEBs exposed to appreciable ohmic heating during operation may experience loosening due to repeated cycling of connected loads.

  In August of 2009, while another plant was operating at 100 percent power, an electrical fault on a 6.9kV non-segregated bus resulted in a turbine trip and automatic reactor scram. During the scram recovery, the turbine bypass valves remained in the fully open position and did not automatically modulate to maintain reactor pressure as expected. The most probable cause of the bus failure was a relaxation of bolted connections on the center phase flexible link(s) caused by repeated thermal cycles over time. The root cause identified for this event was the nonperformance of PM tasks for torque checks of the non-segregated bus links. The damaged bus has been repaired, and changes to the controls for PMs were made to ensure proper performance to prevent this type of failure from recurring.

  INPO SER 5-09 was issued as a result of this event and CPNPP performed an evaluation determine if any areas of vulnerability existed at CPNPP. At the time of the event, there was no non-segregated bus duct for the 6.9kV system, however there was iso-phase bus. The iso-phase bus contains several bolted flexible connections and porcelain insulators to support the bus in the duct. CPNPP has a three-year PM activity in place for the bus and insulator cleaning, which also includes checking tightness of the bolted segments of the iso-phase bus. This PM has been performed every three years on both units. CPNPP also has another PM activity for temperature monitoring of the bus and flexible connections. This PM is being performed at 9 months frequency. Necessary PMs are being performed at regular intervals and performance of the iso-phase bus system with respect to the issue described in the above OE has been acceptable. It should be noted that the CPNPP iso-phase bus is not within the scope of this AMP.

Plant-Specific OE

A review of plant-specific OE indicates that there is minimal plant-specific OE on Metal Enclosed Bus aside from the iso-phase bus which is not within the scope of this AMP. This is because the MEB was installed within the last 20 years to support the installation of alternate startup transformers XST1A and XST2A. The MEB within the scope of this AMP was installed after original plant construction and has less than 20 years of plant operation. Assessments and health reports associated with MEB indicate that the AC Distribution 6.9 kV Switchgear System health report currently shows there are no MEB issues.

- In January of 2011, a notification was received for the Eaton Cutler-Hammer vendor that some of the Belleville washers that were provided to CPNPP for the spare Startup Transformer modification have been determined to be defective by the washer manufacturer. Eaton discovered that Belleville washers, which are used to maintain proper contact pressure in certain critical bus connections, may fail over time. If washers fail at a single copper bus connection, there is a potential that the connection could overheat and create an unsafe condition. This material condition for new washers supplied by a vendor was corrected during modification implementation by replacing the subject Belleville washers.

Although some of the examples above were not determined to be age-related or associated with in-scope MEBs, the OE provides objective evidence that the Metal Enclosed Bus AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Metal Enclosed Bus AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Metal Enclosed Bus AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

B.2.3.41. Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a new AMP. This Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP provides reasonable assurance that the intended functions of the metallic parts of electrical cable connections that are not subject to the EQ requirements of 10 CFR 50.49 and susceptible to age-related degradation resulting in increased resistance of connections will be maintained consistent with the CLB through the PEO.

This Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is a one-time condition monitoring program that verifies that increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation is not an aging effect that requires periodic testing.

This Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP focuses on the metallic parts of the electrical cable connections. One-time testing, on a sample basis, will confirm the absence of age-related degradation of cable connections resulting in increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. Wiring connections for cables that are entirely internal to an active assembly are considered part of the active assembly and, therefore, are not within the scope of this AMP. This program does not apply to high-voltage (> 35 kV) switchyard connections. Cable connections covered under the Environmental Qualification of Electric Components (B.2.2.2) AMP are not included in the scope of this program.

A representative sample of cable connections within the scope of LR are tested on a one-time test basis to confirm the absence of age-related degradation of the cable connection. The findings of the initial one-time test will be evaluated to determine whether periodic testing of cable connections is warranted. Testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation. One-time testing provides additional confirmation to support industry OE that shows that electrical connections have not experienced a high degree of failures, and that existing installation and maintenance practices are effective. The following factors are considered for sampling: voltage level (medium and low-voltage), circuit loading (high load), connection type, and location (high temperature, high humidity, vibration, etc.). Twenty percent of a connector type population with a maximum sample of 25 constitutes a representative connector sample size. The one-time tests for LR are to be completed prior to the PEO.

As an alternative to measurement testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of insulation materials may be used to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling or surface contamination. When this alternative visual inspection is used to check cable connections, the first inspection is completed prior to the PEO and at least every 5 years thereafter. The basis for performing only the alternative visual inspection to monitor age-related degradation of cable connections will be documented.

The acceptance criteria for each inspection or test will be defined by the specific type of inspection or test performed for the specific type of cable connection. Cable connections should not indicate abnormal temperatures for the application when thermography is used. Connections should exhibit a low resistance value appropriate for the application when resistance measurement is used. When the visual inspection alternative for covered cable connections is used, the absence of embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination is suitable in indicating that the covered cable connections are not loose. An unacceptable indication is defined as a noted condition or situation that, if left unmanaged, could potentially lead to a loss of intended function.

NUREG-1801 Consistency

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, will be consistent with NUREG-1801, Section XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”.

Exceptions to NUREG-1801

None.

Enhancements

None.

Operating Experience

The following OE provides objective evidence that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO.

Industry OE

Electrical cable connections exposed to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation during operation may experience increased resistance of connection. There have been limited numbers of age-related failures of cable connections reported. The CPNPP OE with connection reliability and aging effects is adequate to demonstrate the AMP effectiveness of the Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP, including the AMP’s capability to detect the presence or noting the absence of aging effects for electrical cable connections.

There are no SLR-ISGs or other SLR guidance document(s) that reflect new OE since the issuance of GALL Rev 2 that are applicable to any element of the Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP.

The Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP considers the technical information and guidance provided in NUREG/CR-5643, SAND96-0344, IEEE Std. 1205-2000, EPRI 109619, EPRI 104213, NEI White Paper on AMP XI.E6, Final License Renewal Interim Staff Guidance LR-ISG-2007-02, Staff Response to the NEI White Paper on AMP XI.E6, LER 3612007005, LER 3612007006 and LER 3612008006.

Plant-Specific OE

- The new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP program health report is presently ascertained through the existing 118 V and 240 V System, 480 V Switchgear System, 480 V Motor Control Center System, and 6.9 kV Switchgear System health reports. There were no electrical cable connection issues noted in these health reports.

- In October of 2014, two issues for a RCL Flow Transmitter channel were discovered. One cable conductor was damaged (conductor is exposed) at the terminal lug. The conductors for another cable were too short to permit forming and training them neatly from the end of cable jacket to the transmitter termination points. Both items were resolved in the field without a change in the original design configuration.

- In October of 2013, while performing a WO for the inspection of Diesel Generator Diesel Engine Control Panel, loose terminals were found. Wires under terminals were making contact but the technician was able to turn the screw slightly to increase pressure on terminal block. As-found wires under the terminals had resistance with the terminal screw and would have performed their function. The technician was able to turn the screw slightly to ensure the termination was tight. Immediate actions were taken, and the work was completed.

- In April of 2013, during performance of a work order to replace auxiliary switches SI motor breaker, a damaged wire lug to the terminal of a device was found. The WO replaced auxiliary switches as directed, and the WO was revised to rework the lug on the subject wire.

- In February of 2012, a thermography inspection identified a thermal exception on one of the three phases of the Diesel Generator Lube Oil Heater Feeder Breaker Starter Coil. One phase of the coil connection appears to have some localized heating and there is approximately 15ºF difference between phases. The thermal severity of heating at this level for electrical components is within the advisory range, as identified in the specification. The high resistance connection was determined to be due to looseness, corrosion, dirt or adjoining dissimilar metals. This assessment was made based upon the observation of concentrated heat at the connection that dissipates away from the connection. The connection was inspected, cleaned, and properly tightened.

Although some of the examples above were not determined to be age-related, the OE provides objective evidence that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the PEO. In addition, AMPs, such as the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, will receive effectiveness reviews every 5 years or as appropriate, in accordance with the guidance of NEI 14-12.

Conclusion

The new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will provide reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the CLB through the PEO.

APPENDIX C

ADDITIONAL PLANT-SPECIFIC INFORMATION (OPTIONAL)

This is an optional Appendix for the LRA; for CPNPP this Appendix is not used.

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for LR include any Technical Specification changes or additions necessary to manage the effects of aging during the PEO.

A review of the information supporting this LRA and the CPNPP Technical Specifications determined that no changes or additions to the Technical Specifications are required to manage the effects of aging during the PEO. Therefore, this Appendix is not used.

Appendix E

Applicant's Environmental Report

Operating License Renewal Stage

Comanche Peak Nuclear Power Plant

Units 1 and 2

October 2022

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Abbreviations, Acronyms, and Symbols

§	Section
°C	degrees Celsius
°F	degrees Fahrenheit
AADT	average annual daily traffic
AD	anno Domini—with respect to time period
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ALWR	advanced light water reactor
AM	accident management
APE	area of potential effect
AQCR	air quality control region
BC	before Christ—with respect to time period
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOD	biological oxygen demand
BP	before present – with respect to time period
BRA	Brazos River Authority
BTA	best technology available
Btu	British thermal unit
ca.	circa
CAA	Clean Air Act
CCRS	closed-cycle recirculating system
CCW	component cooling water
CCWS	component cooling water system
CDF	core damage frequency
CDP	census-designated place
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLB	current licensing basis
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent

COLA	combined license application
CPI	containment performance improvement
CP PowerCo	Comanche Peak Power Company, LLC
CPNPP	Comanche Peak Nuclear Power Plant
CVCS	chemical and volume control system
CWA	Clean Water Act (Federal Water Pollution Control Act)
CWIS	cooling water intake structure
CWS	circulating water system
CZMA	Coastal Zone Management Act
DBA	design-basis accident
dBA	A-weighted decibels
DDT	dichlorodiphenyltrichloroethane
DECON	dismantling and decontamination, one of three NRC decommissioning strategies
DO	dissolved oxygen
DOE	U.S. Department of Energy
DSM	demand-side management
EA	environmental assessment
EAB	exclusion area boundary
ECCS	emergency core cooling system
EFH	Essential Fish Habitat
EIS	environmental impact statement
ENTOMB	permanent entombment on site, one of three NRC decommissioning strategies
EPA	U.S. Environmental Protection Agency
EPP	emergency preparedness plan
EPRI	Electric Power Research Institute
ER	environmental report
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDS	filter demineralizer system
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission

FES	final environmental statement
FPPA	Farmland Protection Policy Act
fps	feet per second
FR	Federal Register
FSAR	final safety analysis report
FWAT	flow-weighted average temperature
gal/kWh	gallons per kilowatt hour
GEIS	NUREG-1437, Revision 1, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GHG	greenhouse gas
GPI	Groundwater Protection Initiative
gpd	gallons per day
gpm	gallons per minute
gpm_a	average gallons per minute for the month
GPP	groundwater protection program
gpy	gallons per year
GWd/MTU	gigawatt-days per metric ton of uranium
GWPS	gaseous waste processing system
GWR	gaseous waste release
HAP	hazardous air pollutant
HAPC	habitat areas of particular concern
HUD	U.S. Department of Housing and Urban Development
HUC	hydrologic unit code
I-20	Interstate 20
I-35	Interstate 35
I-35W	Interstate 35W
IPA	integrated plant assessment
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISFSI	independent spent fuel storage installation
km	Kilometer
kV	kilovolt
LAR	license amendment request
Ldn	day-night 24-hour average (noise)

LERF	large early release frequency
lg	magnitude short period surface wave (earthquakes)
LLMW	low-level mixed waste
LLRF	large late release frequency
LLRW	low-level radioactive waste
LLW	low-level waste
LOCA	loss of coolant accident
LOS	level of service
LR	license renewal
LRA	license renewal application
Luminant	Luminant Generation Company, LLC
LWPS	liquid waste processing system
mb	Short period body-wave magnitude (earthquakes)
MB	maximum benefit
mb_lg / mblg	magnitude short period surface wave (earthquakes)
MBTA	Migratory Bird Treaty Act
md	magnitude duration (earthquakes)
MDCT	mechanical draft cooling towers
MG	million gallons
mg/L	milligram per liter
MGD	millions of gallons per day
MGM	millions of gallons per month
MGY	millions of gallons per year
ml	local magnitude (earthquakes)
MM	modified Mercalli intensity (seismic intensity scale)
MMBtu	million British thermal units
mph	miles per hour
mrem/year	milli roentgen equivalent man/year
MRLC	Multi-Resolution Land Characteristics Consortium
msl	mean sea level
MW	megawatts
MWD/MTU	megawatt days per metric ton uranium
MWe	megawatts electric
Mwr	magnitude regional (earthquakes)

MWt	megawatts thermal
NA	not available/not applicable
NAAQS	national ambient air quality standards
NAVD88	North American Vertical Datum 1988
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NG	National Guard
NGCC	natural gas-fired combined-cycle
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NUREG	U.S. Nuclear Regulatory Commission technical report designation
NWI	National Wetlands Inventory
NWS	National Weather Service
OCA	owner-controlled area
ODCM	offsite dose calculation manual
OL	operating license
OSHA	Occupational Safety and Health Administration
P2	pollution prevention
Pb	lead
pc/h	passenger cars per hour
PCB	polychlorinated biphenyl

pCi/l	picoCuries per liter
PEO	period of extended operation
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PM	particulate matter
PMF	probable maximum flood
PRA	probabilistic risk assessment
psi	pounds per square inch
PV	photovoltaic
PWR	pressurized water reactor
PWS	public water system
RCRA	Resource Conservation and Recovery Act
RCS	reactor coolant system
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
ROL	renewed operating license
ROW	right-of-way
RWST	refueling water storage tank
SAFSTOR	safe storage, one of three NRC decommissioning strategies
SAMDA	severe accident mitigation design alternatives
SAMA	severe accident mitigation alternative
SAP	Severe Accident Program
SAR	safety analysis report
SBO	station blackout
SCP	Squaw Creek Park
SCR	Squaw Creek Reservoir
SCWD	Somervell County Water District
SERF	small early release frequency
SHPO	state historic preservation officer
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SMR	small modular reactor

SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
SPU	stretch power uprate
SNF	spent nuclear fuel
SSA	sole source aquifer
SSC	systems, structures, and components
SSI	safe shutdown impoundment
SSWS	station service water system
STC	source term category
SWPPP	stormwater pollution prevention plan
TEDE	total effective dose equivalent
TCEQ	Texas Commission on Environmental Quality
TGLO	Texas General Land Office
THC	Texas Historical Commission
THL	Texas horned lizard
THPO	tribal historic preservation officer
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSS	total suspended solids
TWC	Texas Water Commission
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
USACE	U.S. Army Corps of Engineers
US-APWR	U.S. Advanced Pressurized Water Reactor
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Vistra OpCo	Vistra Operations Company, LLC
VOC	volatile organic compound
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Vistra Operations Company LLC (Vistra OpCo) operates Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 pursuant to NRC operating licenses (OLs) NPF-87 and NPF-89, respectively. The current Unit 1 OL will expire at midnight on February 8, 2030, and the current Unit 2 OL will expire at midnight on February 2, 2033. CPNPP is located on Squaw Creek Reservoir (SCR) in Somervell County, Texas, about 5 miles north-northwest of Glen Rose, Texas, and about 40 miles southwest of Fort Worth in north-central Texas.

Vistra OpCo has prepared this environmental report (ER) in conjunction with its application to the NRC for a renewal of the CPNPP OLs, as provided by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23], and
- Title 10, Energy, CFR, Part 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)]

The NRC has defined the purpose and need for the proposed action, renewal of the OLs for nuclear power plants such as CPNPP, as follows (NRC 2013a):

> *The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as State, utility, and, where authorized, Federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the NEPA [National Environmental Policy Act] environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.*

The renewed OLs (ROLs) would allow an additional 20 years of operation for the CPNPP units beyond their current licensed operating periods. The renewed license for CPNPP Unit 1 would expire at midnight on February 8, 2050, and the renewed license for CPNPP Unit 2 would expire at midnight on February 2, 2053.

Vistra OpCo has prepared Table 1.1-1 to verify conformance with regulatory requirements. Table 1.1-1 indicates the sections in the CPNPP license renewal (LR) ER that respond to each requirement of 10 CFR 51.53(c).

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 1 of 3)

Description	Requirement	ER Section(s)
Environmental Report—General Requirements [10 CFR 51.45]		
Description of the proposed action	10 CFR 51.45(b)	2.1
Statement of the purposes of the proposed action	10 CFR 51.45(b)	1.1
Description of the environment affected	10 CFR 51.45(b)	3.0
Impact of the proposed action on the environment	10 CFR 51.45(b)(1)	4.0
Adverse environmental effects which cannot be avoided should the proposal be implemented	10 CFR 51.45(b)(2)	6.3
Alternatives to the proposed action.	10 CFR 51.45(b)(3)	2.6, 7.0, 8.0
Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity	10 CFR 51.45(b)(4)	6.5
Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented	10 CFR 51.45(b)(5)	6.4
Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects	10 CFR 51.45(c)	2.6, 4.0, 7.0, 8.0
Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements	10 CFR 51.45(d)	9.1
Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements	10 CFR 51.45(d)	9.5
Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements	10 CFR 51.45(d)	9.7
Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information	10 CFR 51.45(e)	4.0, 6.3, 7.0, 9.3, 9.5

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 2 of 3)

Description	Requirement	ER Section(s)
Operating License Renewal Stage [10 CFR 51.53(c)]		
Description of the proposed action including the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. The report must describe in detail the affected environment around the plant, the modifications directly affecting the environment or any plant effluents, and any planned refurbishment activities	10 CFR 51.53(c)(2)	2.1, 2.3, 2.4, 3.0, 4.0
Analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below	10 CFR 51.53(c)(3)(ii)	4.0
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.5.1
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.5.2
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm])	10 CFR 51.53(c)(3)(ii)(C)	4.5.3
Groundwater quality degradation (plants with cooling ponds at inland sites)	10 CFR 51.53(c)(3)(ii)(D)	4.5.4
Radionuclides released to groundwater	10 CFR 51.53(c)(3)(ii)(P)	4.5.5
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.6.3

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 3 of 3)

Description	Requirement	ER Section(s)
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.6.4
Effects on terrestrial resources (non-cooling system impacts)	10 CFR 51.53(c)(3)(ii)(E)	4.6.5
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	10 CFR 51.53(c)(3)(ii)(E)	4.6.6
Historic and Cultural Resources		
Historic and cultural resources	10 CFR 51.53(c)(3)(ii)(K)	3.8, 4.7
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river)	10 CFR 51.53(c)(3)(ii)(G)	4.9.1
Electric shock hazards	10 CFR 51.53(c)(3)(ii)(H)	4.9.2
Environmental Justice		
Minority and low-income populations	10 CFR 51.53(c)(3)(ii)(N)	3.11.2, 4.10.1
Cumulative Impacts		
Cumulative impacts	10 CFR 51.53(c)(3)(ii)(O)	4.12
Postulated Accidents		
Severe accidents	10 CFR 51.53(c)(3)(ii)(L)	4.15.2
All Plants		
Consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues	10 CFR 51.53(c)(3)(iii)	7.3
New and significant information regarding the environmental impacts of license renewal of which the applicant is aware	10 CFR 51.53(c)(3)(iv)	4.0, 5.3

1.2 Environmental Report Scope and Methodology

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled, "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the CPNPP LR applicant's ER, Vistra OpCo has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC 2013a), and referenced information specific to transportation (NRC 1999)
- NRC supplemental information in the *Federal Register* (FR) (78 FR 37282)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (NRC 1996a)
- *Regulatory Guide 4.2, Supplement 1, Revision 1, Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC 2013b)

1.3 Comanche Peak Nuclear Power Plant Licensee and Ownership

Vistra OpCo (operator) is acting on its own behalf and for Comanche Peak Power Company, LLC (CP PowerCo) (owner) by submitting this application. Vistra OpCo is a Delaware limited liability company, which is in turn wholly owned by the ultimate parent Vistra Corp (Vistra), a corporation formed under the laws of the State of Delaware with principal executive offices in Irving, TX. See Section 1 of the LRA for additional details regarding the organization of the applicant.

Vistra OpCo is the current licensed operator of CPNPP Units 1 and 2 (Facility Operating License No. NPF-87, Facility Operating License No. NPF-89), which are the subject of the LRA. Vistra OpCo will continue as the licensed operator for the ROLs and CP PowerCo will continue as the owner.

2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

2.1 The Proposed Action

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to renew for the first time, and for an additional 20-year period, the OLs for CPNPP Units 1 and 2, which would preserve the option for Vistra OpCo to continue operating CPNPP and provide reliable high-capacity factor baseload power for the proposed LR operating term. For CPNPP Unit 1, the proposed action would extend the OL from February 8, 2030, to February 8, 2050. For CPNPP Unit 2, the proposed action would extend the OL from February 2, 2033, to February 2, 2053.

Vistra OpCo does not anticipate any LR-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. The relationship of refurbishment to LR is described in Section 2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR Part 54 aging management review for CPNPP. Potential SMITTR activities are described in Section 2.4. No plant upgrades to support extended operations that could directly affect the environment or plant effluents are planned to occur during this period of extended operation (PEO).

2.2 General Plant Information

The ER must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures. This report must describe in detail the affected environment around the plant and the modifications directly affecting the environment or any plant effluents. [10 CFR 51.53(c)(2)]

The CPNPP site is situated on a peninsula located on the southwestern bank of the SCR, which is contained completely within the bounds of the CPNPP site (Luminant 2013b, Section 2.2.1.1).

CPNPP Units 1 and 2 are located in Somervell County in north central Texas and are approximately 65 miles southwest of the Dallas-Fort Worth metropolitan area. In addition, the SCR, utilized for station cooling, extends northward into Hood County. The nearest community, Glen Rose, is located within 5 miles of the site, while Canyon Creek, Granbury, Pecan Plantation, and Tolar are located within 10 miles of the site. Table 3.11-1 provides a list of communities located within a 50-mile radius of CPNPP and their respective distances from site. Arlington, Fort Worth, and Grand Prairie are the major population centers (population greater than 100,000) within 50 miles of CPNPP (Table 3.11-1).

The prominent structures, housed facilities and equipment associated with each of the units include: the containment building (which houses the nuclear steam supply system including the reactor, steam generators, reactor coolant pumps, and related equipment), the turbine building (where the turbine generator and associated main condensers are located), the auxiliary building, safeguard building, diesel generator building, and the fuel building (where the spent fuel storage pool and storage facilities for new fuel are located). Prominent features beyond the power block area include the circulating water intake structure, service water intake structure, discharge tunnel, evaporation ponds, sewage treatment plant, technical and administrative support facilities, firing range, meteorological towers, 345-kilovolt (kV) and 138 kV switchyards. Auxiliary building including control room, fuel building, service water intake structure, circulating water intake structure, and circulating water discharge structure are shared by both units. The tallest structures on the site, particularly the reactor domes (approximately 260.5 feet high) are visible from the Dinosaur Valley State Park and Oakdale Park (Luminant 2013b, Section 4.4.1.4). Figure 3.1-1 shows the general features of the facility and the exclusion area boundary (EAB).

As discussed in Section 3.1.2, CPNPP maintains Squaw Creek Park (SCP) within the site boundary and controls public access to the park and reservoir via County Road 213. The portion of the SCR within the EAB is subject to the waterway exclusion provided in 10 CFR Part 100.3. Consistent with that regulation, appropriate and effective arrangements are in place to control traffic on the reservoir to protect the public health and safety in case of emergency.

2.2.1 Reactor and Containment Systems

2.2.1.1 Reactor System

As shown in Figure 3.1-1, CPNPP is a two-unit (Units 1 and 2) plant. The Unit 1 OL was issued on April 17, 1990. The Unit 2 OL was issued on April 6, 1993. The nuclear steam supply system (NSSS) for each unit is a pressurized water reactor (PWR), which along with the design and fabrication of the initial cores, was supplied by Westinghouse Electric Corporation . CPNPP Units 1 and 2 are essentially identical units (NRC 1981, Section 5.8.2.3). Each of the two generating units consists of one PWR, four steam generators, one steam turbine-generator, a heat dissipation system, and associated auxiliary and engineered safeguards (NRC 1981, Sections 1.1).

The reactor core, inside the reactor pressure vessel, consists of uranium dioxide (UO_2) fuel pellets and control rods. The reactor coolant is water under high pressure containing a low concentration of boron to control reactor core reactivity. The coolant flows upward through the reactor core, then from the reactor vessel to the steam generator where it gives up its heat. Heat given up by the reactor coolant is transferred in the steam generator to the main steam/condensate system, causing the secondary coolant to boil. Steam from the boiling secondary coolant is routed to the turbine generator. As the steam passes through the turbine-generator it gives up its energy, causing the turbine to rotate and generate electric power. As the steam releases its energy, its pressure is reduced until it leaves the turbine generator at a partial vacuum. It is then cooled in the main condenser and the condensed water is pumped back to the steam generator. The condenser is arranged such that the steam condensing on the outside of the tubes can transfer its heat to the water from the cooling reservoir flowing inside the tubes.

Each unit was initially licensed to generate net electrical output of 1,150 megawatts electric (MWe). In 2007, CPNPP submitted an application to the NRC in support of CPNPP Units 1 and 2 stretch power uprate (SPU). The SPU license amendment was approved by the NRC in June 2008 (NRC 2008a). The SPU increased the power output from 3,411 megawatts thermal (MWt) to 3,612 MWt, an increase of 5.9 percent (Luminant 2007). CPNPP is currently licensed for maximum enrichment of 5 percent by weight of U-235.

As part of the SPU, high-pressure turbines at both units were replaced. This did not change the method of generating electricity or the method of handling any influents from the environment or non-radiological effluents to the environment. (NRC 2008b) CPNPP evaluates the impact of the SPU on radiological effluents in Section 2.2.6. No additional power uprates, or measurement uncertainty uprates are planned at this time.

The reactor core is a multi-regions core composed of slightly enriched uranium dioxide pellets enclosed in pressurized, cold worked, Zircaloy-4 or ZIRLO® high performance fuel cladding material tubing, which is plugged, and seal welded at the ends to encapsulate the fuel. Zircaloy-4 and ZIRLO clad have a high corrosion resistance to the coolant, fuel, and fission products. All fuel rods are pressurized with helium during fabrication. The basic fuel assembly consists of the control rod guide thimbles attached to the grids and the top and bottom nozzles. The fuel assemblies are designed to accept control rod insertions in order to provide the required reactivity control for power operations and reactivity shutdown conditions. The fuel rods are supported at intervals along their length by grid assemblies which maintain the lateral spacing between the rods throughout the design life of the assembly. The fuel rods are held by the grids in the assembly to provide for very stiff support.

CPNPP utilizes Westinghouse fuel assembly with VANTAGE + fuel design. The fuel rods are loaded into the fuel assembly structure so that there is clearance between the fuel rod ends and the top and bottom nozzles. All fuel assemblies in the core are functionally identical. Each fuel assembly contains 264 fuel rods of 0.360-inch nominal outer diameter, 24 guide thimble tubes, and one instrumentation tube in a 17 x 17 array supported by eight spacer grids, three intermediate flow mixer grids, and one debris-filtering protective grid in the fuel assembly structure. The reactor core is comprised of an array of fuel assemblies which have different fuel enrichments. The initial loading of fuel into the core is designed so that fuel assemblies with the highest enrichment are placed in the outer region of the core while the two groups of fuel assemblies with lower enrichment are selectively arranged in the central region. During refueling operations, a portion of the fuel is discharged, and new fuel is loaded into the core. The fuel in the reactor core is arranged to achieve an acceptable power distribution.

Reactivity control is provided by two independent systems, neutron absorbing rods and the chemical and volume control system (CVCS) which varies boric acid concentration to control long term reactivity changes. The CVCS regulates the concentration of a chemical neutron absorber (boron) in the reactor coolant to control reactivity changes resulting from the change in reactor coolant temperature between cold shutdown and hot full-power operation, burnup of fuel and burnable poisons, buildup of fission products in the fuel, and xenon transients. The CVCS compensates for long term reactivity changes and can make the reactor subcritical without the benefit of the control element drive system. The rod cluster control assemblies provide reactivity control for shutdown, reactivity changes due to coolant temperature changes in the power range, reactivity changes associated with the power coefficient of reactivity, and reactivity changes due to void formation.

Burnable absorbers may also be used for reactivity control. The most effective reactivity control components are the full-length rod cluster control assemblies and their corresponding control rod drive mechanisms which are the only moving parts in the reactor.

Control rod assemblies are inserted into the guide thimbles of the fuel assemblies. The absorber sections of the control rods are fabricated from silver-indium-cadmium and sealed in stainless steel tubes. Neutron control for slow transients is provided by means of boric acid in solution in the reactor coolant system (RCS).

The reactor core fuel loading and programming is designed to yield a minimum core average burnup of 10,000 megawatt-days per metric ton of uranium (MWD/MTU) and lead rod average burnup of 62,000 MWD/MTU for 18 months fuel cycle. There are no plans to increase the maximum enrichment of fuel beyond 5 percent and average burnup beyond 62,000 MWD/MTU during the proposed LR operating term.

2.2.1.2 Containment System

The containment is a steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit. The interior steel liner is constructed with carbon steel plate for leak tightness. The containment building completely encloses the reactor and the RCS. An interior structure within the containment building supports and provides shielding for the reactor, its steam generators, and other components of the NSSS. The containment superstructure is independent of the adjacent interior and exterior structures. Sufficient space is provided between the containment and the adjacent structures to prevent contact under all combinations of loadings. The containment is designed to withstand the pressures and temperatures resulting from a spectrum of loss of coolant accidents (LOCAs) and secondary system breaks. Together with its engineered safety features, each containment structure is designed to safely sustain internal and external environmental conditions that may reasonably be expected to occur during the life of the plant, including both short- and long-term effects following a LOCA.

The containment has a height of 260.5 feet above grade level. The cylindrical part of the structure consists of 4.5 feet thick walls and is 195 feet measured from the top of foundation mat to the dome spring line. The dome consists of 2.5-foot-thick concrete with an inside diameter of 135 feet.

Access to the containment structure is provided by a personnel airlock, an emergency airlock, and an equipment hatch. The primary shield wall (reactor cavity), a heavily reinforced concrete cylinder, is situated at the approximate center of the containment vessel and extends up from the interior base slab to surround the reactor vessel. This reactor cavity structure provides support for the reactor vessel. During normal operation, the primary shield wall provides biological shielding for maintenance inspection.

2.2.2 Maintenance, Inspection, and Refueling Activities

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment and are detailed throughout the final safety analysis report (FSAR). These programs and activities include, but are not limited to, those implemented to achieve the following:

- Meet the requirements of 10 CFR Part 50, Appendix R (Fire Protection), Appendix B (Quality Assurance), Appendices G and H (Reactor Vessel).
- Meet the requirements of 10 CFR 50.55a Codes and Standards, which invoke the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, In-service Inspection and Testing Requirements.
- Meet the requirements of 10 CFR 50.65, the maintenance rule.
- Maintain water chemistry in accordance with Electric Power Research Institute (EPRI) guidelines.

Additional programs include those implemented to meet technical specification surveillance requirements; those implemented in response to NRC generic communications; and various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components.

Maintenance activities conducted at CPNPP include inspection, testing, and surveillance to maintain the current licensing basis (CLB) of the plant and ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component. CPNPP refuels each of the nuclear units on an 18-month schedule, resulting in at least one refueling every year and two refuelings every third year.

2.2.3 Cooling and Auxiliary Water Systems

The cooling system at CPNPP consists of two major components: the circulating-water system and the station service water system (SSWS). The circulating water is withdrawn from the SCR through an intake structure containing eight water pumps; it is pumped through the condensers and various heat exchangers and then returned to SCR through a submerged discharge tunnel. A dam across an arm of the SCR forms a separate water impoundment called a safe shutdown impoundment (SSI). Service water is withdrawn from the SSI. (NRC 1981, Section 4.2.2.1)

As stated in the FSAR the SSI is designed and constructed to withstand the most severe postulated natural phenomena. The water level of the SSI is maintained by an equalization channel between the SSI and the SCR. The SSI is designed to serve as the ultimate heat sink of the CPNPP and acts to dissipate heat rejected by the SSWS during post-accident shutdown and normal cooldown conditions. It is sized to provide adequate cooling capacity for the CPNPP in accordance with the requirements of NRC Regulatory Guide 1.27.

The ultimate heat sink has the capability to ensure either the simultaneous shutdown and cooldown of both units or the shutdown and cooldown of one unit simultaneously with the dissipation of post-accident heat from the other unit.

The purpose of SSI is to provide once-through cooling water for dissipating reactor heat and to allow an orderly shutdown of the plant. The SSI and SCR are connected by an equalization channel immediately southwest of the SSI dam. For all operating conditions, station service water is taken from the SSI through an intake structure containing four pumps. The water is pumped through various safety related cooling systems and then returned to the SSI through a discharge-chute structure. (NRC 1981, Section 4.2.2.1)

SCR is supplied with makeup water from Lake Granbury.

The typical water balance at CPNPP is shown in Figure 2.2-1.

2.2.3.1 Circulating Water System

CPNPP draws water from and discharges to the SCR. Cooling water for the main condensers is provided by the circulating water system. The circulating water system intake structure is located north of the plant on the SCR. The heated water of the circulating water system is discharged to the SCR via a discharge tunnel at a point southeast of the plant.

Cooling water for normal plant operation of both units is withdrawn from the SCR by eight circulating water pumps with 275,000 gpm capacity each. Maximum design flow is 2,200,000 gpm. All pumps are located on the circulating water intake structure. The number of pumps needed is adjusted seasonally, with three pumps operating during cooler months and four pumps operating during mild or warmer months. The plant can operate at reduced loads operating two or three pumps per unit. Each pump has propeller blades which extend to elevation 758 feet and to a minimum submergence requirement of 12 feet. The circulating water pumps are not required for plant shutdown.

Water from the SCR flows to the eight circulating water pumps (both units) through heavy, steel bar trash racks and 12 traveling screens. Circulating water pumps are located downstream of the traveling water screens to convey screened flow to the condensers. Circulating water is withdrawn through a single screenhouse with twelve intake bays. Each bay is 11 feet, 2 inches wide and has a vertical traveling water screen. A trash rack is located along the upstream face of the structure. The trash rack consists of 4 inches x 1/2-inch-wide steel bars with a 2-inch clear spacing. Twelve 10-foot-wide traveling water screens are located downstream from the trash racks. The screens have 3/8-inch square mesh openings. The screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every four hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures reach below 38 degrees Fahrenheit (°F).

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 1,200 gpm of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens.

The trash racks remove any heavy debris from the intake water while the traveling screens remove smaller debris which can also be present. The backwash water is filtered and returned to the reservoir. For maintenance purposes, each screen well is provided with stop logs to allow dewatering of any individual screen well. For each unit, the water from six screen wells flows to a common suction pit. Four motor-driven, vertical, centrifugal, mixed flow, circulating water pumps take suction from this pit. This system is duplicated for operation of the second unit.

The circulating water system supplies approximately 1,100,000 gpm of cooling water to each unit. This flow is sufficient to remove the heat from the main condenser, the two auxiliary condensers, the turbine plant cooling water heat exchanger, the three-condenser exhausting vacuum pump heat exchangers, and five non-safety ventilation chillers.

The total heat removed amounts to approximately 8.8 x 10^9 British thermal units (Btu)/hour, of which about 8.4 x 10^9 Btu/hour is removed from the main condenser. The circulating water system is supplied by the SCR, which provides water at a design temperature of 95°F. The expected discharge temperature is an approximately 15°F temperature rise above the inlet temperature of SCR. The system is designed to operate with the water in the SCR at its lowest elevation of 770 feet.

Cooling water is returned to the SCR via a tunnel discharging into an open structure, circulating water discharge structure. The discharge structure is located at an adequate distance from the circulating water intake structure to ensure sufficient water mixing and evaporative cooling. This discharge structure greatly reduces the velocity of the circulating water from the pipeline to the end of the structure where the water flows into the reservoir. The discharge velocity is approximately 9.8 feet per second (fps). The low discharge velocity encourages stratification of the heated circulating water. This in turn promotes dissipation of the rejected heat by evaporation and heat transfer to the atmosphere. This mechanism involves the minimum amount of reservoir water in the heat dissipation process.

The circulating water is shock treated with a solution of sodium hypochlorite and sodium bromide to reduce organic fouling by controlling organic and biological growth. Sodium hypochlorite and sodium bromide are drawn from storage tanks and distributed to the circulating water at the intake bays.

At periodic intervals, chlorine will be injected into the circulating-water system to prevent the growth of algae and bacterial slime on the surfaces of the circulating-water tunnel and the condensers (NRC 1981). The chlorine dosage will be adjusted in accordance with the Texas Pollutant Discharge Elimination System (TPDES) permit to restrict the total residual chlorine concentration to a daily maximum of 0.2 milligrams per liter (mg/L) and 880 pounds/day. Effluent limitations for Outfall 001 (Circulating Water discharge) free available chlorine are 0.2 mg/L daily average, with a daily maximum of 0.5 mg/L and 1,101 pounds/day.

The circulating water system is not required for emergency cooldown or for operation of the engineered safeguard systems or for cooling during shutdown; instead, the SSWS system and the related SSI fulfill these functions.

2.2.3.2 Station Service Water and Component Cooling Water Systems

Cooling water is withdrawn from the SSI by four 17,000-gpm capacity service water pumps. All pumps are located in the service water intake structure, a seismic Category I building. Cooling water is returned to the SSI through the service water discharge canal. The discharge canal is located at a sufficient distance from the service water intake structure to ensure adequate water mixing and evaporative cooling.

The SSWS removes heat from the component cooling water system (CCWS) heat exchangers and from the emergency diesel generators. The SSWS supplies cooling water to the safety injection (SI), centrifugal charging pump lube oil coolers, and the containment spray pump bearing oil coolers. In conjunction with the CCWS, the SSWS supplies cooling water to meet the plant cooling requirements during normal operation, shutdown, and during or after a postulated LOCA of either unit. The required cooling water is taken from the SSI, which is the ultimate heat sink. The SSWS also acts as a backup water supply for the auxiliary feedwater system if the condensate storage tank is depleted.

The SSI contains a water supply for a minimum of 30 days of reactor decay heat removal, without outside makeup. The SSWS is designed to properly operate with water in the SSI at the lowest level during this period of time.

The SSWS has a separate system which injects sodium hypochlorite and sodium bromide to control organic fouling. The quality of the SSI water is very similar to that of SCR water. A chemical addition system is used to control corrosion and fouling in the service water system to protect the carbon steel pipe. A coordinated chemical treatment program with phosphate, organic phosphate, and a copolymer is used in addition to the existing biocide treatments for this added corrosion protection.

The SSWS of each of the units is completely independent and redundant. Each unit has two fully independent trains, either of which can supply the required cooling waterflow. The pumps and heat exchangers of each train can be aligned with the other train in the event of a component failure.

The CCWS is a closed system. It is designed to remove residual heat from the RCS, cool the letdown flow to the CVCS, cool safety-feature heat loads, and dissipate rejected heat from various plant components.

The CCWS is normally required to be operating during all phases of plant operation including startup, power operation, shutdown, refueling, and the injection and recirculation phases following a LOCA.

Both the SSWS and CCWS have two flow loops with redundant pumps, heat exchangers, and piping arrangements. The system is designed to meet the required safety function so that no single failure impairs cooling of essential equipment.

2.2.3.3 Thermal Effluent Dispersion

CPNPP performed a thermal discharge study in August 2007 to study the impact of SPU. The uprate resulted in a small increase in temperature at the intake and discharge locations. The increase in the average temperature rise at the intake is 5.6 percent or an increase of 13.2°F. This increase can be compared to the overall increase in the waste heat load to the SCR due to the SPU, which is 6.2 percent. For the purpose of the study, the base case temperature was set to 95°F. The number of days above 95°F would increase from 67 days to 74 days one year out of every 40 years. The increase in evaporation due to the 3,612 MWt uprate is 2.1 million gallons per day (MGD), or 4.2 percent of the current rate. This increase can be compared to the overall increase in the waste heat load of 6.2 percent. That the increase in evaporation is less than, but similar to, the increase in waste heat load is understandable since only a portion of the increased waste heat load is transferred to the atmosphere through evaporative losses. The remaining waste heat load is transferred to the atmosphere by conduction and radiative heat transfer.

As noted in the thermal discharge study, maximum discharge temperature increased from 109°F to111°F and average discharge temperature increased from 95.3°F to 96.6°F at outfall 001. CPNPP is currently permitted by the TPDES permit for discharge at daily average temperature of 113°F and daily maximum temperature of 116°F. Therefore, impacts to thermal discharge analysis due to the SPU were bounded by the thermal discharge study performed as part of the TPDES permit.

2.2.3.4 Municipal Water Supply System

CPNPP potable and sanitary water system is designed to provide water for toilets, sinks, showers, and drinking purposes in all permanent personnel areas of the plant site, as required; water for emergency eyewash and showers, as required; water to fire protection hoses for various onsite buildings; and water to fill and to provide normal makeup to the fire water storage tanks.

The distribution system that provides potable water to the plant and associated support structures and buildings for both Unit 1 and 2 is supplied by the Somervell County Water District (SCWD) public water system (PWS), which started in 2012.

A small quantity (35,900 gallons, less than 1 gpm, in 2020) of groundwater is pumped to be used primarily for potable and sanitary purposes at the recreation training facility. Groundwater withdrawals are discussed in detail in Section 3.6.

Backflow preventers are installed on potable water lines to protect the water supply from a potential contamination source classified as a "high health hazard." Texas Commission on Environmental Quality (TCEQ) requires annual testing of backflow prevention devices by state-certified testers. Backflow preventers are tested and certified annually, and documentation of the certification is kept in the environmental files with a copy sent to SCWD for recordkeeping purposes. CPNPP performs testing of the SCWD supply and the supply to the fire water storage tanks inside the protected area.

The potable and sanitary water system is designed without interconnection with, and is physically separated from, any radioactive sources, thus precluding the possibility of radioactive contamination. It is completely separated from the laundry and hot shower portion of the liquid waste processing system (LWPS). Wastes produced by the potable and sanitary water system contain no radioactive materials and can therefore be safely treated in the domestic waste treatment facility.

Because the system is common to both units and is independent of their operation, a shutdown of either or both units does not affect the supply of potable water. In case of water contamination (radiological or otherwise) or an event where the piping is forced out of service, potable water can be trucked to the site and distributed in portable containers.

2.2.3.5 Fire Protection Water Supply System

The fire protection water supply system capacity was designed using National Fire Protection Association (NFPA) 13 and NRC branch technical position Auxiliary Power Conversion Systems Branch 9.5-1 Appendix A as guidance. The capacity is based on supplying water to the largest fixed extinguishing system and the necessary adjacent hose stations with the shortest portion of the fire protection yard-loop out of service. (Luminant 2020a, Section 6.3.2)

Two dedicated 100-percent capacity, atmospheric fire water storage tanks are provided to supply water to the fire protection water supply system. Each storage tank has a nominal capacity of 524,500 gallons. The tanks are interconnected to facilitate suction from either or both tanks. Refill capability with a separate pump which takes suction from the SSI is provided to allow either tank to be refilled within eight hours after using its contents to extinguish a fire. (Luminant 2020a, Section 6.3.2)

The station fire main system, including the associated pumps, piping, and valves, is shared by the two CPNPP units.

2.2.4 Meteorological Monitoring Program

The CPNPP onsite meteorological monitoring system is designed to provide meteorological data to support offsite radiological dose assessment. 10 CFR Part 50 Appendix E, entitled "Emergency Planning and Preparedness for Production and Utilization Facilities," requires licensees to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Therefore, a reliable meteorological program capable of rapidly providing valid meteorological information is required to assess actual or potential consequences of a radiological emergency condition. This is accomplished by measuring, recording, and storing wind direction, wind speed, and temperature at various elevations and precipitation.

The CPNPP meteorological monitoring system, including instrumentation package, meets the criteria of Regulatory Guide 1.23 with the exception of calibration requirements of wind speed and direction sensors, which are calibrated once every 12 months instead of semiannually, as required by Regulatory Guide 1.23. As discussed in CPNPP's offsite dose calculation manual (ODCM), the onsite controls have been shown to meet the accuracy and data recovery recommendations of Regulatory Guide 1.23. (CPNPP 2014)

The CPNPP meteorological monitoring system includes two onsite meteorological towers, the primary tower, and the backup tower. The locations of the two meteorological towers are shown in Figure 3.1-1. The primary meteorological tower is located east of the Unit 1 and Unit 2 reactor buildings, and is a 60-meter (m), guyed, open lattice type, constructed to withstand and rotate fewer than 2.01 degrees in 100 miles per hour (mph) uniform horizontal wind load. The instrument elevator and instrumentation booms are located on the 10-m and 60-m levels. These booms are oriented to the west. The aspirated temperature shields at 10 m and 60 m are oriented laterally to the north. The primary tower instrument translators are located in an environmentally controlled building approximately 70 feet west-northwest of the primary tower.

The backup meteorological tower is located 75 feet east-northeast of the primary tower. The backup tower is a 10-m free standing open lattice type tower with an instrumentation boom located on top of the tower at 10 m. The aspirated temperature shield is oriented laterally to the north to further minimize the effects of direct sunlight on the measured temperature. In addition, the backup tower field instrumentation is located in the same environmentally controlled instrument building as the primary tower.

The recording of meteorological data from the primary tower is accomplished by utilizing two digital and one auxiliary digital paperless recording systems. The recording of meteorological data from the backup tower consists of one digital and one auxiliary digital paperless recording system.

Meteorological data from both towers are provided to the meteorology and plant computers. Signals from both meteorological towers are transmitted through shielded twisted pair cable to the digital to analog converter of the meteorological system receiver located in the Unit 1 plant computer room. Digital output of the meteorology and plant computers is displayed in the Unit 1 plant computer and control room, as well as the technical support center and emergency operation facility, where meteorological data consistent with the requirements of NUREG-0696 are displayed.

The meteorology computer is designed to provide digital readout of meteorological data received from the primary and backup towers for all parameters. Both 15-minute and hourly averaged data are generated. The 15-minute averaged data are derived from the meteorological parameters that are sampled every 5 seconds (except precipitation which is a totalized value). The hourly averaged data are derived from the 15-minute averages. The 15-minute averaged data and the hourly averaged data can be stored internally in the computer for a period of up to 10 years. This data averaging methodology meets the requirements of Regulatory Guide 1.23.

The plant computer is designed to a provide digital readout of 15-minute averaged data from the primary meteorological tower. The 15-minute averaged data are based on a 5-second sampling rate. Trending data for the previous week are also available from the plant computer.

To assure data quality and accuracy, a comprehensive calibration of the meteorological station components is performed at 6-month intervals. The procedure includes close visual inspection of all instrument sensors for wear, electronic component calibration, ambient temperature, and dewpoint comparison using mercury-type thermometers, and calibration of recorders.

Normal maintenance includes a comprehensive inspection of the station's electronic and mechanical equipment as part of an ongoing operation and maintenance program. Inspections are performed on a weekly frequency, as a minimum, but on average two operational inspections are performed per week. Station operating procedures call for, among other things, a manual check of the zero and full-scale positioning of the analog recorders, as well as a verification of the associated direct current (DC) voltages displayed by the digital panel meter for the primary recording system.

The meteorological variables which are monitored include wind speed, wind direction, ambient temperature, temperature difference with height (Delta-T), sigma theta, and precipitation. The meteorological variables monitored at CPNPP are listed in Table 2.2-1.

Based on the previous 5 years (2016–2020), the meteorological data recovery rate at CPNPP has been greater than 90 percent. (Luminant 2017a; Luminant 2018a; Luminant 2019; Luminant 2020b; Luminant 2021a) Meteorology and air quality at CPNPP are discussed in detail in Section 3.3.

2.2.5 Power Transmission System

2.2.5.1 In-Scope Transmission Lines

Based on NRC Regulatory Guide 4.2 (NRC 2013b, Section 2.2), transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system and power lines that feed the plant from the grid during outages. All in-scope transmission lines are located completely within the CPNPP site boundary, as shown in Figure 2.2-2.

The CPNPP output is connected to the 345-kV transmission system via the 345-kV switchyard. The startup and shutdown power for the units are derived from the 138-kV and 345-kV switchyards. The CPNPP switchyards are located approximately 600 feet west of the turbine building. The locations of the 138-kV and 345-kV switchyards are shown in Figure 3.1-1.

The onsite electric system includes power supplies, distribution equipment, and instrumentation and control to supply power to the unit auxiliary loads (normal and safety-related) during startup, normal operation, and normal and emergency shutdown. Connection of the generator outputs to the 345-kV switchyard is via isolated-phase bus (generator main leads), step-up transformers, and transmission lines.

The preferred power sources supply power to the Class 1E buses during plant startup, normal operation, emergency shutdown, and upon a unit trip. These sources originate as part of the 138-kV and 345-kV offsite power systems and supply power to the 6900-V Class 1E auxiliary bus systems through startup transformers.

There are no interconnections between the 138-kV switchyard and the 345-kV switchyard at the CPNPP site. The 138-kV switchyard is physically and electrically independent of the 345-kV switchyard. The 345-kV and the 138-kV switchyards each consist of a two-bus arrangement. Transmission circuits terminate on one or both buses in the switchyards. Power can be supplied to each switchyard from any of their respective transmission circuits.

Two separate and physically independent startup transformers provide startup, preferred and alternate shutdown power to the safety-related auxiliaries of the units on an immediate basis. One transformer is connected to the 345-kV switchyard while the second transformer is connected to the 138-kV switchyard; these transformers are connected to the safety-related 6,900-V auxiliary bus systems and, as such, provide two independent means of supplying the safety-related equipment from the offsite power system without relying on the main generator.

Two station service transformers provide power to the non-safety-related auxiliaries. These transformers are connected to the 345-kV switchyard. One transformer is connected to the non-safety-related 6,900-V auxiliary buses of one unit while the second transformer is connected to the non-safety-related 6,900-V buses of the other unit. In addition, the 25-kV plant support power loop, fed from the 138-kV switchyard, supplies power to non-safety-related equipment.

2.2.5.2 Vegetation Management Practices

The in-scope transmission lines are within CPNPP site boundary, as shown in Figure 2.2-2. The transmission lines cross the CPNPP industrial area, where vegetation is sparse and minimal vegetation management is required.

2.2.5.3 Avian Protection

Threatened and endangered species potentially occurring near CPNPP, or within counties occurring within a 6-mile radius of CPNPP, are described in Section 3.7.8. As discussed in Section 3.7.7.2, CPNPP implements deterrents to keep birds away from some operational areas; given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures pose a minimal bird collision hazard.

2.2.5.4 Public

As presented in Section 2.2.5.1, all in-scope transmission lines are located completely within CPNPP owned property and controlled by Vistra OpCo. Therefore, the public does not have access to this area and, as a result, no induced shock hazards exist for the public.

2.2.5.5 Plant Workers

The GEIS suggests that occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC 2013a, Section 3.9.5.1).

CPNPP maintains the safety specific policies for all work conducted at electrical transmission locations. Transmission line maintenance activities at CPNPP are controlled by plant procedures. CPNPP has rigid procedure requirements that control the use of man lift and cranes near electrical transmission lines to prevent shock. Compliance with the National Electrical Safety Code (NESC) clearance standards is maintained by CPNPP's procedure-driven design control process and the design attribute review. This process documents evaluations of changes that would potentially affect the electrical shock hazard of the in-scope transmission lines.

2.2.6 Radioactive Waste Management System

The waste processing systems (WPS) are designed to process liquid, gaseous, and solid waste while achieving the lowest reasonable radioactive release to the environment. Liquid and gaseous wastes to be recycled within the plant are first segregated from those to be processed or shipped offsite. Segregation of wastes is consistently maintained in the subsystems to ensure proper handling. The WPS, with the exception of the equipment associated with the reactor coolant drain tanks, are completely shared. The reactor coolant drain tanks and associated equipment are located inside their respective containment structures.

CPNPP uses liquid, gaseous, and solid radioactive waste processing systems to collect and process the liquid, gaseous, and solid wastes that are the byproducts of the operation of CPNPP. These systems process radioactive liquid, gaseous, and solid effluents to maintain levels as low as reasonably achievable (ALARA) before they are released to the environment. The WPS meets the design objectives of 10 CFR Part 50, Appendix I, and controls the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes.

The ODCM for CPNPP describes the methods used for calculating the concentration of radioactive material in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents from CPNPP. The ODCM also specifies controls for release of liquid and gaseous effluents to ensure compliance with the NRC regulations. (CPNPP 2014, ODCM) The quantity of liquid and gaseous effluents released, and amount of solid radioactive waste shipped from CPNPP is reported in the annual radioactive effluent release report.

Fuel assemblies are removed from the core once they have achieved the desired fuel burnup. The spent fuel is currently stored onsite in the spent fuel pools in the fuel handling building or in dry cask storage containers at the onsite independent spent fuel storage installation (ISFSI). Spent fuel is stored in the CPNPP ISFSI under a general license. ISFSI license information is provided in Table 9.1-1.

2.2.6.1 Liquid Waste Processing System

The CPNPP LWPS services both units with shared components. The LWPS is designed to control, collect, process, handle, store, and dispose of liquid radioactive waste generated as the result of normal operation, including anticipated operational occurrences from LWPS equipment malfunction, excessive leakage in RCS equipment, and excessive leakage in auxiliary system equipment.

The system design considers potential population and occupational exposures and ensures that quantities of radioactive releases to the environment meet the requirements specified in 10 CFR Parts 20 and 50 and the dose design objectives specified in Appendix I of 10 CFR Part 50, during both normal and anticipated operational occurrences.

The LWPS collects and processes potentially radioactive wastes for recycle or disposal during the normal mode of operation. Provisions are made to sample and analyze fluids before they are discharged. Based on this analysis, these wastes are either released under controlled conditions via the circulating water discharge canal or retained for further processing. The circulating waterflow serves to reduce the concentration of radioactivity in the plant effluent by diluting the LWPS discharges.

Normally, radioactive liquids discharged from the RCS are recycled or processed by the boron recycle system, thereby limiting inputs into the LWPS. Water in the recycle holdup tank that needs to be processed is sent to the filter/demineralizer system. This limits input to the LWPS and results in processing of relatively small quantities of generally low-activity level wastes.

The LWPS is designed to segregate different effluents from equipment leaks and drains according to their chemical and radiochemical properties. In addition, interconnecting piping is available to allow for operating flexibility and provide for efficient utilization of purification equipment.

The LWPS is arranged to recycle as much reactor grade water entering the system as possible. This is implemented by the segregation of equipment drains and waste streams, which prevents the intermixing of liquid wastes. The LWPS consists mainly of two sub-systems designated as drain channel A and drain channel B. Drain channel A is connected to drain channel B and processed for release through the filter demineralizer system (FDS). A drain system is also provided inside the containment to collect drains and leaks and transfer them to an appropriate tank. Capability for handling and storage of spent demineralizer resins is also provided.

Instrumentation and controls necessary for the operation of the LWPS are located on a control board in the auxiliary building. Any alarm on this control board is relayed to the main control board in the control room.

Contaminated equipment leak-offs and drains are collected in the floor drain tanks of the drain channel B system, processed to within limits for release via the FDS system, and then released via the circulating water system to SCR.

<u>Reactor Coolant Drain Tank Subsystem</u>

Recyclable reactor-grade effluents enter this subsystem from equipment leaks and drains, valve leak-offs, pump seal leak-offs, loop drain leak-offs, and from other deaerated tritiated water sources inside the containment. This liquid may be processed by the boron recycle system rather than by the LWPS.

<u>Drain Channel C Subsystem</u>

Drain channel C is provided to collect and process waste effluents from onsite laundry, personnel decontamination showers and sinks, and surface decontamination. These liquids may be collected in the laundry and hot shower tank. The liquid collected in the laundry and hot shower tank is pumped through the laundry and hot shower tank strainer and filter to one of the two 5,000-gallon waste monitor tanks. The wastewater is then sampled to determine if the liquid is to be discharged or reprocessed through the FDS or the waste evaporator. With the use of the FDS the laundry holdup monitor tanks may also receive effluent.

Blowdown from the steam generators of each unit is cooled, filtered, demineralized, and returned to the condenser or heater drain tank for reuse as secondary coolant. This blowdown processing system is in operation continuously so that no releases are made from the blowdown system.

Discharges from the turbine building sumps are routed to the WMS. These discharges are normally routed to the low volume waste treatment facilities. However, when radioactivity is present above specified levels, the discharges are diverted to the co-current waste treatment facilities. These facilities are also part of the WMS. After batching, these wastes are sampled for radioactivity and if required, treated for conventional pollutants, and discharged to the circulating water discharge canal.

CPNPP does not anticipate any increase in liquid waste releases beyond current operations, during the proposed license renewal operating period.

2.2.6.2 Gaseous Waste Processing System

The gaseous waste systems are designed to collect, process, store and release gaseous wastes generated due to plant operations including anticipated operational occurrences. The systems are designed to assure that the release of gaseous effluents from the plant and expected offsite doses are ALARA as defined in the design objectives in Appendix I of 10 CFR Part 50. The gaseous systems have sufficient capacity and redundancy to meet discharge concentration limits of 10 CFR Part 20 during periods of design basis fuel leakage.

The design of the gaseous waste processing system (GWPS) is based on continuous operation of the NSSS assuming that fission products associated with 1 percent of the core power generation are available for leakage from the fuel into the coolant. This condition is assumed to exist over the life of the plant.

The GWPS is shared between both units. The main flow path in the GWPS is a closed loop comprised of two waste gas compressors, two catalytic hydrogen recombiners, eight gas decay tanks for normal power service and two gas decay tanks for service at shutdown and startup. The eight gas decay tanks used for normal power service can also be used to function as shutdown gas decay tanks at shutdown and startup. The system also includes a gas decay tank drain pump, four gas traps, and a waste gas drain filter. All of the equipment is located in the auxiliary building.

The GWPS stores fission gases removed from the RCS. This reduces the escape of fission gases from the RCS during maintenance operations or through equipment leakage. These gases should be contained as long as practical, thus the discharges from the GWPS to the environment for normal plant operation should occur infrequently. The GWPS also provides capacity for holdup of gases generated during reactor shutdown. A portion of the gas from shutdowns is typically contained in one of the shutdown gas decay tanks.

Operation of the system is such that fission gases are distributed throughout the eight normal operation gas decay tanks. Separation of the GWPS gaseous inventory in several tanks reduces the amount of fission gases that would be released in the event of a gas decay tank rupture.

The primary location from which radioactive gases are removed from the RCS is the volume control tank. Smaller quantities are received via the vent connections, from the reactor coolant drain tank, the pressurizer relief tank, and the recycle holdup tanks. The waste and recycle evaporator gas strippers are normally vented to the auxiliary building exhaust.

During normal power operation, nitrogen gas and fission gases are typically circulated around the GWPS loop by one of the two compressors. Hydrogen gas is introduced to the volume control tank where it is mixed with fission gases stripped from the reactor coolant by the action of the volume control tank letdown line nozzle spray. The gas stream may then be vented from the volume control tank into the circulating nitrogen stream in the waste gas system, at the compressor suction.

The resulting mixture of nitrogen, hydrogen and fission gases is pumped by one of the compressors to one of the two catalytic hydrogen recombiners where enough oxygen is added to react with and reduce the hydrogen to a low residual level. Water vapor formed in the recombiner by the hydrogen-oxygen reaction is condensed and removed, and the cooled gas stream (now composed primarily of nitrogen and fission gases) is discharged from the recombiner, routed through a gas decay tank, and sent back to the compressor suction to complete the loop circuit. Depending on gas decay tank pressure the waste gas may be pumped by the compressor to a gas decay tank prior to processing by the hydrogen recombiner.

CPNPP evaluated the impacts of the SPU on gaseous radioactive wastes. Gaseous radioactive wastes are activation gases and fission product radioactive noble gases, which come from radioactive system leakage, process operations including volume control tank venting, gases used for tank cover gas, and gases generated in the radiochemistry laboratory. The SPU did not significantly increase the inventory of gases normally processed in the gaseous waste management system as there was no change to plant system functions and no change to the gas volume inputs. (NRC 2008b)

The activity of radioactive gaseous nuclides in the waste gas system increased as a result of the SPU. This is due to the increased levels of gases in the RCS and the actions performed in the volume control tank. However, the operation of the waste gas system continues to allow for decay of the short-lived radionuclides. Tritium remained the largest component of the gaseous effluents, the largest contributor being from evaporation from the spent fuel pools. The SPU resulted in an increase (approximately 9.5 percent for noble gases, 6.6 percent for 1-131, and 6.5 percent for long-lived activity) in the equilibrium radioactivity in the reactor coolant, which in turn increases the activity in the gaseous waste disposal systems and the activity released into the atmosphere (estimated to increase by 9.5 percent for noble gases, 6.5 percent for particulates including tritium, and 12.6 percent for iodines). (NRC 2008b)

The evaluation shows that even with the small increase in the gaseous radioactivity being discharged into the environment, the projected dose to the maximally exposed member of the public, while slightly increased, has been and will remain well below the ALARA criteria in Appendix I to 10 CFR Part 50. (NRC 2008b)

CPNPP does not anticipate any increase in gaseous waste releases (GWRs) beyond current operations during the proposed LR operating period.

2.2.6.3 Solid Waste Management System

The solid waste management system is designed to control, collect, condition, handle, process, package, and temporarily store, prior to offsite shipment, solid radioactive waste generated as a result of normal operation, including anticipated operational occurrences.

Connections have been provided to allow for the bulk disposal of wastes to a truck mounted or mobile waste processing system. These connections supply waste from the chemical drain tank, waste conditioning tank, the NSSS spent resin transfer system, and the steam generator blowdown spent resin transfer system.

While the SPU slightly increased the activity level of radioactive isotopes in the RCS and the volume of radioactive liquid generated from leakage and planned drainage, there has been only a minimal effect on the generation of radioactively contaminated sludge and resin solids processed as radwaste. (NRC 2008b)

The CPNPP's process control program contains or refers to the current formulas, sampling, analyses, tests, and determinations made to ensure that processing and packaging of wet solid radioactive waste based on demonstrated processing of actual or simulated wastes will be accomplished in such a way to ensure compliance with federal and state regulations, burial site criteria, and other requirements governing the disposal of radioactive waste.

Waste processing is performed by a mobile processing vendor. The Vistra OpCo process control program requires that the vendor operate in accordance with a process control program and procedures which have been reviewed and approved by Vistra OpCo. Additionally, any vendor selected to provide waste processing services or products used to achieve the 10 CFR Part 61 stability requirements shall have documentation demonstrating compliance with 10 CFR Part 61 stability requirements.

CPNPP does not anticipate any increase in solid waste releases beyond current operations, during the proposed license renewal operating period.

2.2.6.3.1 Spent Resin Handling Operations

Resin may be disposed of by use of a vendor-supplied mobile system via the bulk disposal connection. When sufficient resin has accumulated to warrant disposal, the spent resin storage tank is pressurized with nitrogen, and resin is transferred to the bulk disposal connection. Upon completion of transfer, the spent resin storage tank is vented to the plant vent, and flush water is pumped through all lines to ensure resin removal is complete.

Normally, resin from the primary system demineralizers is transported to and stored in the spent resin storage tank prior to being packaged for disposal. The spent resin sluice portion of the LWPS consists of a spent resin sluice filter, spent resin sluice pump, and the spent resin storage tank. The resin sluice water, after being directed to an ion exchange vessel by the sluice pump, is returned to the spent resin storage tank for reuse. Thus, sluicing of spent resin from primary plant demineralizers is normally accomplished without generating a large volume of additional liquid waste.

2.2.6.4 Ultimate Disposal Operations

Radioactive wastes are stored in a designated staging area prior to shipment. Shipment of the radioactive waste originates from the staging area. All waste that is processed at CPNPP for disposal is packaged in strong, tight containers meeting all applicable DOT, NRC, and burial site requirements pertaining to the storage, shipment, and burial of radioactive waste.

All shipments and notifications are made in accordance with the state, NRC, and DOT regulations, and appropriate CPNPP procedures. As discussed earlier, quantity of radioactive waste shipped from CPNPP is reported in the annual monitoring report in accordance with the ODCM.

2.2.6.5 Low Level Mixed Waste

Mixed waste is radioactive waste that contains or consists of waste constituents that the U.S. Environmental Protection Agency (EPA) lists as hazardous waste. Therefore, any mixed waste is under regulatory requirements of NRC and EPA. Since burial sites are not allowed to receive mixed waste, any such waste generated will have to be stored indefinitely. CPNPP makes every effort to minimize or eliminate generation of mixed waste, when possible, by minimizing the use of hazardous material in the RCA and reviewing possibility of utilizing an alternate non-hazardous substitute material, if available.

CPNPP does not have conditional exemption for low level mixed waste (LLMW) in accordance with 40 CFR Part 266, Subpart N. CPNPP currently has a few partially filled mixed waste containers in the accumulation area but has not generated any new mixed waste in the last 10 years.

2.2.6.6 Low Level Radioactive Waste

Low level radioactive waste is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. CPNPP has contracts with Waste Control Specialists and Energy Solutions for disposal of low-level radioactive waste.

In 2020, low-level waste (LLW) was shipped to the Waste Control Specialists facility in Andrews, TX, for burial or disposal (Luminant 2021a, Table 9.10). Currently, CPNPP has no waste greater than Class C stored . Disposal of greater than Class C waste is the responsibility of the federal government.

2.2.7 Nonradioactive Waste Management System

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. Solid and hazardous wastes in Texas are regulated and administered by the TCEQ (EPA

2021a). CPNPP generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes that occur at the site. Nonradioactive waste commonly generated at CPNPP includes used oil, spent resin, sewer liquid, e-waste, used oil filters, universal waste (e.g., used lamps containing low quantity mercury, paint-related materials, used batteries/non-polychlorinated biphenyl (PCB) ballasts, etc.), expired chemicals (hazardous and non-hazardous), spent solvents, used anti-freeze, and asbestos.

Various nonradioactive wastewater management and disposal activities are conducted at CPNPP. CPNPP Units 1 and 2 cooling water and auxiliary equipment cooling water is treated by chlorination with biofouling control, to prevent growth of algae and bacterial slime on the surfaces of the circulating water tunnel and the condensers (NRC 1981).

Domestic wastewater is discharged from a treatment facility that employs extended aeration and activated sludge return for treatment. The facility is a single, integral, above-ground installation consisting of a surge basin, grinder pumps, aeration basin, circular clarifier, aerobic digester, and a sludge holding basin.

Low Volume Waste

The low volume waste (LVW) treatment facilities provide collection, treatment, and discharge of normally non-radioactive wastewaters. The non-radioactive low-volume waste sources from secondary support systems include equipment, floor, laboratory, and sample drains; water treatment wastes from demineralizer regeneration, reverse osmosis systems operation, condensate polisher system and other miscellaneous water treatment blowdown and backwash operations; periodic drainage and flushing of various system components. These low-volume waste sources are routed to a low-volume waste management system and discharged via the low volume waste outfall (Outfall No. 004) in accordance with the regulatory requirements of the TCEQ and the TPDES permits.

The WMS consists of the following components: a surge basin, oil/water separator, clarifier blowdown and condensate polisher decant basins, three separate interconnected low volume waste retention ponds with double synthetic liners and leachate collection systems. The complete WMS provides for monitoring and management of process wastewater to comply with TPDES permit parameters for oil and grease, total suspended solids (TSS), pH, and visible floating solids or foam for Outfall 004.

The LVW settling ponds consist of two 1.75 million gallons (MG) capacity lined settling ponds and a 6.7 MG capacity emergency settling pond. The 1.75 MG settling ponds are sized for average water flow of approximately 455,000 gallons per day (gpd) to be turned over in accordance with the ODCM limits and wastewater discharge permit (batch or continuous flow). These ponds are lined with a double synthetic liner with a leachate collection system.

The treated non-radioactive low-volume wastes are normally commingled with the wastes which are potentially low-level radioactive and are discharged via the Low Volume Waste Outfall to the condenser cooling water. The commingled waste stream is sampled prior to mixing with cooling water for compliance with the appropriate effluent limitations.

Hazardous Waste

Hazardous waste commonly generated at CPNPP includes metal cleaning waste, oil contaminated with Freon when collected from chiller units, ignitable liquids, and laboratory packs. CPNPP maintains a pollution prevention (P2) plan as required by TCEQ. One of the goals of the P2 plan is maintain hazardous waste generation and disposal at or below 2,500 pounds total annually (single outage year) or 3,500 pounds total annually (dual outage year) for three targeted hazardous waste streams (ignitable fluids, torex water waste, and Freon-contaminated waste oil) and waste generation and disposal at or below 1,200 pounds for all other hazardous waste. CPNPP waste generation will be minimized via current site processes, as applicable.

CPNPP also maintains a hazardous waste contingency and emergency procedure plan to supplement the existing spill prevention control and countermeasure (SPCC) plan and is prepared in addition to the CPNPP emergency preparedness plan (EPP) to address required contingency planning and emergency procedures for hazardous waste, as required by EPA RCRA 40 CFR Part 264, Subpart D, and Texas Administrative Code (TAC) 335.151–157. This plan is designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned releases of hazardous waste or hazardous waste constituents to air, soil, or surface water from incidents that are not of a sufficient magnitude to be classified within the scope of the EPP. These incidents would not be expected to degrade the level of safety of the plant or to be released offsite. In the event a release of a hazardous waste escalates to a condition that would be classified in accordance with the CPNPP EPP, the EPP would be implemented. TCEQ and RCRA registration information is included in Table 9.1-1.

CPNPP is classified by the EPA and TCEQ as a small quantity generator of hazardous waste. This means that CPNPP can generate more than 200 pounds but less than 2,200 pounds of any type of hazardous waste in a month, never accumulate more than 13,200 pounds of hazardous waste onsite, and store hazardous waste for no more than 180 days or 270 days if the destination facility is located more than 200 miles (TCEQ 2021a). CPNPP maintains a log of approved waste vendors currently used to manage and dispose of hazardous and nonhazardous wastes, and recyclable wastes generated at CPNPP. Nonradioactive hazardous and recyclable waste quantities over the most recent 5 years (2016–2020) are provided in Table 2.2-2. Nonhazardous waste is estimated to be approximately 100,000 pounds annually. This does not include common trash or construction debris which is transported to a local municipal landfill via a trash collection vendor.

Because CPNPP ships hazardous materials that are regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in Title 49 of the CFR, including the requirement to possess a current hazardous materials certificate of registration. DOT registration information is included in Table 9.1-1.

For most hazardous waste records, regulations require that records be retained for at least 3 years from the date the hazardous waste for which the record pertains was last shipped offsite. The documentation generally includes description of waste, date of initial waste generation, description of the process that generated the waste, hazardous waste determination, all analytical data used to characterize Class 3 wastes including quality control data, and waste classification determination. (TAC 2021)

Table 2.2-1 Meteorological Parameters Monitored at CPNPP

Parameter	Primary Tower (elevation level)	Backup Tower (elevation level)
Wind Speed	10 m, 60 m	10 m
Wind Direction	10 m, 60 m	10 m
Ambient Air Temperature	10 m, 30 m, 60 m	10 m
Ambient Dewpoint Temperature	10 m, 60 m	10 m
Temperature Stability	10-30 m, 10-60 m	N/A
Precipitation	Surface	Surface

Table 2.2-2 Nonradioactive Waste Quantities at CPNPP

Year	Hazardous Waste (pounds)	Recycle Waste (pounds)
2016	1,080	243,938
2017	4,425	148,394
2018	1,620	90,633
2019	1,910	309,766
2020	640	248,050

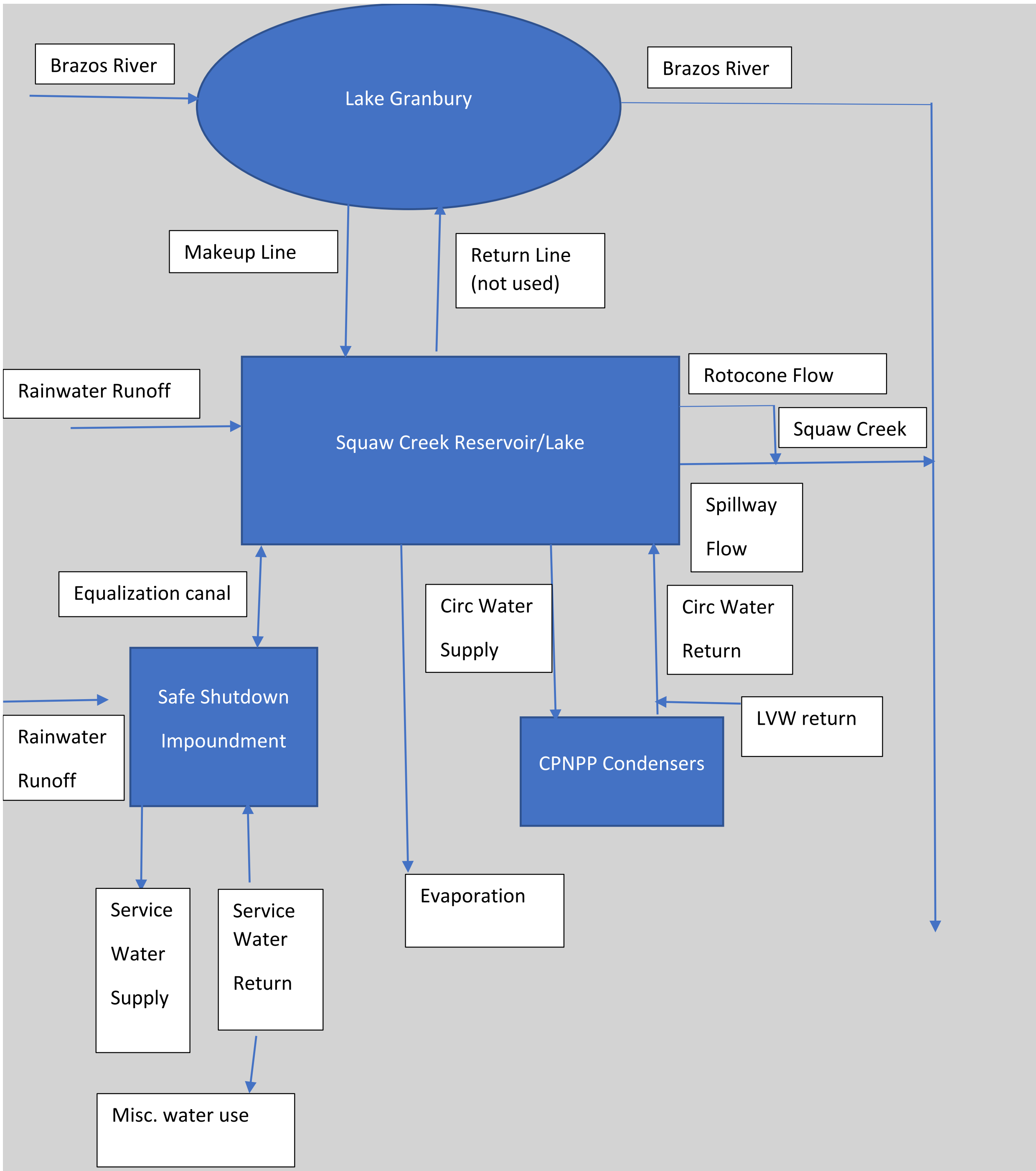


Figure 2.2-1 CPNPP Typical Water Balance

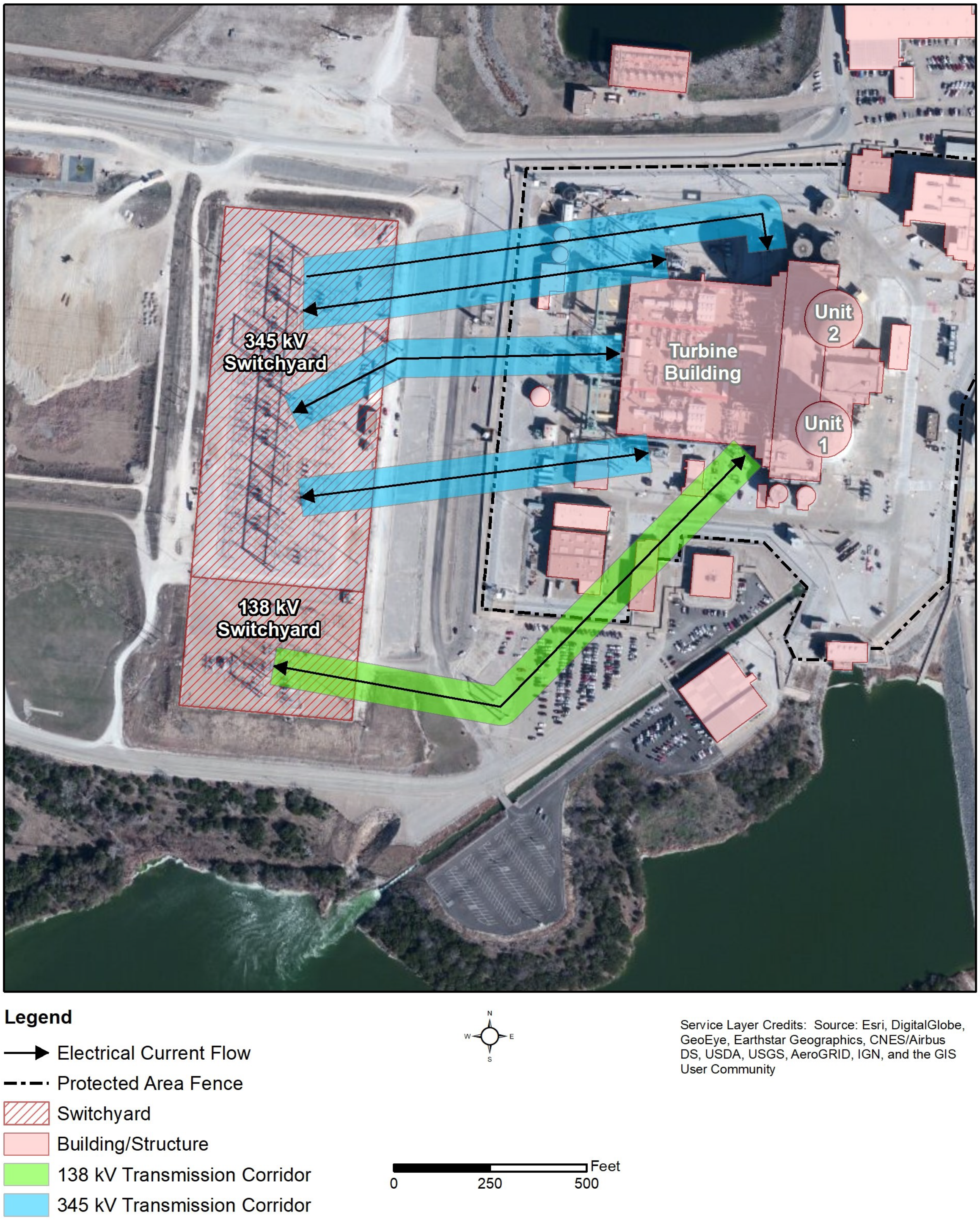


Figure 2.2-2 In-Scope Transmission Lines

2.3 Refurbishment Activities

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plan to modify the facility or its administrative control procedures as described in accordance with § 54.21. If LR-related refurbishment is planned at a facility, the applicant's ER would include analysis for environmental impacts of the proposed refurbishment activity. [10 CFR 51.53(c)(3)(ii)].

Refurbishment activities are replacement and repair of major components which usually occur infrequently and possibly only once in the life of the plant systems (e.g., steam generator and vessel head replacement). The NRC considered such refurbishment activities to include replacement of reactor vessel heads, steam generators and pressurizers in PWRs, and replacement of recirculation piping systems in boiling water reactors. The NRC also acknowledges that licensees may undertake refurbishment activities for reasons of safety, economics, reliability, or efficiency (i.e., not just to support license renewal). Refurbishment activities to be undertaken to allow continued operation beyond the current license term would be LR-related refurbishment and would be addressed in the applicant's license renewal ER. Impacts from refurbishment activities outside of license renewal are assumed by NRC to have been accounted for in annual site evaluation reports, environmental operating reports, and radiological environmental monitoring program reports. (NRC 2013a, Sections 2.1.1 and 2.1.2)

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term were assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently and possibly only once in the life of the plant for any given item. The other category is SMITTR actions, most of which are repeated at regular intervals and schedules. (NRC 2013a, Section 2.1.1)

The NRC requirements for the renewal of OLs for nuclear power plants include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the CLB during the additional 20 years of operation requested in the LRA. An example of an SSC subject to aging is the reactor vessel.

The CPNPP's IPA, which Vistra OpCo conducted under 10 CFR Part 54 and is described in the body of the LRA, has identified no LR-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the CLB, during the proposed period of extended operation. Vistra OpCo does not anticipate the continued operation of CPNPP to result in any environmental impact greater than SMALL.

2.4 Programs and Activities for Managing the Effects of Aging

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21. This report describes in detail the modifications directly affecting the environment or any plant effluents.

The programs for managing the effects of aging on certain structures and components within the scope of LR at the site are described in the body of the LRA. The evaluation of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the proposed LR operating term.

2.5 Employment

The non-outage workforce at the CPNPP site consists of approximately 1,159 full-time permanent and non-outage contract employees (Table 2.5-1). Overall plant staffing levels have been reduced since initial licensing due to increased efficiencies in Vistra OpCo's operations and general staff attrition and retirement. There are no plans to add additional permanent employees to support plant operations during the proposed LR operating term, and as noted in Section 2.3, no LR-related refurbishment activities have been identified. Nor are there plans to add additional permanent operational staff to support SMITTR activities during the proposed LR operation period.

During refueling outages, which usually last approximately 28 days per unit, there are typically an additional 800 to 1,200 contract employees onsite. Refueling and maintenance outages for the two CPNPP units are on an 18-month cycle, resulting in at least one refueling every year and two refueling events every third year.

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 1 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Alabama (1)	Morgan (1)	Decatur	1
Arizona (4)	Maricopa (4)	Avondale	1
		Buckeye	2
		Phoenix	1
Arkansas	Union (1)	Smackover	1
California (2)	Orange (1)	Fullerton	1
	San Diego (1)	Oceanside	1
Colorado (1)	Douglas (1)	Parker	1
Florida (7)	Citrus (1)	Hernando	1
	Escambia (1)	Gonzalez	1
	Indian River (1)	Vero Beach	1
	Jackson (1)	Cottondale	1
	Pinellas (1)	West Lealman	1
	Seminole (1)	Oviedo	1
	St. Lucie (1)	Jensen Beach	1
Georgia (1)	Wayne (1)	Jesup	1
Idaho (1)	Bonneville (1)	Idaho Falls	1
Illinois (2)	Peoria (1)	Peoria	1
	Winnebago (1)	Loves Park	1
Iowa (1)	Linn (1)	Cedar Rapids	1
Kansas (2)	Coffey (1)	Lebo	1
	Ellsworth (1)	Wilson	1
Kentucky (1)	Breckenridge (1)	Irvington	1
Louisiana (1)	Lafourche (1)	Raceland	1
Maryland (11)	Anne Arundel (1)	Severna Park	1
	Calvert (1)	Chesapeake Ranch Estates	1
	Montgomery (6)	Gaithersburg	1
		Montgomery Village	1
		North Bethesda	3
		Poolesville	1
	Prince George's (2)	College Park	2
	Worcester (1)	Berlin	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 2 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Mississippi (2)	Madison (1)	Madison	1
	Warren (1)	Vicksburg	1
Missouri (1)	Hickory (1)	Weaubleau	1
Nebraska (2)	Franklin (1)	Campbell	1
	Otoe (1)	Nebraska City	1
New Jersey (1)	Gloucester (1)	Sewell	1
North Carolina (3)	Mecklenburg (1)	Charlotte	1
	Union (1)	Waxhaw	1
	Wake (1)	Raleigh	1
Ohio (4)	Franklin (3)	Columbus	1
		Westerville	2
	Licking (1)	Johnstown	1
Oklahoma (2)	Payne (1)	Stillwater	1
	Stephens (1)	Duncan	1
Pennsylvania (8)	Allegheny (6)	Baldwin	1
		Cheswick	1
		Coraopolis	2
		Pittsburgh	1
		Tarentum	1
	Beaver (2)	Beaver	1
		Beaver Falls	1
South Carolina (3)	Lexington (1)	Red Bank	1
	Newberry (1)	Newberry	1
	Richland (1)	Blythewood	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 3 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Texas (1,084)	Bell (1)	Belton	1
	Bosque (51)	Clifton	2
		Granfills Gap	1
		Iredell	6
		Kopperl	4
		Meridian	13
		Morgan	9
		Valley Mills	1
		Walnut Springs	15
	Brazoria (1)	Lake Jackson	1
	Burleson (1)	Caldwell	1
	Callahan (1)	Cross Plains	1
	Cherokee (1)	Jacksonville	1
Texas (cont.)	Collin (9)	Allen	1
		Frisco	4
		McKinney	1
		Plano	2
		Richardson	1
	Comanche (3)	Comanche	2
		De Leon	1
	Cooke (1)	Gainesville	1
	Coryell (1)	Gatesville	1
	Dallam (1)	Texline	1
	Dallas (32)	Coppell	1
		Dallas	6
		DeSoto	1
		Garland	1
		Grand Prairie	5
		Hutchins	1
		Irving	14
		Rowlett	1
		Sachse	2
	Denton (7)	Argyle	1
		Carrolton	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 4 of 6)

State	County	City/Town	Full-Time Employees[a]
Texas (cont.)		Denton	2
		Little Elm	1
		The Colony	2
	Eastland (2)	Carbon	1
		Eastland	1
	Ellis (11)	Midlothian	8
		Red Oak	1
		Waxahachie	2
	Erath (51)	Bluff Dale	10
		Dublin	7
		Stephenville	34
	Fort Bend (1)	Richmond	1
	Freestone (2)	Fairfield	2
	Grayson (1)	Pottsboro	1
	Gregg (1)	Kilgore	1
	Hamilton (23)	Hico	23
	Harris (4)	Houston	1
		Kohrville	1
		Seabrook	2
	Henderson (1)	Gun Barrel City	1
	Hill (6)	Blum	3
		Covington	1
		Whitney	2
	Hood (355)	Cresson	7
		Granbury	318
		Lipan	7
		Tolar	23
	Hopkins (2)	Como	1
		Sulphur Springs	1
	Johnson (85)	Alvarado	3
		Burleson	11
		Cleburne	63
		Godley	1
		Grandview	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 5 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Texas (cont.)		Joshua	2
		Keene	2
		Lillian	1
		Rio Vista	1
	Kaufman (1)	Kaufman	1
	Limestone (2)	Mexia	1
		Tehuacana	1
	Matagorda (1)	Bay City	1
	McLennan (4)	Crawford	1
		Ross	1
		Waco	1
		West	1
	Montgomery (3)	Montgomery	1
		New Caney	1
		Spring	1
	Palo Pinto (2)	Mineral Wells	1
		Palo Pinto	1
	Parker (24)	Aledo	8
		Millsap	1
		Weatherford	15
	Rusk (1)	Henderson	1
	Somervell (192)	Glen Rose	177
		Rainbow	15
	Tarrant (196)	Arlington	97
		Bedford	2
		Benbrook	17
		Crowley	7
		Euless	2
		Fort Worth	58
		Grand Prairie	1
		Grapevine	1
		Haltom City	1
		Hurst	1
		Keller	3

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 6 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Texas (cont.)		Mansfield	4
		North Richland Hills	1
		Watauga	1
	Titus (1)	Mount Pleasant	1
	Webb (1)	Laredo	1
	Williamson (1)	Austin	1
	Wise (2)	Rhome	2
Virginia (1)	Alexandria (1)	Alexandria	1
	Arlington (1)	Arlington	1
	Fairfax (1)	Kingstowne	1
	Suffolk (1)	Suffolk	1
Washington (5)	Benton (1)	Richland	1
	Kitsap (4)	Bremerton	1
		Silverdale	2
		Poulsbo	1
Employees – Zip Codes Unable to Confirm			2
TOTAL			**1,159**

(USCB 2020a; USPS 2021)

a. Based on CPNPP staff assigned city/town zip code.

Note: CPNPP employee place of residence information is for Vistra OpCo permanent and non-outage contract staffing and does not include temporary refueling outage workers.

2.6 Alternatives to the Proposed Action

The proposed action as described in Section 2.1 is for the NRC to renew the CPNPP OLs for an additional 20 years. Because the NRC decision is to renew or not renew the existing CPNPP OLs, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the CPNPP OLs. The no-action alternative does not provide a means for meeting current and future regional electricity needs. Because CPNPP provides a significant block of long-term baseload capacity, it is reasonable to assume that the decision not to renew the CPNPP OLs would involve replacement of its 2,460 MWe of generation. Vistra OpCo has considered a range of replacement power alternatives from which to select those alternatives to be further analyzed for replacement of CPNPP baseload power generation.

2.6.1 Alternatives Evaluation Process

Vistra OpCo developed the following set of evaluation criteria to review CPNPP replacement alternatives:

- The purpose of the proposed action (LR) is the continued generation of approximately 2,460 MWe net baseload power beyond CPNPP's current license term to meet future system generating needs.
- Alternatives evaluated in this ER would need to provide baseload generation.
- Alternatives considered must be fully operational by 2030, when Unit 1's OL expires (NRC 1990a), considering development of the technology, permitting, construction of the facilities, and connection to the grid.
- Alternatives must be electricity-generating sources that are technically feasible and commercially viable.

2.6.2 Alternatives Considered

Using a screening process based on the above criteria, Vistra OpCo considered the full range of alternatives considered in the GEIS in light of the need to meet the criteria.

The following generation sources were selected as reasonable replacement alternatives based on capability to provide reliable baseload power:

- CPNPP Units 3 and 4 utilizing approved advanced light water reactor (ALWR) technology with mechanical draft cooling towers.
- Small modular nuclear reactors with mechanical draft cooling towers located at the CPNPP site.
- Natural gas combined cycle units with mechanical draft cooling towers located at the CPNPP site.
- Combination of natural gas combined cycle units with mechanical draft cooling towers at the CPNPP site, an offsite wind farm, and offsite solar facilities.

The alternatives selected as reasonable replacement baseload generation alternatives are presented in Section 7.2.1.

Vistra OpCo determined the following generation alternatives were not considered reasonable replacements in comparison to renewal of the CPNPP OLs. Wind and solar are included in the list as unreasonable as a discrete generating alternative but are components of the combination alternative identified above.

- Purchased power
- Plant reactivation or extended service life
- Conservation and energy efficiency measures (demand-side management (DSM) programs)
- Wind
- Solar
- Geothermal
- Hydropower
- Biomass
- Fuel cells
- Wave and current energy
- Oil-fired plants
- Coal-fired plants

The alternatives not selected as reliable baseload generation for replacing the CPNPP generation are presented in Section 7.2.2.

3.0 AFFECTED ENVIRONMENT

CPNPP Units 1 and 2 are located in Somervell County in north central Texas on SCR. The SCR was established for station cooling and extends northward into Hood County. Plant property associated with the CPNPP site is approximately 7,700 acres.

3.1 Location and Features

One of the largest cities in the region, the city of Fort Worth in Tarrant County, is approximately 40 miles northeast of CPNPP. The closest city to CPNPP is Glen Rose in Somervell County, approximately 5 miles south-southeast (see Table 3.11-1). The coordinates for CPNPP Unit 1 are latitude 32° 17' 52.02" north and longitude 97° 47' 06.15" west. CPNPP Unit 2 is located at latitude 32° 17' 54.85" north and longitude 97° 47' 05.79" west. Figure 3.1-1 shows the CPNPP site boundary, facility structures, switchyards, and the EAB. Topographic features adjacent to CPNPP and within the site boundary are shown in Figure 3.1-2.

3.1.1 Vicinity and Region

The vicinity of CPNPP is defined as the area within a 6-mile radius of a center point established equidistant between the Unit 1 and Unit 2 containment structures. As seen in Figure 3.1-3, the CPNPP vicinity falls within the rural portions of both Hood and Somervell counties, and farmland and rural residential properties lie just outside of the CPNPP site boundary (NRC 2011, Section 2.1). Because of overall population size and proximity with nearby urban areas, Hood County has been designated to be in the Granbury micropolitan statistical area inside the Dallas-Fort Worth combined statistical area. In contrast, due to distance and less interaction with urban areas, Somervell County is not associated with any metropolitan or micropolitan statistical areas. (USCB 2020b) Hood County's reported population was 61,598 persons in 2020, up from 51,182 in 2010 and 41,100 in 2000. Somervell County's population has also increased during the same timeframe to, 9,205 persons in 2020, up from 8,490 in 2010, and 6,809 in 2000. (USCB 2021a; USCB 2022a)

Table 3.11-1 provides a list of communities located within a 50-mile radius of CPNPP. Within the vicinity, the city of Glen Rose is the county seat of Somervell County and the nearest city to CPNPP (TSL 2021). Glen Rose had 2,659 persons in 2020, which was an increase from 2010 (2,444) and 2000 (2,122). The city of Granbury is the largest city in Hood County and the county seat. The Granbury city center is located approximately 10 miles north of CPNPP (TSL 2021). Granbury's 2020 population was 10,958, which is an increase from its 2010 population (7,978) and 2000 population (5,718) (USCB 2021b; USCB 2022b).

The region of CPNPP is defined as the area within a 50-mile radius of the established CPNPP plant center point. As seen in Figure 3.1-4 and described in Table 3.11-2, all, or parts of 19 counties are located within the CPNPP region. According to Section 3.11 demographic analysis, the region is considered a high population area. One of the largest counties in the region, Tarrant County, is home to the city of Fort Worth and located in the Dallas-Fort Worth metropolitan statistical area, within the Dallas-Fort Worth-Arlington combined statistical area (USCB 2020b). The population of Tarrant County was 2,110,640 in 2020, 1,809,034 in 2010, and 1,446,219 in 2000 (USCB 2021a; USCB 2022a).

As of 2020, there were three cities in the 50-mile region with populations over 100,000: Arlington, Fort Worth, and Grand Prairie. Ten additional communities within the 50-mile region have populations over 25,000: Burleson, Cedar Hill, Cleburne, Haltom City, Hurst, Mansfield, Midlothian, North Richland Hills, Waxahachie, and Weatherford. (USCB 2021b)

In Somervell County, the CPNPP site is situated along Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. As discussed in Section 3.2, the land around the CPNPP site is primarily rural and undeveloped, consisting of grasslands, deciduous and evergreen forests, and some agricultural cropland.

Figure 3.1-3 illustrates the farm-to-market (FM) local road and highway system located within the 6-mile vicinity of CPNPP in Hood and Somervell counties. (NRC 2011, Section 2.1) There are two highways in the vicinity, including U.S. Highway 67 (US 67), located south of the CPNPP site, and running generally northeast to southwest through the city of Glen Rose. The other is Texas State Highway (SH) 144, a north-south highway located east of CPNPP and SCR, connecting the city of Granbury in Hood County with US 67 in Somervell County. County Road (CR) 213 provides access within the site boundary on the east to the SCR and CP PowerCo-owned recreational SCP (see Figure 3.1-5). West of the SCR, FM 56 provides direct road access to CPNPP facilities via the main plant access road (see Figure 3.1-1). (USCB 2020b; USDOT 2020)

As seen in Figure 3.1-4, the Interstate 20 (I-20) transportation corridor (northwest of CPNPP) runs east-west across the state of Texas, connecting the cities in the region to the Dallas-Fort Worth metroplex. East of CPNPP, the Interstate 35W (I-35W) corridor runs north-south through the region. (USDOT 2020)

Running parallel to the plant access road is a CPNPP rail spur providing access to the plant. In Hood County, the rail line connects to the Fort Worth and Western Railroad main line at the city of Tolar (see Figure 3.1-1) (TXDOT 2021a). Within the region, access to the nearest Texas Amtrak passenger rail service and station is in the city of Cleburne (Amtrack 2021).

As depicted in Figure 3.1-3 and Figure 3.1-4, there are 12 private airports/heliport and one public airport within about 10 miles of CPNPP. Approximately 3.9 miles north, the privately owned Parker Airport is the nearest airfield to CPNPP. The Glen Rose Medical Center, approximately 4.5 miles southeast, has the nearest heliport to CPNPP. The Granbury Regional Airport is the nearest public airfield to CPNPP, approximately 10.3 miles north of the plant. The Dallas-Fort Worth International Airport, located approximately 60 miles northeast of CPNPP, is the nearest full-service commercial airport. (AirNav 2021)

3.1.2 Station Features

Located in north-central Texas, the CPNPP site falls in the Grand Prairie and North-Central Plains physiographic regions. The Grand Prairie physiographic region ranges in elevation from 450 to 1,250 feet and is characterized by low hills. The North-Central Plains physiographic region ranges from 900 to 3,000 feet in elevation and is characterized by low north-south ridges. (NRC 2011, Section 2.5.2.4)

The area within the CPNPP site boundary is approximately 7,700 acres. The CPNPP rail line and plant access road that connects to FM 56 are owned and controlled by CP PowerCo. CPNPP also maintains SCP within the site boundary and controls public access to the park and reservoir via CR 213. There are no other highways, railways, or navigable waterways that traverse or are immediately adjacent to the site.

The EAB portion of CPNPP is approximately 4,170 acres (see Figure 3.1-1). The portion of the SCR within the EAB is subject to the waterway exclusion provided in 10 CFR 100.3. Consistent with that regulation, appropriate and effective arrangements are in place to control traffic on the reservoir to protect the public health and safety in case of emergency.

CP PowerCo has acquired and will maintain surface ownership of all the land within the EAB. Accordingly, CP PowerCo has the authority to control all activities within the EAB, except for certain mineral exploration activities. While CP PowerCo has acquired mineral rights beneath all seismic Category 1 structures, portions of the remainder of the EAB are subject to certain outstanding mineral rights. The only outstanding mineral rights in the EAB for CPNPP, and surrounding areas, relate to the exploration for and production of oil, gas, and other subsurface minerals. As to the mineral rights within the EAB not owned by CP PowerCo, CP PowerCo will assure that the exercise of such mineral rights will pose no health and safety threat during plant operations.

A 6-inch natural gas pipeline, and a 26-inch crude oil pipeline traverse the EAB about 4,900 feet southwest of the CPNPP center point. CP PowerCo has granted the pipeline owners easements, which retain for CP PowerCo absolute control to control all such activities within the EAB, including ingress and egress for the purpose of maintaining the pipelines and their right-of-way (ROW).

CP PowerCo has acquired all the land that constitutes the site property with the exception of one small parcel east of the plant known as the Hopewell cemetery (see Figure 3.8-4). This parcel is outside the EAB however and fenced off.

CPNPP has one active agricultural lease agreement within the site boundary for approximately 4,070 acres of property. Permitted agricultural use includes hay production and cattle grazing.

CPNPP offers plant staff the opportunity to participate in seasonal controlled bow hunting of deer as part of the onsite deer management program (see Section 3.2). The nearest residents to CPNPP are 0.8 miles southwest and 0.8 miles south-southwest of the center point and located outside the site boundary.

3.1.3 Federal, Native American, State, and Local Lands

As shown in Figures 3.1-5 and 3.1-6, there are a variety of national, state, and local parks, recreational areas, and wildlife habitats located in the CPNPP 50-mile region. As described in Table 3.1-1, there are eight public use lands within the six-mile vicinity of CPNPP. The closest to CPNPP is SCP. Public access is controlled by CPNPP, and the main recreational use is fishing from the SCR, either by making a reservation for boat access or from the banks of the reservoir. SCR and Park are currently closed to the public, but recreational use is expected to resume in the future on a seasonal basis. (Luminant 2021b).

The state of Texas has three federally recognized American Indian nations and tribal communities. No tribal lands are located within the 50-mile region of CPNPP. (NCSL 2021)

There are four Texas military installations located within the CPNPP region. Along with the Naval Air Station Joint Reserve Base Fort Worth, the Texas National Guard (NG) installations and training areas within the region include the NG Fort Wolters, NG Saginaw, and NG Fort Worth – Shoreview. (USACE 2021) There are no significant industrial and military facilities or activities located within 10 miles of CPNPP.

3.1.4 Federal and Non-Federal Related Project Activities

Since the initial CPNPP Unit 1 and Unit 2 licensing was finalized, the plant has undertaken minor construction and maintenance activities at the site.

In 2006, CPNPP replaced the Unit 1 steam generators and reactor pressure vessel closure head, housing the removed components onsite in a newly constructed storage facility. (NRC 2007a). For the proposed LR operating term, Vistra OpCo has determined that it expects the existing CPNPP Unit 2 steam generator and reactor pressure vessel head will not require replacement. There are currently no plans to construct an expansion to the old steam generator storage facility where the Unit 1 steam generators and reactor pressure vessel head are stored onsite (see Figure 3.1-1).

CPNPP has determined that the current onsite ISFSI pad has enough space for canister storage to support the current licenses. The possible need to expand the size of the ISFSI, and the scope of any such potential expansion, is speculative and not reasonably foreseeable at this time as it would depend on the status of the U.S. Department of Energy's (DOE)'s future performance of its obligation to accept spent nuclear fuel (SNF) or the availability of other interim storage options. If ISFSI expansion were needed, previously disturbed tracts of land in the proximity of the existing ISFSI are likely to be sufficient for the construction of a new ISFSI. This expansion would cause no significant environmental impact. No major changes to CPNPP

Units 1 and 2 operations or plans for future expansion of plant infrastructure during the LR term are anticipated.

In a separate licensing action, a combined license application (COLA) for a U.S. Advanced Pressurized Water Reactor (US-APWR), designated as CPNPP Units 3 and 4, was prepared by Luminant Generation Company LLC (Luminant) and submitted to the NRC for approval in 2008. Subsequently, in 2013 the CPNPP COLA project was put on hold. The licensing application review process remains suspended. (Luminant 2013a)

Additional federal or non-federal projects identified as taking place in the CPNPP region include the Texas Department of Transportation (TxDOT) ongoing road maintenance and construction projects. Additionally, the SCWD has been adding new waterlines to the county distribution network. More water lines are anticipated to be installed in the future, but currently a schedule has not been established.

Table 3.1-1 Federal, State, and Local Lands[a] Totally or Partially within a 6-Mile Radius of CPNPP

Name	Management	Distance[b]	Direction	Nearest Place	County
SCP (public use area)[c]	Local	1	N	Pecan Plantation	Hood and Somervell
Wheeler Branch Reservoir (park and habitat)	Local	3	SSE	Glen Rose	Somervell
Dinosaur Valley State Park	State	4	SSW	Glen Rose	Somervell
Somervell County Park	Local	4	SSE	Glen Rose	Somervell
Oakdale Park	Local	5	SSE	Glen Rose	Somervell
Glen Rose Bird Sanctuary	Local	5	SSE	Glen Rose	Somervell
Big Rocks Park	Local	5	SSE	Glen Rose	Somervell
Paluxy Heritage Park and River Walk	Local	5	SSE	Glen Rose	Somervell

(Luminant 2021b; SCWD 2021a; TPWD 2021a; TPWD 2021b; USDA 2020)

a. List is based on best available public information and includes lands that are totally or partially within a 6-mile radius of CPNPP.

b. Distances are approximate (rounded to the nearest mile and calculated based on the CPNPP center point and land centroid data).

c. SCP (public use area) distance is based on public use portion of property.

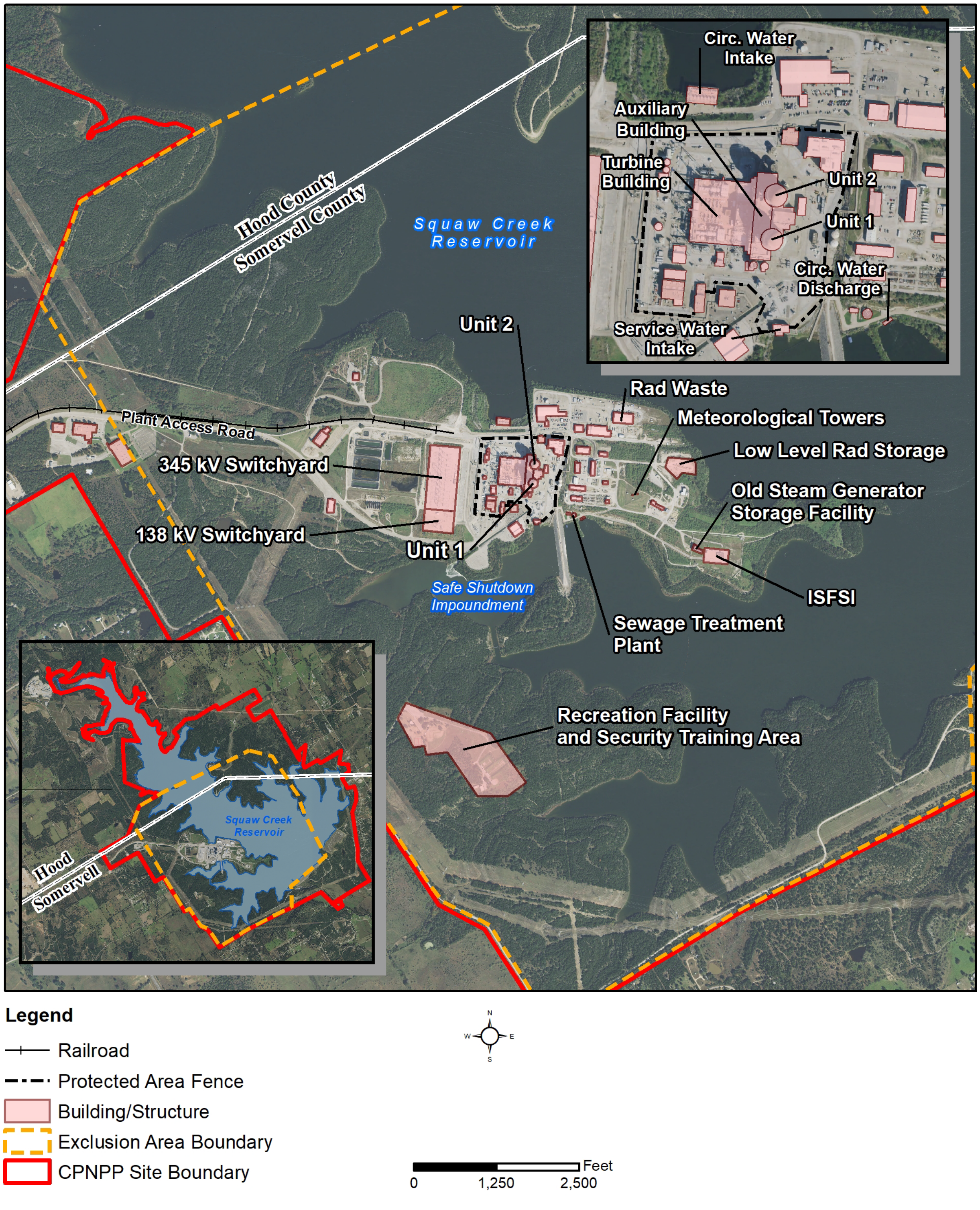


Figure 3.1-1 CPNPP Plant Layout

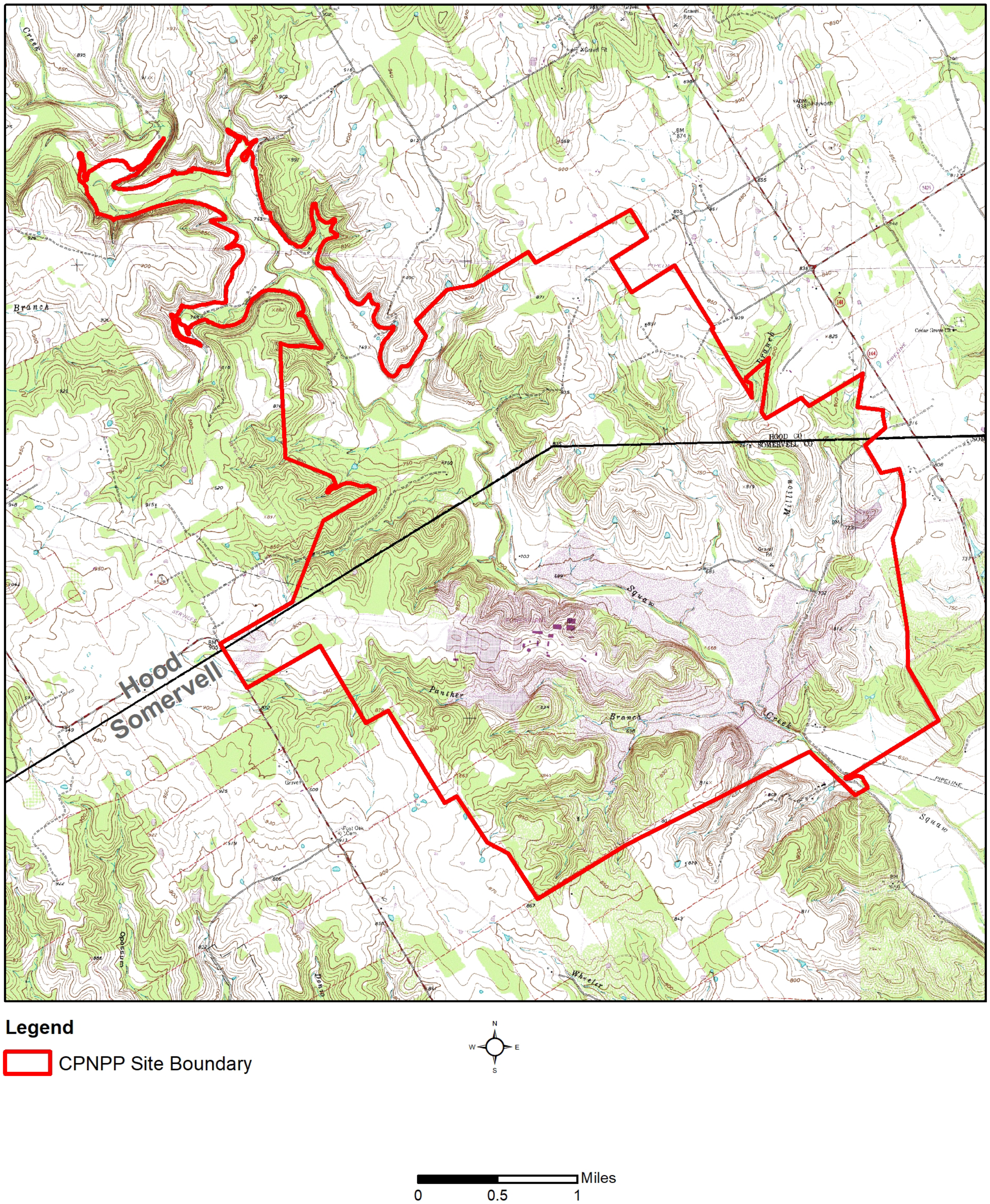


Figure 3.1-2 CPNPP Area Topography

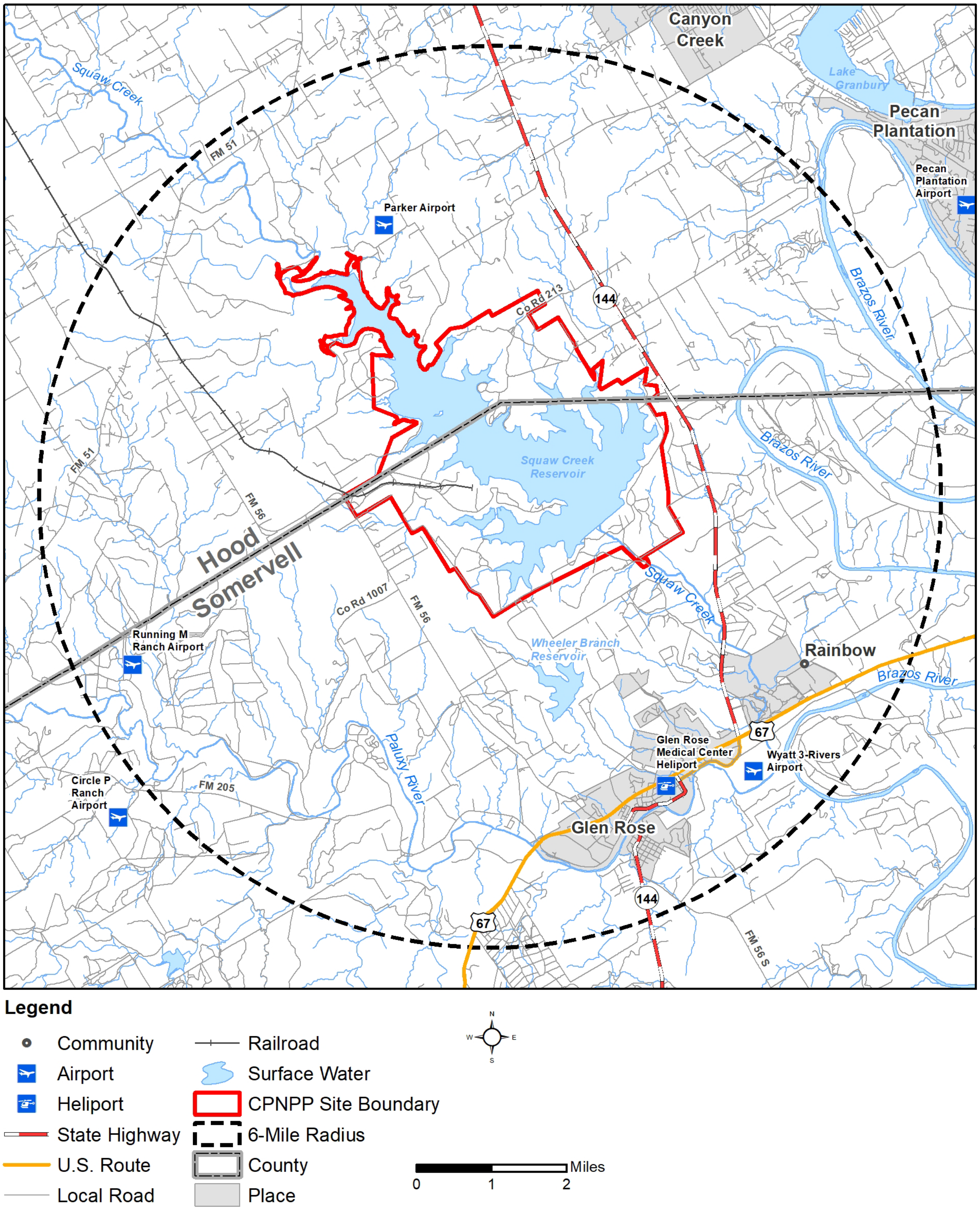


Figure 3.1-3 CPNPP Site and 6-Mile Radius

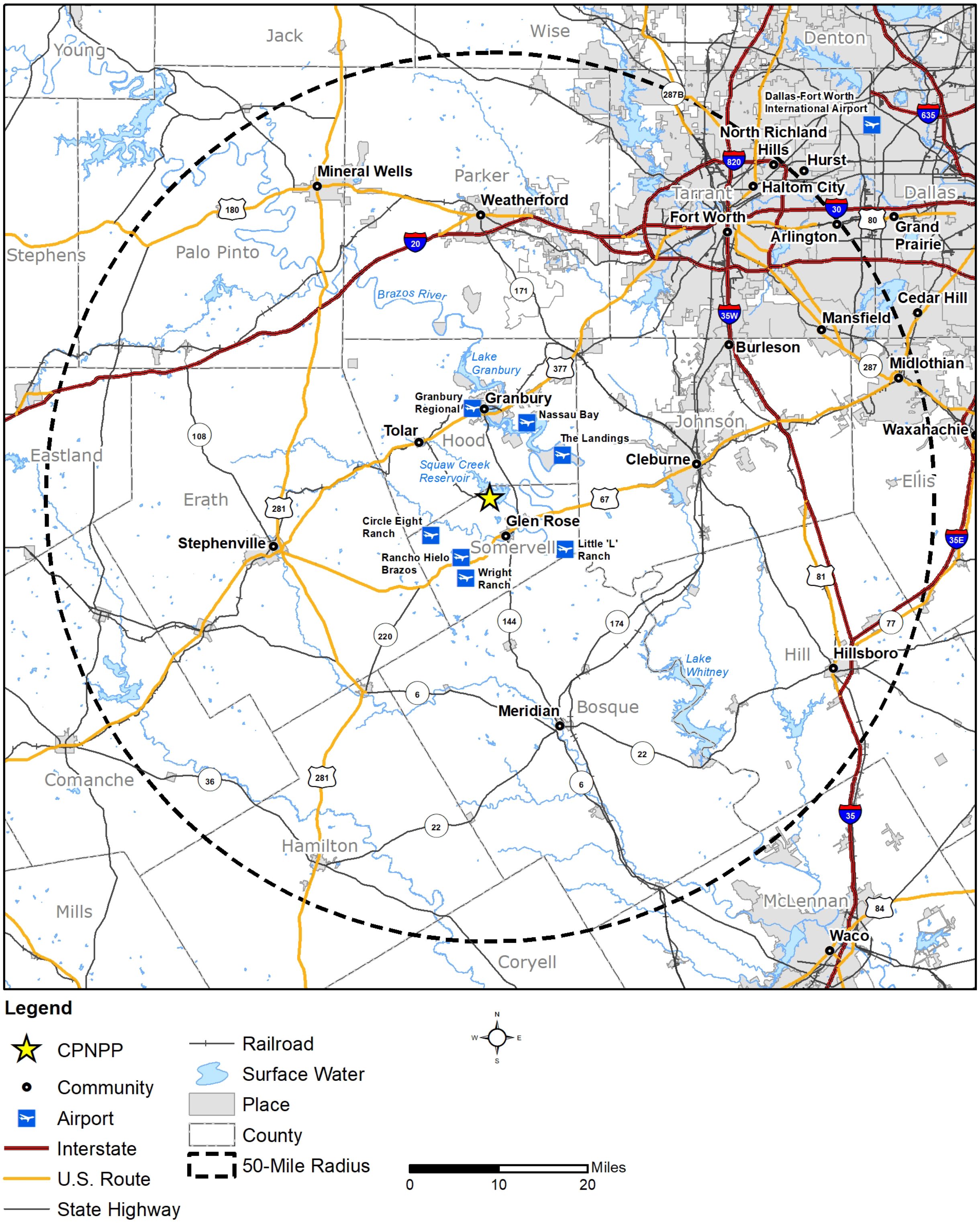


Figure 3.1-4 CPNPP Site and 50-Mile Radius

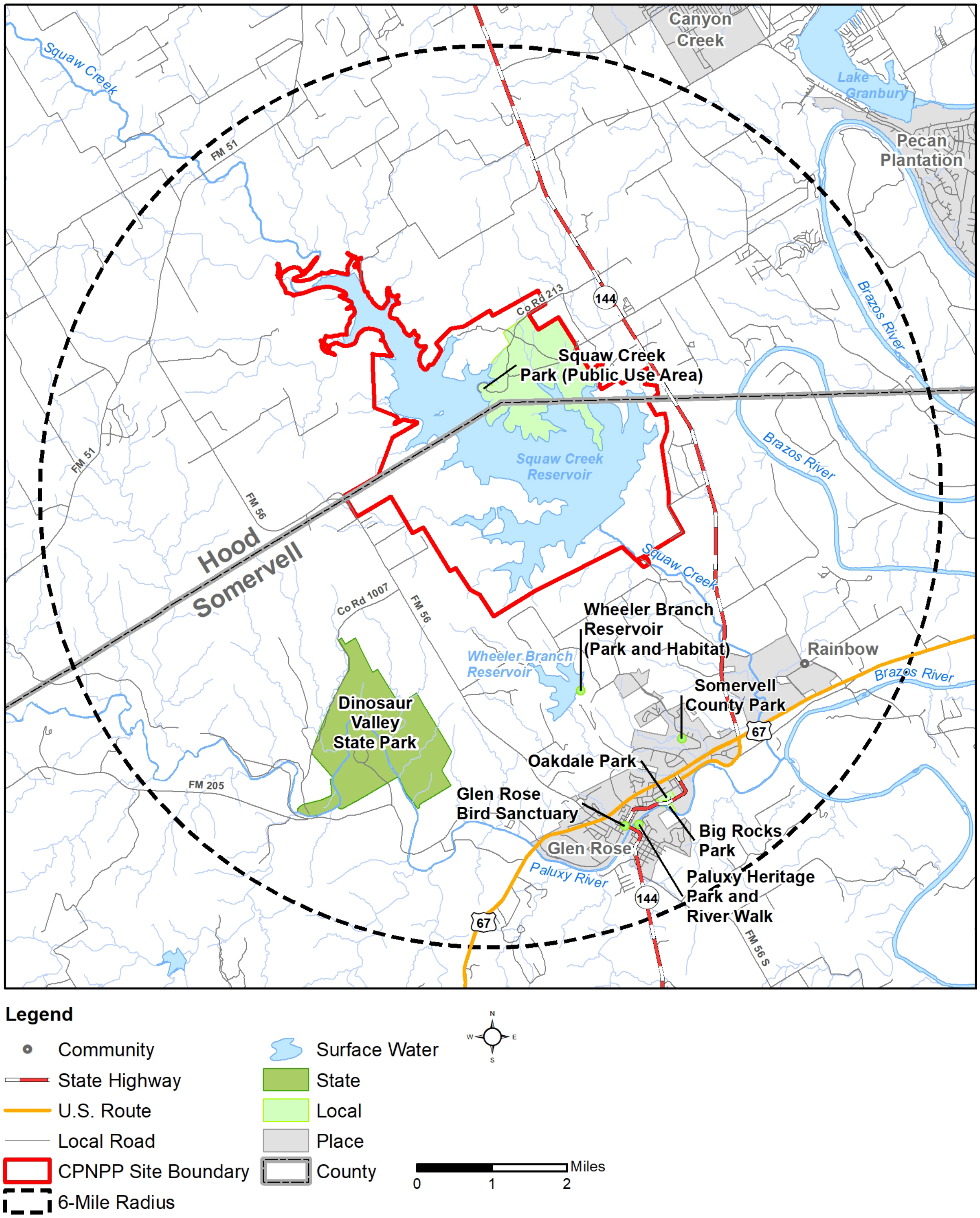


Figure 3.1-5 Federal, State, and Local Lands within a 6-Mile Radius of CPNPP

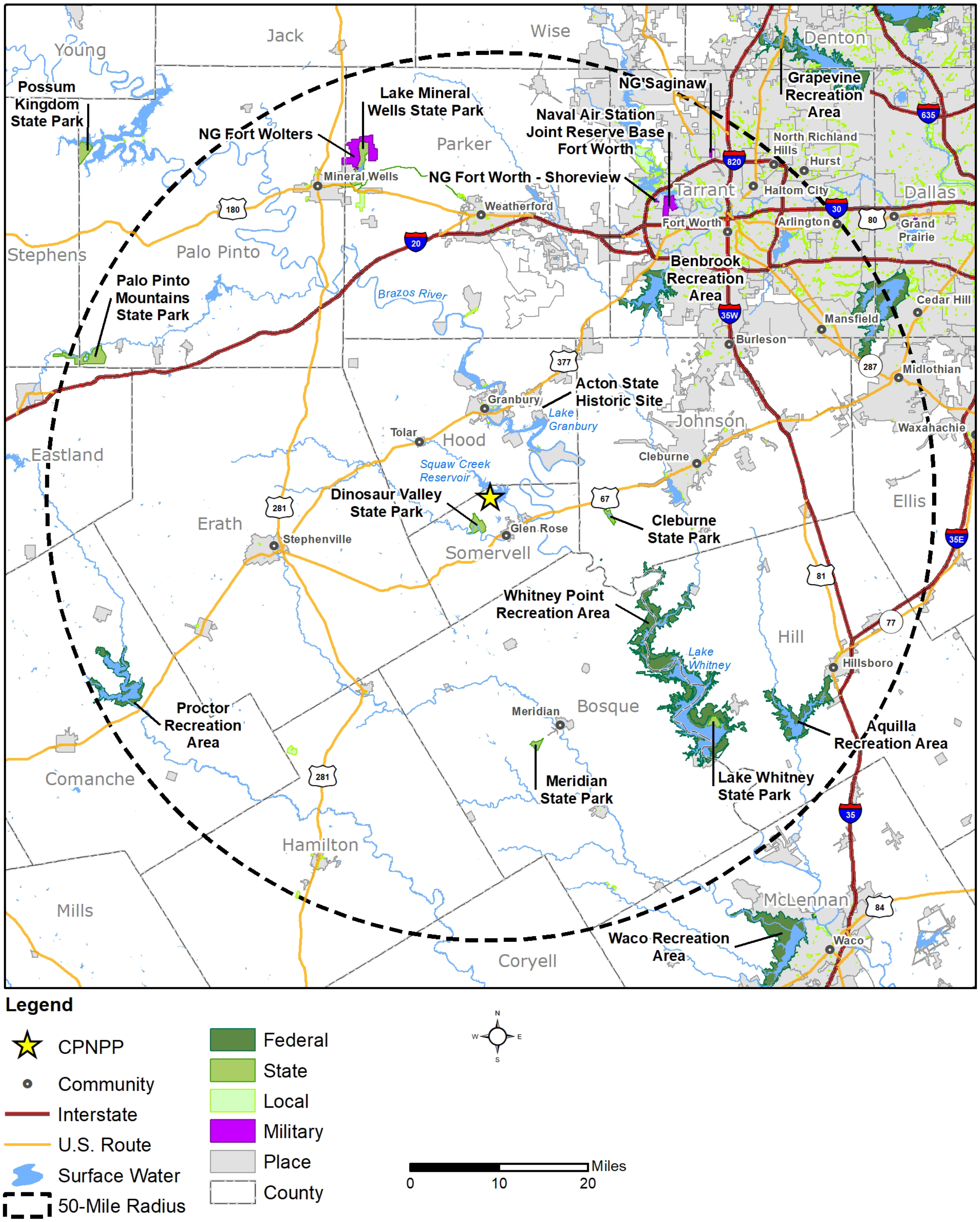


Figure 3.1-6 Federal, State, and Local Lands within a 50-Mile Radius of CPNPP

3.2 Land Use and Visual Resources

The land use description focuses on Hood, Somervell, and Tarrant counties, Texas, because, as described in Section 2.5, approximately 64 percent of the CPNPP workforce resides in these three counties and CPNPP pays taxes to Somervell County.

3.2.1 Onsite Land Use

CPNPP is situated on approximately 7,700 acres surrounding and inclusive of the SCR in Hood and Somervell counties, Texas. As illustrated in Figure 3.1-1, the plant area occupies a peninsula that extends into the SCR in Somervell County, and is accessed by the plant access road, which connects to FM 56 and a railroad spur that connects to the Fort Worth and Western Railroad main line (Luminant 2013b). The nearest communities to CPNPP are Glen Rose, approximately 5 miles south-southeast of the site, and Granbury, approximately 10 miles north of the site. Granbury is the largest city within the vicinity (i.e., a six mile radius). CP PowerCo owns and controls the access roads as well as the rail spur from the site to the Fort Worth and Western rail junction in Tolar, Texas, approximately 11 miles from the site. CP PowerCo owns and controls all surface land within the CPNPP site boundary. Five-year agricultural leases are in place that allow for hay production, and cattle grazing within the site boundary. As described in Section 3.1, CP PowerCo maintains SCP, located within the CPNPP site boundary, and controls access to the public use area within the park and SCR. CPNPP allows for deer hunting by plant staff as part of the plant's deer management program. There are a total of 40 zones along the west and south sides of SCR within the site boundary where bow hunting is allowed seasonally.

As discussed in Section 3.1.2, CP PowerCo owns a portion of the subsurface mineral rights within the site, with the remainder of the site and EAB subject to certain outstanding mineral rights. There are oil and gas wells located onsite. Based on the low potential for commercial production of minerals at CPNPP and the surrounding area, it is anticipated that the exercise of such outstanding mineral rights would involve only sporadic, exploratory activity with little or no production. CP PowerCo has granted easements and access of rights-of-way to owners of pipelines that traverse the EAB for maintenance purposes. No activities unrelated to CPNPP operations are permitted in the plant area without CPNPP approval, and CP PowerCo maintains authority to determine all activity within the CPNPP site and EAB, including ingress and egress for pipeline maintenance and mineral rights exploration.

As shown in Table 3.2-1 and illustrated in Figure 3.2-1, open water is the largest land use/land cover category within the CPNPP site boundary and is primarily associated with SCR, covering approximately 42 percent of the site. Evergreen forest, grassland/herbaceous, and developed areas (including areas developed for plant operations, rail, and roads) are the next largest land use/land cover categories with approximately 26.7 percent, 17.8 percent, and 8.2 percent, respectively. The remaining land use/land cover categories found onsite comprise approximately 5 percent of the CPNPP site. (TNRIS 2020)

CPNPP is located in unincorporated portions of Somervell and Hood counties. The cities of Glen Rose (Somervell County) and Granbury (Hood County) have zoning laws in place to mandate and regulate acceptable land-use practices. There are no zoning or land development regulations in place for unincorporated areas of Somervell and Hood counties. A portion of the CPNPP site falls within the extraterritorial jurisdiction area of the city of Glen Rose in Somervell County but is outside of the city limits and therefore not subject to the city's zoning regulations (CGR 2021a).

3.2.2 Offsite Land Use

As seen in Tables 3.11-2 and 3.11-3, Somervell, Hood, and Tarrant counties have seen an increase in total population since 2010, and this trend is expected to continue through 2053.

The CPNPP vicinity, as described in Section 3.1, includes portions of Somervell and Hood counties. The land use/land cover categories located within the vicinity of CPNPP are illustrated in Figure 3.2-2. The area surrounding CPNPP is predominately rural and undeveloped, and as noted in Table 3.2-2, grassland/herbaceous is the largest land use/land cover category at approximately 55 percent. The next largest land use/land cover categories in the vicinity are evergreen forest (18.1 percent); developed lands (8.3 percent); and deciduous forest (6.7 percent). The remaining land use/land cover categories found within the vicinity of CPNPP comprise approximately 12 percent. (TNRIS 2020)

Somervell County occupies approximately 119,337 acres of land, of which 82,967 acres (69.5 percent) are proportioned to farmland. The 2017 census of agriculture reports that the county had a total of 352 farms, with an average size of 236 acres. Approximately 184 farms produce crops, with the primary crop reported as forage (10,483 acres) and orchards (402 acres). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (211 farms), layers (46 farms), sheep and lambs (25 farms), and hogs and pigs (12 farms) reported. Other agricultural uses of farmland within the county included pasturelands (62,663 acres; 287 farms), permanent pasture and rangeland (48,870 acres; 260 farms), and woodlands (16,804 acres; 130 farms). (USDA 2017)

Hood County occupies approximately 269,238 acres of land, with approximately 205,407 acres (76.3 percent) proportioned to farmland. In 2017 it was reported that the county had a total of 1,176 farms, with an average size of 175 acres. Approximately 578 farms produce crops, with primary crops reported as forage (23,503 acres) and orchards (2,154 acres). Livestock commodities such as cattle and calves (721 farms), layers (149 farms), sheep and lambs (65 farms), hogs and pigs (19 farms), and broilers and other meat-type chickens (2 farms) were also reported. Other agricultural uses of farmland within the county included pasturelands (161,535 acres; 954 farms), permanent pasture and rangeland (143,452 acres; 867 farms), and woodlands (14,410 acres; 272 farms). (USDA 2017)

Tarrant County occupies approximately 552,756 acres of land, of which 190,682 (34.5 percent) are proportioned to farmland. In 2017 it was reported that the county had a total of 1,173 farms, with an average size of 163 acres. Approximately 487 farms produce crops, with primary crops reported as forage (13,584 acres), wheat (3,304 acres), orchards (219 acres), and potatoes (2 acres). Livestock commodities such as cattle and calves (515 farms), layers (237 farms), sheep and lambs (94 farms), and broilers and other meat-type chickens (17 farms) were reported. Other agricultural uses of farmland within the county included pasturelands (146,848 acres; 854 farms), permanent pasture and rangeland (128,434 acres; 779 farms), and woodlands (7,917 acres; 224 farms). (USDA 2017)

The State of Texas Local Government Code Chapter 211 provides municipalities with the authority to govern land use and development through the implementation and enforcement of zoning regulations with the goal of promoting public health, safety, morals, general welfare, and protection, and preserving places and areas of historical, cultural, or architectural importance and significance (TCS 2021).

Texas counties have limited regulatory authority and are primarily established to deliver public services which include:

- Providing public safety and justice
- Holding elections at every level
- Maintaining vital records
- Building and maintaining roads, bridges and in some cases, county airports
- Providing health and safety services
- Collecting property taxes for the county and sometimes for other taxing entities
- Issuing vehicle registration and transfers
- Registering voters

Counties do not have the authority to pass ordinances or zoning regulations, as that authority is retained by municipalities. (Lumen 2021; TAsC 2021)

As discussed in Section 3.2.1, the cities of Glen Rose and Granbury have zoning laws in place as part of their municipal code of ordinances to govern existing and future land uses (CGR 2021b; Granbury 2021a). The city of Granbury adopted a comprehensive plan in 2016; however, as of June 2021, one is not currently in place for the city of Glen Rose (Granbury 2021b). There are no zoning or designated land uses for unincorporated areas outside of the two cities and there are no comprehensive land use plans in place for Hood and Somervell counties.

Tarrant County is home to the city of Fort Worth and is one of several counties that comprise the Dallas-Fort Worth metropolitan statistical area (see Section 3.1.1). The county has multiple incorporated cities and towns that administer ordinances and land use planning activities within their jurisdictions. Tarrant, Somervell, and Hood counties are part of the North Central Texas Council of Governments (NCTCOG). The NCTCOG is a voluntary association of local governments with a membership of 235 political jurisdictions. Though a political subdivision of the State of Texas, the NCTCOG does not have the authority to levy taxes or enact laws. The primary role of the NCTCOG is to "perform long-range comprehensive planning for matters that transcend jurisdictional boundaries, promote sound development of the 16-county region and facilitate cooperation and coordination among its member governments." The NCTCOG adopted a Comprehensive Economic Development Strategy in 2016 which outlined goals, priorities, and strategies for achieving sustainable regional growth and economic development. This strategy is required to be updated every 5 years. (NCTCOG 2021)

3.2.3 Visual Resources

As discussed in Section 3.1.1, CPNPP is located in rural portions of Hood and Somervell counties. Figure 3.1-1 shows the building site layout and the property boundary in association with the SCR. The surrounding area is primarily rural, consisting of grasslands, deciduous and evergreen forest, and some agricultural cropland with rural residential interspersed (Luminant 2013b). The nearest residents to CPNPP are approximately 0.8 miles south-southwest and 0.8 miles southwest of the plant.

The tallest structures and therefore the predominant visual features onsite are the Units 1 and 2 reactor containment buildings, which are approximately 260.5 feet tall. The area immediately surrounding CPNPP is generally rural, with hilly terrain that provides visual screening and offers limited views to nearby residents and portions of the SCR and SCP. According to viewshed analysis, the domes of the containment buildings are also visible from portions of Oakdale Park in the city of Glen Rose and from the Dinosaur Valley State Park. As the distance from the CPNPP site increases, the visibility of the containment buildings decreases significantly and has minimal visual effect beyond 20 miles. (Luminant 2013b) There are no plans for refurbishment that would create new visual impacts during the proposed LR operating term. Therefore, CPNPP would continue to have minimal visual impact on the neighboring properties, SCR, SCP, and nearby public areas.

Table 3.2-1 Land Use/Land Cover, CPNPP Site

Category	Acres	Percent
Open Water	3,208.93	41.9
Developed, Open Space	231.74	3.0
Developed, Low Intensity	154.12	2.0
Developed, Medium Intensity	122.54	1.6
Developed, High Intensity	120.54	1.6
Barren Land (Rock/Sand/Clay)	1.33	0.02
Deciduous Forest	310.02	4.0
Evergreen Forest	2,048.25	26.7
Mixed Forest	12.01	0.2
Shrub/Scrub	3.11	0.04
Grassland/Herbaceous	1,366.62	17.8
Cultivated Crops	1.56	0.02
Woody Wetlands	77.17	1.0
Emergent Herbaceous Wetlands	7.34	0.1
Total	**7,665.28**[a]	**100**

a. The acreages presented in this table are based on the Multi-Resolution Land Characteristics Consortium (MRLC) land use/land cover data. These data are presented in a raster (pixel-based) format and because of their square geography, they do not exactly match the CPNPP site boundary. This geographic variation creates a small difference between total acreage reported compared to the CPNPP property acreage stated throughout the ER. (TNRIS 2020)

Table 3.2-2 Land Use/Land Cover, 6-Mile Radius of CPNPP

Category	Acres	Percent
Open Water	3,981.75	5.5
Developed, Open Space	3,758.69	5.2
Developed, Low Intensity	1,356.38	1.9
Developed, Medium Intensity	581.34	0.8
Developed, High Intensity	278.66	0.4
Barren Land (Rock/Sand/Clay)	129.21	0.2
Deciduous Forest	4,836.86	6.7
Evergreen Forest	13,137.07	18.1
Mixed Forest	88.74	0.1
Shrub/Scrub	787.72	1.1
Grassland/Herbaceous	39,748.37	54.9
Pasture/Hay	2,503.72	3.5
Cultivated Crops	244.63	0.3
Woody Wetlands	953.18	1.3
Emergent Herbaceous Wetlands	33.14	0.05
Total	**72,419.46**	**100.00**

(TNRIS 2020)

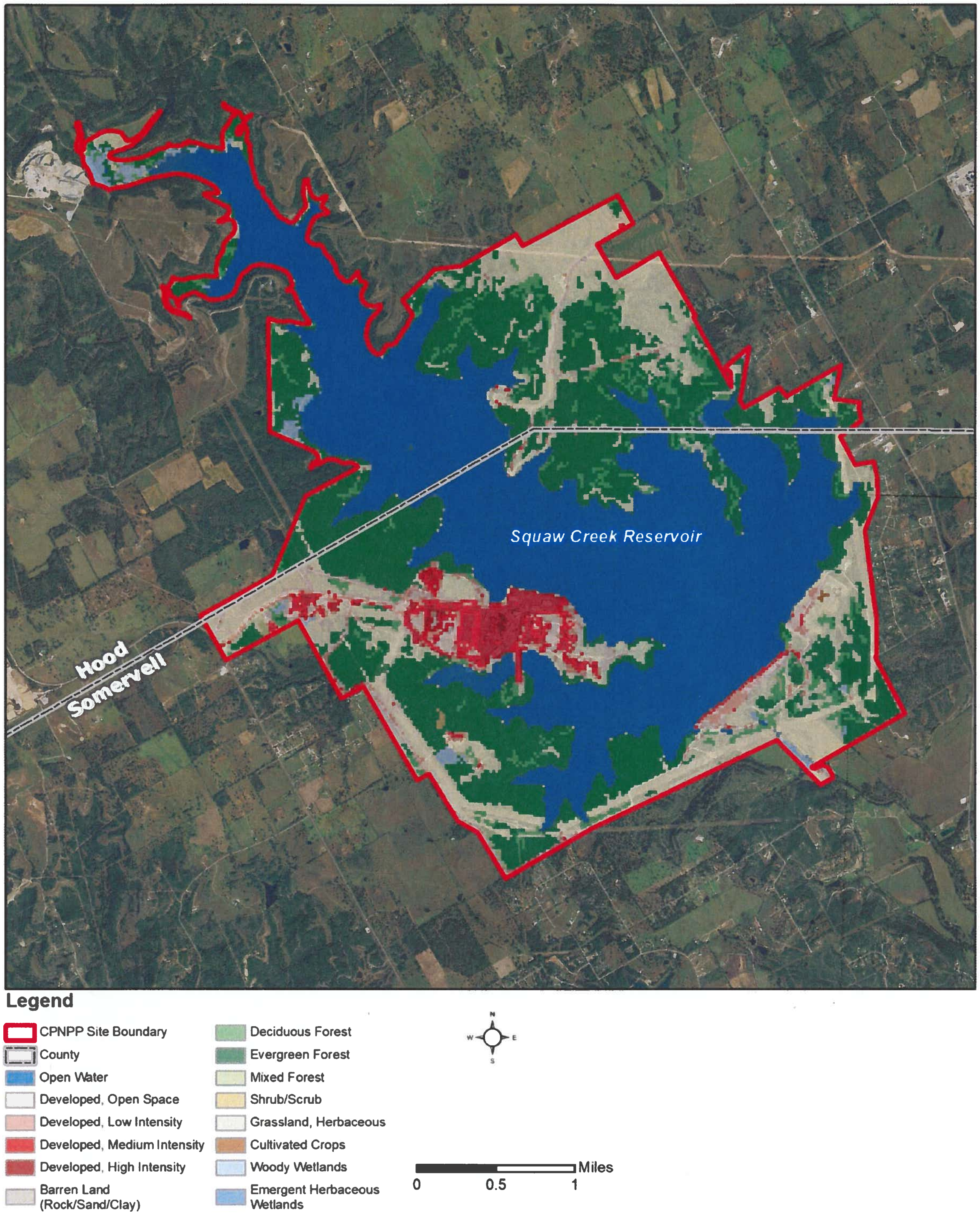


Figure 3.2-1 Land Use/Land Cover, CPNPP Site

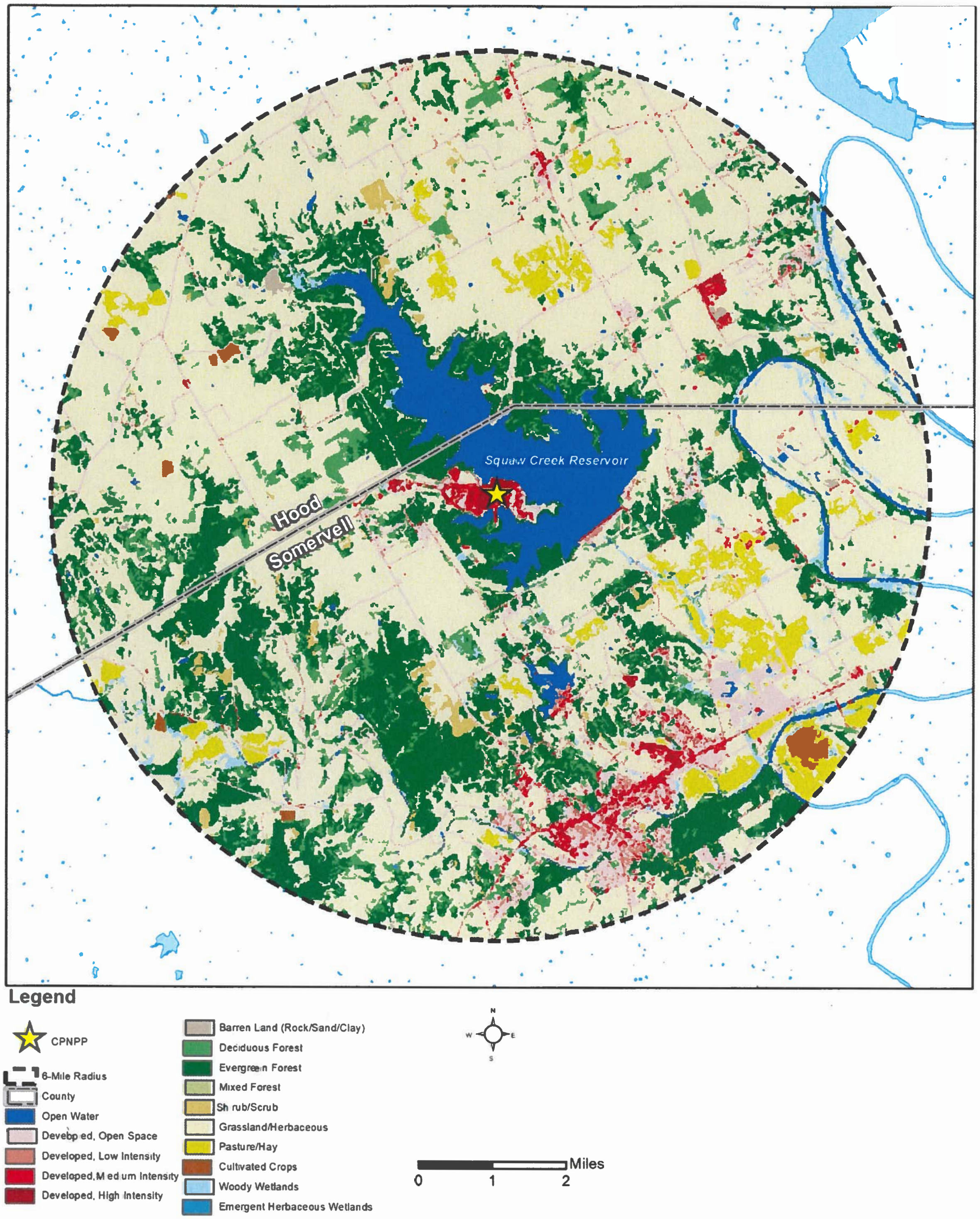


Figure 3.2-2 Land Use/Land Cover, 6-Mile Radius

3.3 Meteorology and Air Quality

CPNPP is located approximately 290 miles northwest of the Gulf of Mexico and is approximately equidistant between Cleburne and Stephenville, Texas, west of the Brazos River. The CPNPP site usually experiences a continental climate with marked temperature extremes both diurnally and seasonally. Maritime tropical air masses almost completely dominate the weather in summer. During the winter, outbreaks of polar continental air are the most common frontal activity, while pacific maritime cold fronts are more frequent in the spring and fall. Wide variations in precipitation amounts occur from year to year, including both drought and persistent rains (occasionally induced by land-weakened, rain-filled tropical cyclones from the Gulf of Mexico). (NRC 2021a) A high-level overview of the plant layout is provided in Figure 3.1-1.

Climatological data presented below have been provided to represent a range of meteorological conditions considered typical for the CPNPP site region. This analysis used three first-order weather stations and precipitation data from Rainbow, Texas, in Somervell County. The Dallas-Fort Worth and the Waco, Texas, weather stations are the closest first-order National Weather Service (NWS) data collection stations to CPNPP with a significant period of meteorological data. These stations are nearly equidistant from the site in the northeast and the southeast directions. The Abilene weather station (another first-order weather station) is to the west at nearly twice the distance as the Dallas-Fort Worth and Waco weather stations. (NCDC 2020; NOAA 2021a) The data from all four of these weather stations have been used to describe the representative climatic conditions at the site, thus making its continued use appropriate for comparison.

Hourly meteorological data for CPNPP are available from January 1999. The meteorological data archive prior to that date has been permanently stored on magnetic tape. The precipitation data collected at the site were not used because it is collected using a rate of measurement rather than volume. Data from the Rainbow weather station (approximately 5 miles east-southeast of the site) were used to supplement daily precipitation data for the analysis (NOAA 2021a).

3.3.1 General Climate

The Dallas-Fort Worth weather station is located approximately 59 miles northeast of CPNPP in north-central Texas, approximately 250 miles north of the Gulf of Mexico. The climate is humid subtropical with hot summers. It is also continental, characterized by a wide annual temperature range. Summer daytime temperatures frequently exceed 100°F. Generally, the highest temperatures of summer are associated with fair skies, westerly winds, and low humidity. Characteristically, hot weather in the summer is broken into three to five-day periods by thunderstorm activity. There are only a few nights each summer when the low temperature exceeds 80 degrees. Winters are mild, but cold fronts occur about three times each month, and often are accompanied by sudden drops in temperature. Periods of extreme cold that occasionally occur are typically short-lived, so that even in January mild weather occurs frequently. (NCDC 2020)

The Waco weather station is located approximately 58 miles southeast of CPNPP, in the rich agricultural region of the Brazos River Valley in north-central Texas. The weather station lies on the edge of the gently rolling Blackland Prairies ecoregion. To the west lies the rolling to hilly Grand Prairie ecoregion. The climate is humid subtropical with hot summers. It is a continental-type climate characterized by extreme variations in temperature. Tropical maritime air masses predominate throughout the late spring, summer, and early fall months, while polar air masses frequent the area in winter. In an average year, April and May are the wettest months, while the July–August period is the driest. Most warm season rainfall occurs from thunderstorm activity. Consequently, considerable spatial variation in amounts occur. Cloudiness and showers are more frequent in the spring than in the fall. During July and August, daytime temperatures are hot in summer with little variety in the day-to-day weather. The highest temperatures are associated with fair skies, light winds, and comparatively low humidity. The average first occurrence of 32°F is late November, and the average last occurrence is in mid-March. Cold fronts moving down from the High Plains often are accompanied by strong, gusty, northerly winds and sharp drops in temperature. Cold weather is usually of short duration, rarely lasting longer than 2 or 3 days before a rapid warming occurs. Winter precipitation is closely associated with frontal activity, and may fall as rain, freezing rain, sleet, or snow. (NCDC 2020)

The Abilene weather station is located approximately 111 miles west of CPNPP in north-central Texas, on the boundary between the humid east Texas climate and the semi-arid west and north Texas climate. The rainfall pattern is typical of the Great Plains. Most precipitation occurs from April to October and is usually associated with thunderstorms. Severe storms are infrequent, occurring mostly in the spring. South is the prevailing wind direction, and southerly winds are frequently high and persist for several days. Strong northerly winds often occur during the passage of cold fronts. The large range of high and low temperatures, characteristic of the Great Plains, extends south to the Abilene area. High daytime temperatures prevail in the summer but are normally broken by thunderstorms about five times a month. Rapid cooling after sunset results in pleasant nights with low summertime temperatures in the upper 60s and low 70s. High summer temperatures are usually associated with fair skies, southwesterly winds, and low humidity. Rapid wintertime temperature changes occur when cold, dry, arctic air replaces warm moist tropical air. Drops in temperature of 20 to 30 degrees in one hour are not unusual. However, periods of cold weather are short lived. (NCDC 2020)

The climate of the CPNPP region is continental and is characterized by rapid changes in temperature, marked extremes, and large daily and annual temperature ranges. The mean annual temperature decreases from southeast to northwest because of elevation and latitude changes. The general climate of the region is modified frequently by advancing warm moist air from the Gulf of Mexico, resulting in high humidity and cloudiness. Rainfall generally decreases from east to west and is heaviest in late spring and early summer.

In summer, the Bermuda High exerts a strong influence upon the weather of the region. It furnishes the tropical maritime air from the Gulf of Mexico which almost completely dominates the weather from May to September. This air mass is responsible for almost all of the thunderstorm activity in the region regardless of time of year. Occasionally, in summer, tropical continental air may move into west Texas from the high plateaus to the west. This air mass is characterized by very hot daytime temperatures and almost cloudless skies.

During the winter and early spring, outbreaks of polar continental air are the most common frontal activity. Although these fronts frequently have little weather associated with them, they often stall in central and southern Texas. On occasion, arctic air masses push through the region and cause some of the coldest temperatures. Cold weather rarely lasts more than a few days.

Spring is characterized by rapid changes of temperature (i.e., alternating periods of warm and cold conditions.) On average, thunderstorms are more frequent and more violent in the spring than any other season. Spring is normally the wettest season of the year. Fall is characterized by fair weather, low wind speeds, and moderate temperatures. It is the most pleasant season of the year.

3.3.2 Meteorology

3.3.2.1 Wind Direction and Speed

The prevailing wind direction at CPNPP is south to southeast with northerly components during the winter months due to frequent outbreaks of polar air masses. The average annual wind speed is 10.2 mph (see Table 3.3-2).

For Dallas-Fort Worth, the 23-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 170 degrees (southerly). Monthly prevailing winds are from the south year-round. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10.5 mph. A maximum 3-second wind speed of 79 mph was recorded in March 2019. (NCDC 2020)

For Waco, the 45-year period of record data show the annual prevailing wind direction is from 190 degrees (southerly). Monthly prevailing winds are from the south year-round. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10 mph. A maximum 3-second wind speed of 77 mph was recorded in July 2010. (NCDC 2020)

For Abilene, the 40-year period of record data show the annual prevailing wind is from 170 degrees (southerly). Monthly prevailing winds range from the south to the south-southwest most of the year. In February, the prevailing wind direction is from the north. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10.9 mph. A maximum 3-second wind speed of 70 mph was recorded in June 2013. (NCDC 2020)

Mean monthly wind speeds at the CPNPP site are provided in Table 3.3-2, based on a 21-year record (1999–2020) of measurements from the lower level (32.8 feet above ground level) of the onsite meteorological monitoring system. Annual wind rose diagrams for the period 2016–2020 are provided in Figures 3.3-1, 3.3-2, 3.3-3, 3.3-4, and 3.3-5. (NRC 2021a)

3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the Dallas-Fort Worth monitoring station. The local climate data summary for the Dallas-Fort Worth area indicates that the mean daily maximum temperature is highest in August (96.1°F) and decreases to the seasonal low in January (55.3°F). The Dallas-Fort Worth area experiences normal temperatures above 90°F approximately 95.2 days per year from February through November. The highest temperature of record (113°F) occurred in June 1980. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 34.5°F. Record low temperatures less than 32°F have been recorded from October through April, with below-freezing temperatures normally occurring approximately 29.4 days per year from October through April. The lowest temperature of record by the Dallas-Fort Worth station is -1°F, occurring in December 1989. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Dallas-Fort Worth area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are also available from the Waco monitoring station. The local climate data summary for the Waco area indicates that the mean daily maximum temperature is highest in August (96.9°F) and decreases to the seasonal low in January (57.6°F). The Waco area experiences normal temperatures above 90°F approximately 103.6 days per year from February through November. The highest temperature of record (114°F) occurred in July 2018. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 36.1°F. Record low temperatures below 32°F have been recorded from December through February, with below-freezing temperatures normally occurring approximately 31 days per year. The lowest temperature of record by the Waco station is -5°F, occurring in January 1949. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Waco area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are also available from the Abilene monitoring station. The local climate data summary for the Abilene area indicates that the mean daily maximum temperature is highest during July (95°F) and decreases to the seasonal low in January (56.1°F). The Abilene area experiences normal temperatures above 90°F approximately 90 days per year from February through November. The highest temperature of record (110°F) occurred in July 1978. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 32.1°F. Record low temperatures below 32°F have been recorded from October through April, with below-freezing temperatures normally occurring approximately 45.3 days per year. The lowest temperature of record by the Abilene station is -9°F, occurring in

January 1947. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Abilene area are summarized in Table 3.3-3.

Average temperatures in the area of CPNPP range from 48.2°F in January and 85.9°F in August, with annual extremes of approximately 12.6°F low and 107°F high. Monthly and annual daily mean temperature data and temperature extremes for the CPNPP area are summarized in Table 3.3-4. On average CPNPP has temperatures consistent with the regional and local stations with monthly average temperatures of the site falling within all of the mean daily maximum and mean daily minimum values for the representative sites.

3.3.2.3 Precipitation

Rainfall occurs during brief but sometimes intense showers and thunderstorms. As seen in Table 3.3-6, there are two periods of greater precipitation in the vicinity of CPNPP when compared to rest of the year. The first is in May and June, followed by September and October . The pattern is similar for Dallas-Fort Worth and Waco, which show more precipitation in May and June, and again in September and October, with lower amounts in July and August. The Abilene station precipitation data show a similar pattern for May and June but has a less distinct fall precipitation pattern (NCDC 2020). The Rainbow weather station precipitation data, as listed in Table 3.3-6, has a pattern more similar to Dallas-Fort Worth and Waco than the precipitation pattern for Abilene. (NOAA 2021a)

The precipitation records of normal rainfall totals for the Dallas-Fort Worth area indicate that precipitation of 0.01 inches or more occurs on average for 79.8 days per year, with four or more days per month receiving at least some precipitation. The annual average precipitation at the Dallas-Fort Worth station is 36.14 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June, with the most precipitation occurring in May. The highest seasonal precipitation occurs during the spring and fall (approximately 42 percent falling March, April, May, and June). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Dallas-Fort Worth, 8.11 inches, occurred in September 2018. Dallas-Fort Worth received a record minimum monthly rainfall total (0 inches) in August 2000. (NCDC 2020)

The precipitation records of normal rainfall totals for the Waco area indicate that precipitation of 0.01 inches or more occurs on average for 81.8 days per year, with five or more days per month receiving at least some precipitation. The annual average precipitation at the Waco station is 34.69 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June with the most precipitation occurring in May. The highest seasonal precipitation occurs during the spring and fall (approximately 39 percent falling March, April, May, and June). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Waco, 9.67 inches, occurred in October 2015. Waco received a record minimum monthly rainfall total (0 inches) in July 1993. (NCDC 2020)

The Abilene precipitation records indicate that precipitation of 0.01 inches or more normally occurs on average for 68.9 days per year, with four or more days per month receiving at least some precipitation. The annual average precipitation at the Abilene station is 24.82 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June with the most precipitation occurring in June. The highest seasonal precipitation occurs during late spring and early fall (approximately 59 percent falling May, June, August, September, and October). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Abilene, 8.26 inches, occurred in July 2015. Abilene received a record minimum monthly rainfall total (0 inches) in August 2000. (NCDC 2020)

3.3.2.4 Snow and Glaze

In the CPNPP region, Winter precipitation is closely associated with frontal activity, and may fall as rain, freezing rain, sleet, or snow. The Dallas-Fort Worth and Waco weather stations report 1.2 inches of snow annually. The Abilene weather station reports 4.7 inches of snow annually. (NCDC 2020) Snow is not recorded at the CPNPP site.

3.3.2.5 Relative Humidity and Fog

The closest available fog data for the CPNPP region are from the Dallas-Fort Worth and Waco weather stations. The local climatological data for Dallas-Fort Worth and Waco weather stations indicate an average of 9.5 and 14 days per year of heavy fog, respectively. The Abilene weather station indicate an average of 7.2 days per year of heavy fog. Heavy fog is defined by the NWS as fog which reduces visibility to 0.25 miles or less. (NCDC 2020) Fog is not recorded at the site by CPNPP.

3.3.2.6 Severe Weather

3.3.2.6.1 Thunderstorms

The CPNPP site is located near the High Plains, an area noted for severe thunderstorm and tornado activity (NRC 2011, Section 2.9.1.4). Thunderstorms are frequent during the spring months, with the greatest occurrence in May (NCDC 2020). The mean number of days with thunderstorms in each month for Dallas-Fort Worth, Waco, and Abilene are provided in Table 3.3-7. Based on National Centers for Environmental Information (NCEI) records, Somervell County, Texas, has recorded 62 significant thunderstorm events since 1971, with most of the thunderstorms occurring in April, May, and June. (NCEI 2020)

3.3.2.6.2 Tornados

The most common time of year for tornadoes is the spring (NRC 2011, Section 2.9.1.4). Based on NCEI records, a total of six tornadoes have been recorded in Somervell County, Texas, since 1988. The records show that the intensity of the storms was limited to F0, F2, EF0, and EF1. (NCEI 2020)

3.3.2.6.3 Hurricanes

As recorded in National Oceanic and Atmospheric Administration (NOAA) historical storm records, there was one hurricane that tracked within 100 miles of Somervell County, Texas, between 1853 and 2020. An unnamed hurricane in September 1900 was the most recent hurricane that tracked within that distance; by the time it crossed the county line into Somervell County, it was downgraded to a tropical storm. Twenty-nine additional tropical storms and depressions have tracked within 100 miles of Somervell County. (NOAA 2021b)

3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC 2007b). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable, and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC 2013c, Section 2.9.1.4).

Based on a 5-year average (2016–2020), onsite temperature difference data recorded at CPNPP indicate that stable atmospheric conditions (E to G) occurred about 29.0 percent of the time and unstable conditions (A to C) occurred about 23.6 percent of the time. The remaining observations (about 47.4 percent) fell into the neutral (D) category. (NRC 2021a) Stability class distributions at CPNPP covering the period 2016–2020 are presented in Table 3.3-8.

3.3.3 Air Quality

3.3.3.1 Clean Air Act Non-Attainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 U.S. Code (USC) § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or non-attainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$, fine particulates; and PM_{10}, coarse particulates), ozone, and sulfur dioxide (SO_2).

Emissions from non-radiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Non-attainment areas are geographic areas where the ambient levels of criteria air pollutants in the air are designated as not meeting the primary standard set forth in federal, state, and local regulations. Attainment areas are geographic areas where ambient air pollutant levels meet or are better than the criteria or cannot be classified (depending on the pollutant and other factors). A maintenance area is an area that formerly did not meet the attainment criteria but currently meets or exceeds the attainment criteria. (EPA 2021b)

The CPNPP site is in Somervell County, which is in the Metropolitan Dallas-Fort Worth Intrastate AQCR. Somervell County is one of 19 counties in the AQCR. [40 CFR 81.39] Nine counties in the AQCR make up the non-attainment area for 8-hour ozone (2015 standard). These counties include Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Tarrant, and Wise counties, Texas. For 8-hour Ozone (2008 standard), the previous nine counties and Rockwell County are combined to produce the non-attainment area. Collin County, Texas, is a maintenance area for lead (1978 standard) and lead (2008 standard). All remaining counties within the Metropolitan Dallas-Fort Worth Intrastate AQCR which includes Somervell County, are in attainment for all criteria pollutants. (EPA 2021b).

Figure 3.3-6 illustrates non-attainment and maintenance areas defined under the CAA, as amended, within a 65-mile radius of CPNPP. The closest Class I Area is the Wichita Mountains National Wildlife Refuge, over 175 miles north [40 CFR 81.424]. The Class I areas within the state of Texas are over 350 miles to the southwest [40 CFR 81.429]. Given the minor nature of air emissions associated with operations of CPNPP, this distance is sufficiently far as to not warrant concern.

3.3.3.2 Air Emissions

CPNPP holds a TCEQ air permit (19225) that authorizes the operation of emission sources listed in the permit at the CPNPP Units 1 and 2. The listed emission sources include one auxiliary boiler, six emergency diesel generators, and two diesel fire water pumps. Permitted air emission sources are listed in Table 3.3-9. Because CPNPP utilizes a once-through cooling system for condenser cooling purposes, there are no cooling towers or associated particulate emissions.

The permitted emission sources at CPNPP are regulated by the applicable regulations cited in the emissions permit. CPNPP does not meet the requirements for annual reporting per 30 TAC 101.10(A). Theoretical maximum annual emissions are calculated and presented in Table 3.3-10. The values are calculated using the applicable regulations to assume emission source run time limits and fuel sulfur content limits. All other emission generating equipment not detailed in the air permit comply with Permit by Rule (PBR) per 30 TAC 106.

As presented in Chapter 9, there have been no notices of violation or non-compliances associated with CPNPP air emissions over the five years from 2016–2020.

As presented in Section 2.3, no LR-related refurbishment or other LR-related construction activities have been identified. In addition, CP PowerCo's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect CPNPP's current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed LR operating term.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC 2013a, Section 4.3.1.1). As discussed in Section 2.2.5, the in-scope transmission lines at CPNPP are 138-kV and 345-kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

3.3.4 Greenhouse Gas Emissions

Because CPNPP is not required to inventory and report greenhouse gases (GHGs), data do not exist for mobile sources such as visitors and delivery vehicles. Therefore, CP PowerCo calculated estimates of GHG gas emissions on those direct (stationary and portable combustion sources) and indirect (workforce commuting) plant activities from information that was readily available from CPNPP and other sources such as the US Census Bureau (see Table 3.3-11). Estimates from stationary and portable combustion sources are based on reported fuel usage. Estimates of workforce commuting are based on current staffing of 1,159 employees as discussed in Section 2.5, an estimate of 4.4 percent workforce carpooling, and use of EPA's Greenhouse Gas Equivalency Calculator. (EPA 2021c; USCB 2021c) Estimates of GHG emissions generated at CPNPP are presented in Table 3.3-11.

Ozone-depleting substances such as chlorofluorocarbons and hydrochlorofluorocarbons are present at CPNPP and can potentially be emitted; however, estimating GHG emissions from these substances is complicated due to their ability to deplete ozone, which is also a GHG, making their global warming potentials difficult to quantify. These ozone-depleting substances are regulated by the CAA under Title VI. As discussed in Section 9.5.2.3, CP PowerCo maintains a program to manage stationary refrigeration appliances at CPNPP to recycle, recapture, and reduce emissions of ozone depleting substances and is in compliance with Section 608 of the CAA. Because these emissions are not expected to add to the values in Table 3.3-11, CP PowerCo did not include potential emissions as result of leakage, servicing, repair, and disposal of refrigerant equipment at CPNPP.

The potential for cumulative impacts of continued operation of CPNPP and climate change are addressed in Section 4.12.

Table 3.3-1 Regional Wind Conditions

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Mean Speed (MPH)	36	10.8	11.3	12.1	12.2	11.4	10.5	9.9	8.7	8.6	9.8	10.6	10.3	10.5
Prevailing Direction (degrees from)	23	190	170	170	170	170	170	170	170	170	170	190	190	170
Max 3-Second Speed (MPH)	24	55	78	79	75	67	64	64	60	52	67	54	60	79
Max Speed Year of Occurrence		2017	2000	2019	2008	2006	2009	2012	2013	2016	2019	2006	2015	Mar. 2019
Waco, Texas														
Mean Speed (MPH)	36	10	10.6	11.3	11.4	10.6	10	9.8	9	8.4	9.2	9.8	9.5	10
Prevailing Direction (degrees from)	45	190	170	170	170	170	170	190	190	190	170	190	190	190
Max 3-Second Speed (MPH)	26	66	63	64	69	75	74	77	49	55	60	55	49	77
Max Speed Year of Occurrence		2017	2013	2005	1999	2016	2016	2010	2019	1995	2000	2001	2012	Jul. 2010
Abilene, Texas														
Mean Speed (MPH)	36	10.7	11.4	12.4	13	12.1	11.3	10	9	9.2	10.3	10.8	10.5	10.9
Prevailing Direction (degrees from)	40	200	360	170	170	170	170	170	170	170	170	200	200	170
Max 3-Second Speed (MPH)	23	53	59	55	68	64	70	60	67	53	56	56	58	70
Max Speed Year of Occurrence		2019	2007	2019	1998	2010	2013	2017	1997	2010	2012	2005	2015	Jun. 2013

(NCDC 2020)

Table 3.3-2 CPNPP Wind Conditions

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Mean Speed (MPH)	21	10.6	11.1	11.2	11.8	11.1	10.2	9.2	8.6	8.7	9.5	10.1	10.3	10.2
Prevailing Direction (degrees from)	21	0	170	160	160	160	160	160	170	140	150	160	150	160

Table 3.3-3 Regional Temperatures

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Mean Daily Maximum (°F)	77	55.3	59.8	68.1	76.1	83.5	91.5	95.8	96.1	88.7	78.9	66.7	58.2	76.6
Highest Daily Maximum (°F)	66	88	95	96	101	103	113	110	110	111	102	94	89	113
Year of Occurrence		1969	1996	1991	2006	1985	1980	1998	2011	2000	1979	2017	2005	Jun-80
Mean Daily Minimum (°F)	77	34.5	38.3	46	54.5	63.4	71.1	74.9	74.6	67.5	56.7	45.3	37.4	55.4
Lowest Daily Minimum (°F)	66	4	7	15	29	39	51	59	56	43	29	20	-1	-1
Year of Occurrence		1964	1985	2002	1989	2013	1964	1972	1967	1984	1993	1959	1989	Dec-89
Waco, Texas														
Mean Daily Maximum (°F)	90	57.6	60.9	69.7	77.4	84.8	91.7	96.4	96.9	89.6	80.6	67.9	60	77.8
Highest Daily Maximum (°F)	77	88	96	100	101	102	109	114	112	111	101	92	91	114
Year of Occurrence		1971	1996	1971	1963	1985	1980	2018	1969	2000	1989	2017	1955	Jul-18
Mean Daily Minimum (°F)	90	36.1	39.4	47	55.3	64.1	71	74.8	74.4	67.5	57.2	45.8	38.5	55.9
Lowest Daily Minimum (°F)	77	-5	4	15	26	34	52	58	53	40	25	17	-4	-5
Year of Occurrence		1949	1985	1948	2009	2013	1964	2013	1992	1983	1993	1976	1989	Jan-49
Abilene, Texas														
Mean Daily Maximum (°F)	72	56.1	60.6	68.9	77.7	84.5	91.4	95	94.6	87.2	77.7	65.9	57.8	76.5
Highest Daily Maximum (°F)	80	89	93	97	104	109	109	110	109	107	103	92	89	110
Year of Occurrence		1943	2009	1974	2012	2011	1994	1978	2019	2000	1979	1980	1955	Jul-78
Mean Daily Minimum (°F)	72	32.1	36.3	43.6	52.6	61.2	68.9	72.5	71.8	64.8	54.4	42.5	34.3	52.9
Lowest Daily Minimum (°F)	80	-9	-7	7	25	33	47	55	50	35	20	14	-7	-9
Year of Occurrence		1947	1985	1943	1973	2013	1964	1940	1992	1942	2019	1976	1989	Jan-47

(NCDC 2020)

Table 3.3-4 CPNPP Site Temperatures 1999–2020

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Monthly Average (°F)[a]	21	48.2	51.5	59.3	67.2	74.3	81.6	84.9	85.9	79.2	68.7	58.3	49.3	67.6
Highest Daily Maximum (°F)	21	88.8	92.2	92.6	100.2	99.5	103.8	106.8	106.3	107.0	96.5	92.4	91.4	107.0
Year of Occurrence	21	2006	2008	2006	2006	2000	2011	2018	2011	2000	2014	2017	2005	2000
Lowest Daily Minimum (°F)	21	14.7	12.6	15.1	31.3	41.8	62.7	66.0	62.3	32.3	29.2	22.6	15.3	12.6
Year of Occurrence	21	2014	2011	2014	2007	2013	2000	2014	2015	2008	2019	2019	2016	2011

a. Calculated average of all temperature measurements for each month and of all measurements for the period January 1999–August 2020.

Table 3.3-5 Regional Precipitation (Sheet 1 of 2)

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Normal Monthly (inches)	30	2.13	2.66	3.49	3.07	4.9	3.79	2.16	1.91	2.55	4.22	2.71	2.55	36.14
Maximum Monthly (inches)	66	6.18	11.31	7.39	12.19	16.96	11.1	11.13	6.85	12.69	15.66	9.86	8.75	16.96
Year Occurred		2012	2018	2002	1957	2015	2007	1973	1970	2018	2018	2015	1991	May-15
Maximum 24-hour (inches)	66	4.27	4.72	4.39	4.55	5.34	3.98	4.01	4.05	8.11	5.91	4.78	4.22	8.11
Year Occurred		2012	2018	1977	1957	1989	2017	2004	1976	2018	1959	2015	1991	Sep-18
Minimum Monthly (inches)	66	T	0.15	0.07	0.11	0.7	0.34	0	0	T	T	0.02	0.17	0
Year Occurred		1986	1963	2011	1987	2017	2006	1993	2000	2019	1975	2005	1981	Aug-00
Waco, Texas														
Normal Monthly (inches)	30	2.12	2.63	3.15	2.69	4.3	3.43	1.79	2.05	3.06	3.9	2.82	2.75	34.69
Maximum Monthly (inches)	77	6.1	7.91	9.76	13.37	15	12.06	8.58	10.33	9.49	15.19	9.72	9.81	15.19
Year Occurred		1998	1997	2007	1957	1965	1961	1971	2008	2010	2015	2004	1997	Oct-15
Maximum 24-hour (inches)	77	4.79	3.97	6.17	5.09	7.18	4.39	4.93	4.8	5.89	9.67	4.26	7.98	9.67
Year Occurred		1998	1997	2012	1957	1953	2014	2004	1958	2010	2015	1952	1997	Oct-15
Minimum Monthly (inches)	77	0.03	0.07	0.04	0.12	0.55	0.18	0	T	0	0	T	0.04	0
Year Occurred		1971	1999	1956	1983	1998	2008	1993	1952	1956	1952	2012	1950	Jul-93

Table 3.3-5 Regional Precipitation (Sheet 2 of 2)

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Abilene, Texas														
Normal Monthly (inches)	30	1.02	1.36	1.74	1.64	3.18	3.56	1.87	2.59	2.24	2.98	1.41	1.23	24.82
Maximum Monthly (inches)	80	4.35	3.6	5.16	6.8	13.19	9.6	8.3	8.18	11.03	12.09	5.12	6.28	13.19
Year Occurred		1968	1992	1979	1966	1957	1961	2015	1969	1974	2018	2004	1991	May-57
Maximum 24-hour (inches)	80	2.84	2.09	2.24	3.75	4.76	3.66	8.26	6.3	6.7	6.08	2.43	2.62	8.26
Year Occurred		2010	2018	1998	1957	1990	1959	2015	1978	1961	1981	1975	1991	Jul-15
Minimum Monthly (inches)	80	T	0	0.03	T	0.15	T	T	0	T	0	0	T	0
Year Occurred		2018	1999	1963	1961	1956	1994	2011	2000	1956	1952	1949	1972	Aug-00

(NCDC 2020)

Table 3.3-6 Rainbow Precipitation Records 1991–2020

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Monthly (inches)	30	2.1	2.3	3	3	4.2	3.3	1.7	2.6	3	3.8	2.3	2.2	33.5
Maximum Monthly (inches)	30	6.7	6.7	6.4	9	14.8	11.5	6.2	9.2	11.2	12	8.3	9.4	59.6
Year Occurred	30	2012	1997	2006	2015	2015	2000	2007	1996	2018	2015	2004	1991	2015
Minimum Monthly (inches)	30	0.06	0.01	0.08	0.08	0.73	0.03	0.00	0.00	0.03	0.28	0.05	0.05	16.3
Year Occurred	30	2014	1999	2011	2005	1996	2018	1993 2000	1999 2000 2002	2019	2010	1999 2012	2005	2005

(NOAA 2021a)

Table 3.3-7 Regional Thunderstorms

Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas													
72	1.3	2	4	5.8	7.6	6.3	4.7	4.7	3.3	3.3	1.9	1.3	46.2
Waco, Texas													
72	1.4	2.2	3.6	5.1	7.1	5.5	3.6	3.9	3.5	3.1	1.9	1.3	42.2
Abilene, Texas													
72	0.5	1.2	2.6	4.2	7.2	5.7	4.3	4.8	3.3	2.8	1.3	0.7	38.6

(NCDC 2020)

Table 3.3-8 CPNPP Stability Class Distributions

Percent Frequency of Occurrence by Stability Class Pasquill Stability Class[a]							
Year	**A**	**B**	**C**	**D**	**E**	**F**	**G**
2016	6.8	7.4	9.4	48.9	21.1	4.4	2.1
2017	8.3	7.1	9.1	44.8	22.9	5	2.9
2018	11.1	7	9.2	46.4	20	4.2	2.1
2019	8.7	6.8	8.6	46.5	22.4	4.7	2.4
2020	6	5.2	7.3	50.3	22.8	5.5	2.9
2016–2020	8.2	6.7	8.7	47.4	21.8	4.7	2.5

(NRC 2021a)

a. Classes are as follows (NRC 2007b, Regulatory Guide 1.23, Table 1):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

Table 3.3-9 Permitted Air Emission Sources (Sheet 1 of 2)

Emission Source[(a)(b)(c)]	Description	Capacity Rating	Permit Conditions[(d)]
CP-AB1S[(c)]	Auxiliary Boiler	92.08395 MMBtu/hr	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur and refinery grade, first run oil not to be blended or contain waste oil or solvents. Shall not exceed 0.16 pounds per million Btu heat input. Opacity shall not exceed 20%. Limited to 150 hours per year. SO_2 limited to 51.16 lbs/hr and 3.84 tons/yr. NO_x [(e)] limited to 14.73 lbs/hr and 1.11 tons/yr. CO limited to 14.73 lbs/hr and 1.11 tons/yr. PM limited to 8.29 lbs/hr and 0.62 tons/yr. VOC limited to 0.46 lbs/hr and 0.04 tons/yr. Planned maintenance startup and shutdown VOC limited to 26.34 lbs/hr and 0.15 tons/yr.
CP-EDG1S[(b)] CP-EDG2S[(b)] CP-EDG3S[(b)] CP-EDG4S[(b)]	Emergency Generator Nos. 1 through 4	(4) 9,717 BHP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 600 combined hours per year. SO_2 limited to 36.2 lbs/hr each and 10.9 tons/yr combined. NO_x limited to 278.5 lbs/hr each and 83.6 tons/yr combined. CO limited to 23.6 lbs/hr each and 7.1 tons/yr combined. PM limited to 4.3 lbs/hr each and 1.3 tons/yr combined. VOC limited to 1.3 lbs/hr each and 0.39 tons/yr combined.
CP-EDG5S[(b)]	Emergency Generator No. 5	640 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 100 hours per year. SO_2 limited to 2.7 lbs/hr and 0.13 tons/yr. NO_x limited to 9.1 lbs/hr and 0.45 tons/yr. CO limited to 2.1 lbs/hr and 0.10 tons/yr. PM limited to 0.6 lbs/hr and 0.03 tons/yr. VOC limited to 0.1 lbs/hr and <0.01 tons/yr.

Table 3.3-9 Permitted Air Emission Sources (Sheet 2 of 2)

Emission Source[a][b][c]	Description	Capacity Rating	Permit Conditions[d]
CP-EDG6S[b]	Emergency Generator No. 6	167 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 100 hours per year each. SO_2 limited to 0.8 lbs/hr and 0.04 tons/yr. NO_x limited to 5.2 lbs/hr and 0.26 tons/yr. CO limited to 1.2 lbs/hr and 0.06 tons/yr. PM limited to 0.4 lbs/hr and 0.02 tons/yr. VOC limited to 0.4 lbs/hr and 0.02 tons/yr.
CP-DFP1S[b] CP-DFP2S[b]	Diesel Fire Engine Pump No. 1 and 2.	(2) 400 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 150 combined hours per year. SO_2 limited to 2.9 lbs/hr each and 0.22 tons/yr combined. NO_x limited to 12.4 lbs/hr each and 0.93 tons/yr combined. CO limited to 2.7 lbs/hr each and 0.20 tons/yr combined. PM limited to 0.9 lbs/hr each and 0.07 tons/yr combined. VOC limited to 1.0 lbs/hr each and 0.08 tons/yr combined.

a. Emission source unit reference is from TCEQ Permit No. 19225.

b. Stationary combustion sources also subject to 40 CFR Part 63, Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

c. Also subject to 40 CFR Part 63, Subpart JJJJJ–National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.

d. For a full discussion of air permit conditions, see TCEQ Permit No. 19225.
NO_x = nitrogen oxides PM = particulate matter VOC = volatile organic compound

Table 3.3-10 Theoretical Maximum Annual Air Emissions Summary

Annual Emissions (tons/year)						
CO	NO_X	PM	SO_2	VOC	HAP	CO_2e
11.68	91.62	3.15	15.21	4.70	1.22	5,231

CO_2e = carbon dioxide equivalent
HAP = hazardous air pollutant

Table 3.3-11 Annual Greenhouse Gas Emissions Inventory Summary

Carbon Dioxide Equivalent (CO_2e) Emissions, Metric Tons	
Emission Source	
Combustion Sources[a]	4,745
Workforce Commuting[b]	5,129
TOTAL	**9,874**

GHG calculated emissions are based on the following:

a. Fuel usage for combustion sources shown in Table 3.3-9; EPA Compilation of Air Pollutant Emissions factors (AP-42).

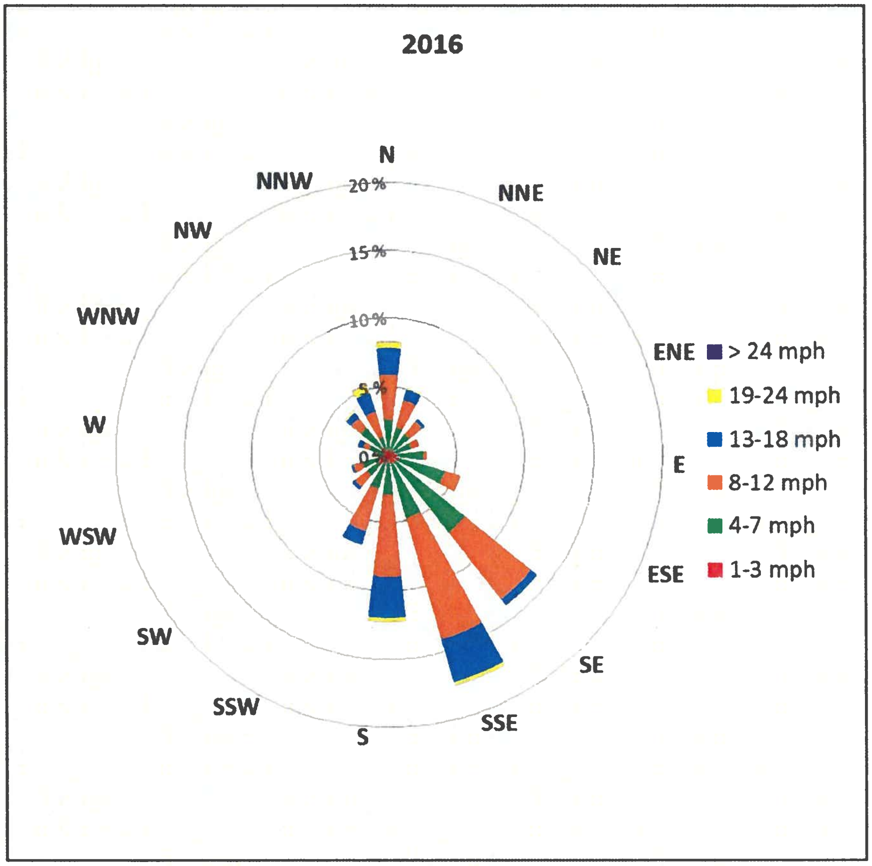
b. Workforce commuting calculations are based on:

i. Statistical information from U.S. Census Bureau (USCB) indicates that 4.4 percent of Texas workers in the transportation and warehouse and utilities industry carpool to work (USCB 2021c). The number of CPNPP employees as of December 2020 was 1,159. Utilizing the 4.4 percent USCB carpool statistic, a value of 1,108 passenger vehicles per day was utilized.

ii. Based on the EPA's Greenhouse Gas Equivalencies Calculator, the CO_2e/year is 5,129 metric tons for 1,108 vehicles (EPA 2021c).

iii. Carbon dioxide has a global warming potential (100-year time horizon) of 1 based on Table A-1 to Subpart A of 40 CFR Part 98.

iv. 3,546 metric tons CO_2e/year × 1 (global warming potential).



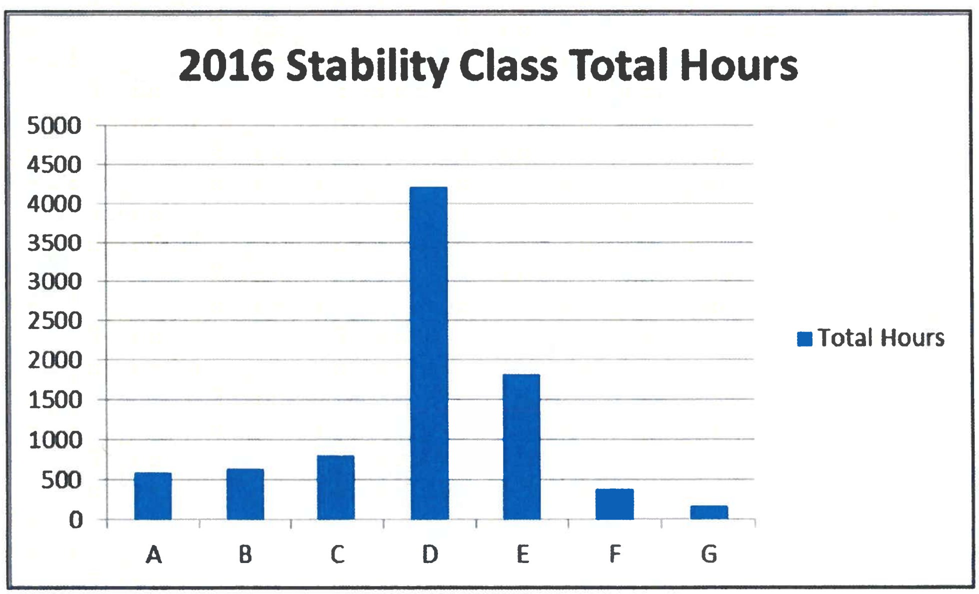
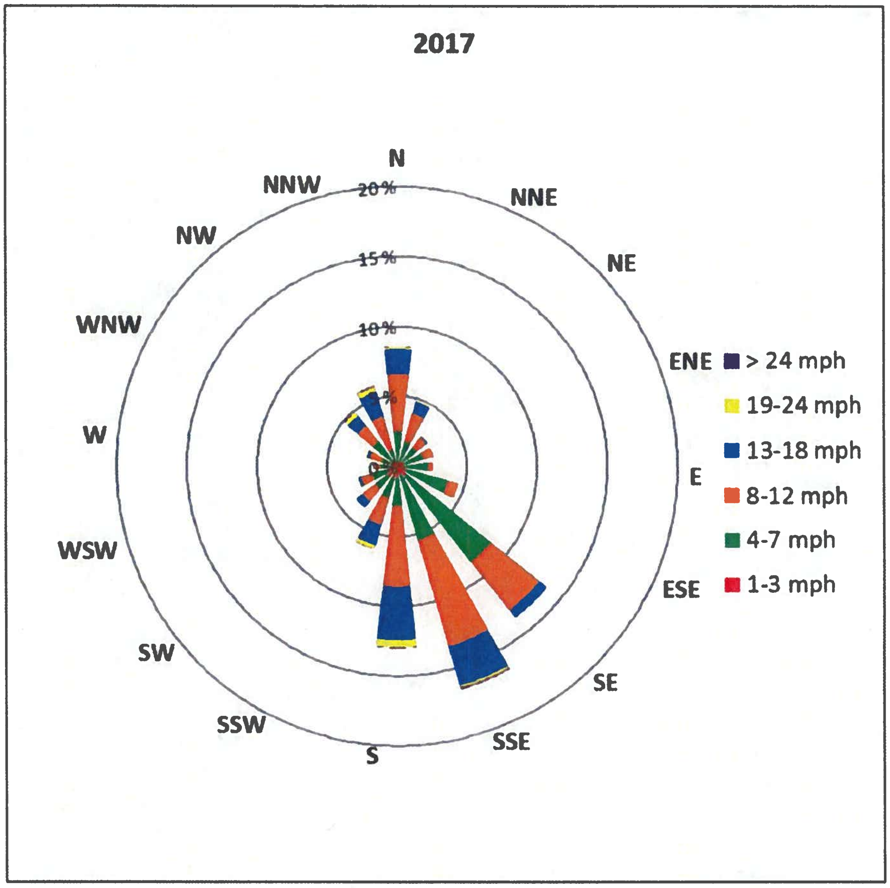


Figure 3.3-1 2016 CPNPP Wind Rose



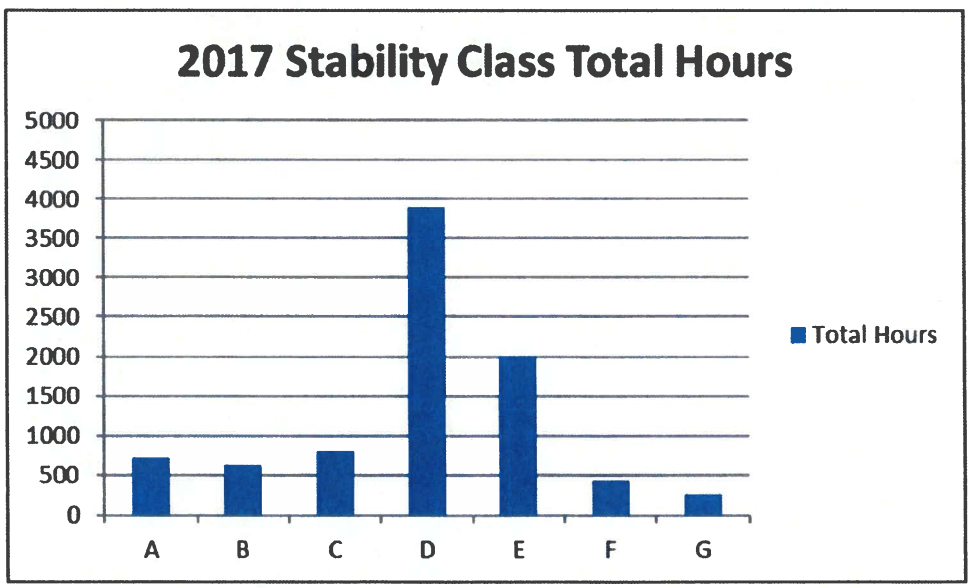
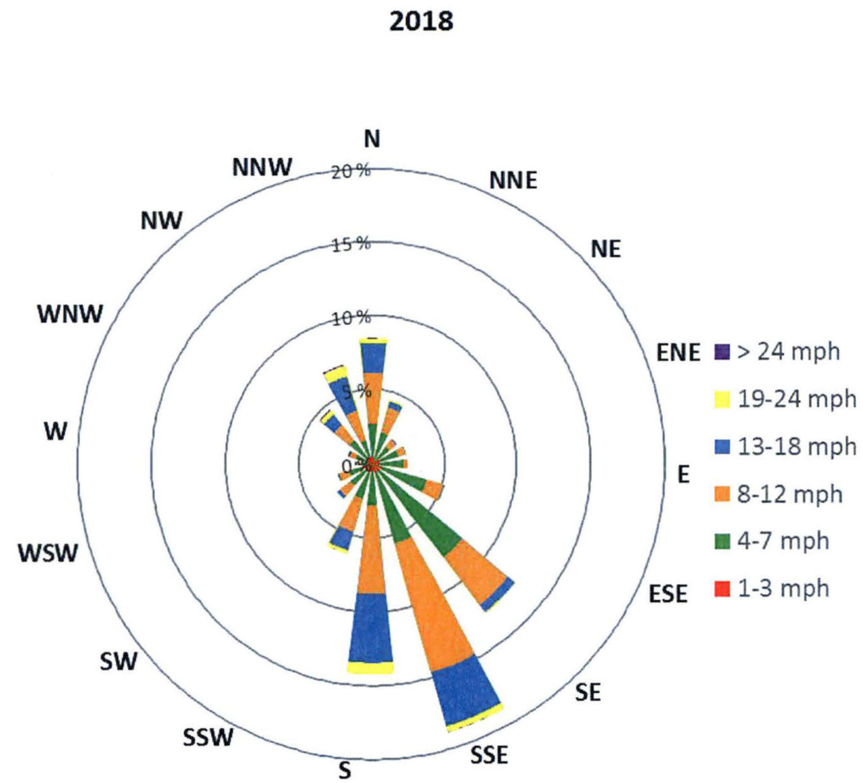


Figure 3.3-2 2017 CPNPP Wind Rose



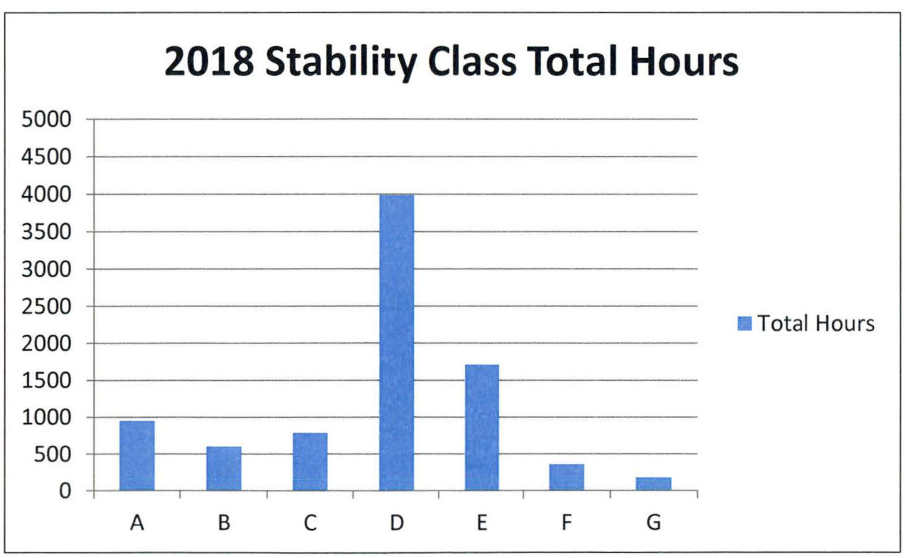
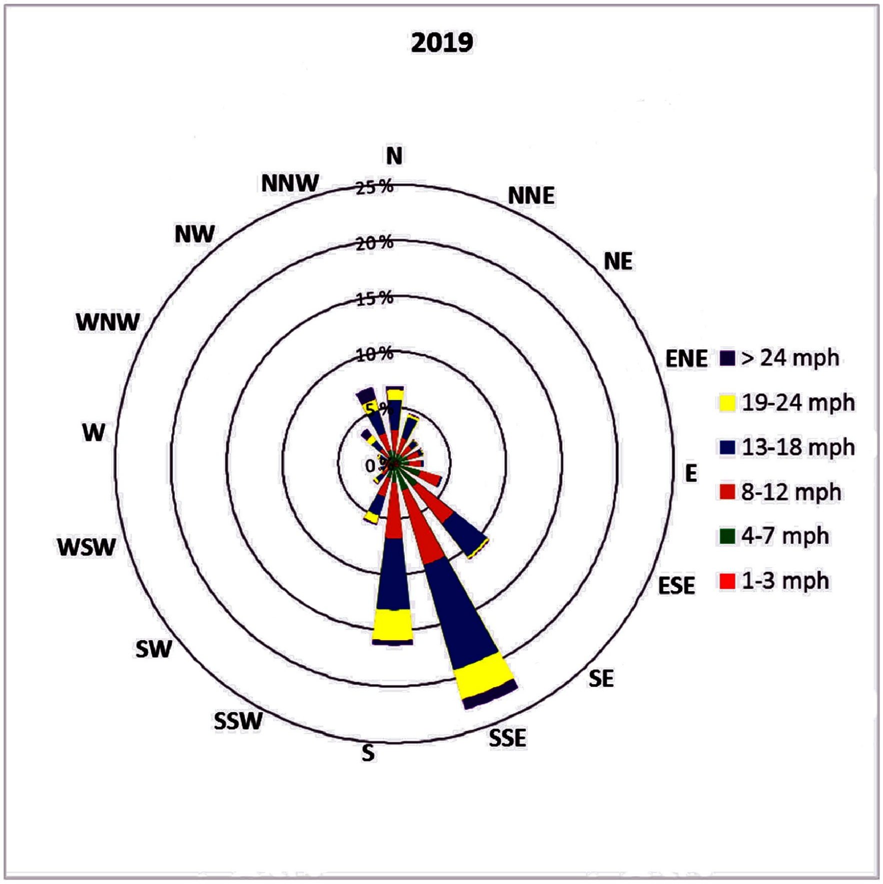


Figure 3.3-3 2018 CPNPP Wind Rose

2019 Wind Rose and Stability Class Graphs



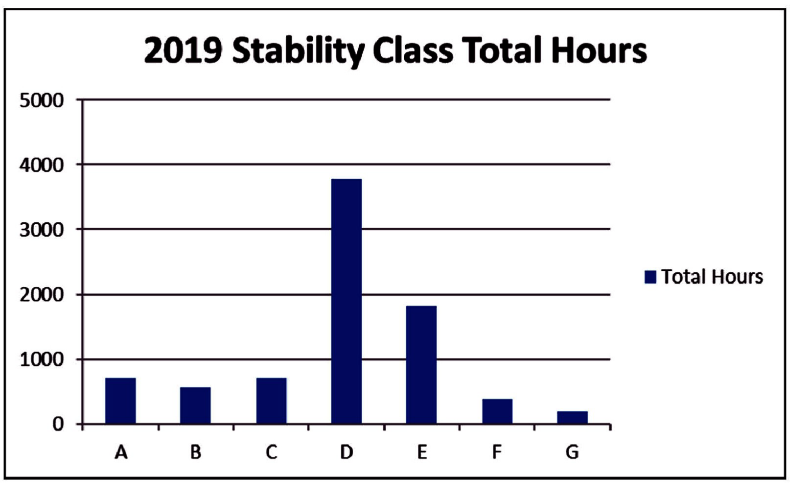
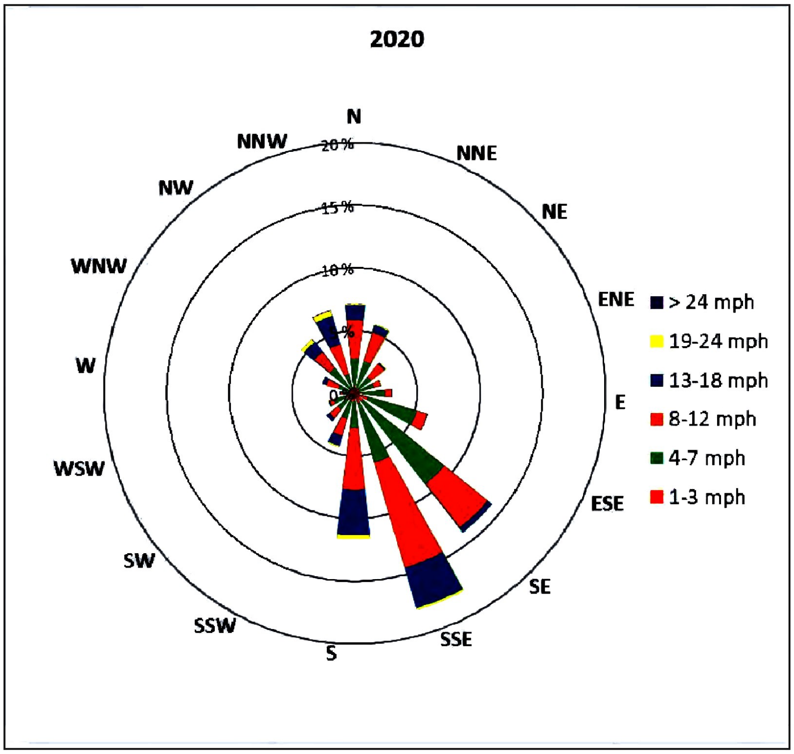


Figure 3.3-4 2019 CPNPP Wind Rose

2020 Wind Rose and Stability Class Graphs



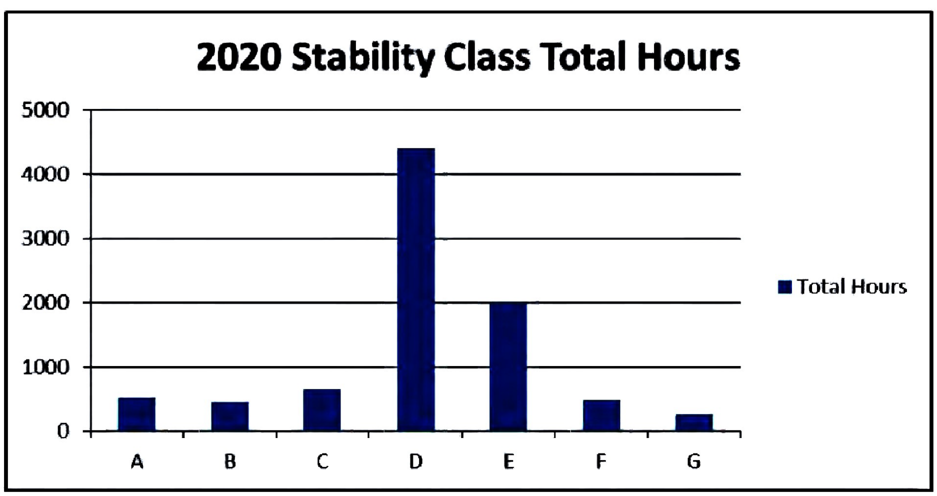


Figure 3.3-5 2020 CPNPP Wind Rose

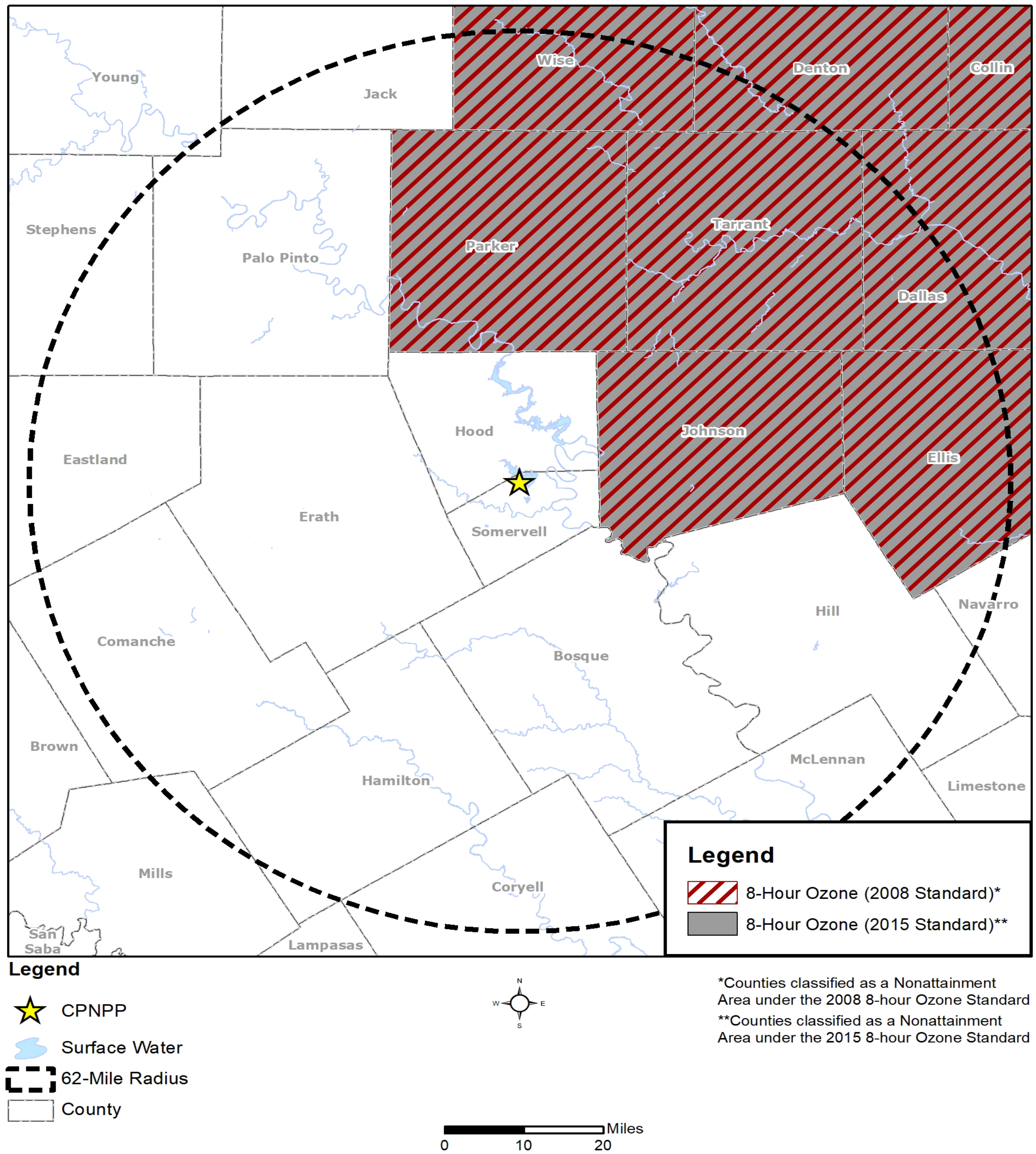


Figure 3.3-6 Air Quality Non-Attainment Areas within a 62-Mile Radius of CPNPP

3.4 Noise

Noise is produced at CPNPP from industrial plant operations and site activities. Industrial and operational background noise at CPNPP is generally from emergency diesel generator operations, turbine generators, transformers and electrical equipment, public address systems, transmission lines and switchyards, the main steam safety valves, heating, ventilation and air-conditioning systems, vents, water pumps, material-handling equipment, motors, maintenance vehicles (forklifts, tractors, trucks, etc.), warning sirens, trucks, and vehicular traffic. Many of the noise sources are confined indoors, underground, or are used infrequently. A shooting range is also located onsite, away from the main portion of the plant, but can create sporadic noise when weapons are fired. (Luminant 2013b, Section 2.5.5)

The loudest sound emitted from CPNPP plant systems would be from release of steam into the atmosphere and the use of firearms at the shooting range. The steam release occurs four times over each three-year period during shutdowns. If a trip occurs, there may also be a steam release. The most likely source of noise is when the main steam atmospheric relief valves open at the roof of the Safeguard Buildings, and that may be heard from a distance but not at levels that would require hearing protection. The shooting range is active on weekdays.

The firing range is approximately 1,710 feet from the closest point of the site boundary in the western direction. The nearest residents to CPNPP are located approximately 0.8 miles south-southwest and 0.8 southwest of the plant.

From an ambient noise study performed in February 2007, receptors were reviewed within a 10-mile radius of the site including the nearest residences, south fence line, near the east fence line, Post Oak Memorial Chapel and cemetery, Freedom Church, and Happy Hill Children's Home. Recreation locations were also selected. These noise measurements provide information on the baseline noise levels in the area during both the daytime and nighttime periods. (Luminant 2013b, Section 2.5.5)

No sensitive receptors, except for wildlife and migratory birds, were located within the fence line of the facility. Noise is attenuated with distance for the residences to the south-southwest because trees with foliage, ground cover, earthen berms, and other natural features dampen the noise. However, because water is between the eastern fence line and the residences across SCR, potential noise from the site would not be attenuated with distance past the fence line as it would be by natural methods. These residences are located a substantial distance from the site and are thus unaffected by CPNPP noise. (Luminant 2013b, Section 2.5.5)

The ambient noise study concluded that the fence line and offsite noise levels measured were in the range of values expected for ambient noise for a low density residential and rural location. Area noise levels ranged between 35 A-weighted decibel scale (dBA) and 70 (traffic) dBA (daytime) and between 36 dBA and 60 dBA (nighttime). Average equivalent sound levels (Leq) were measured between 36 dBA and 55 dBA (daytime) and from 37 dBA to 55 dBA (nighttime). These measurements for the day-night average (Ldn) are similar to expected levels for the day-night average in a rural area ranging from 50 to 55 Ldn. (Luminant 2013b, Section 2.5.5) The conclusions of the study are still relevant as there have been no significant changes to receptors since 2007 and no anticipated changes during the LR period.

Other noise generated onsite is from natural sources such as wind through foliage, wildlife, and insects. Noise generated outside of the fence line from nearby offsite sources includes residential activities, traffic along the western fence line (plant entrance), and boats at the northern fence line. (Luminant 2013b, Section 2.5.5)

The U.S. Department of Housing and Urban Development (HUD) has established noise impact guidelines for residential areas based on Ldn. The Ldn is the 24-hour average sound level, in decibels, obtained after addition of 10 decibels (dB) to sound levels in the night from 10 p.m. to 7 a.m. (HUD 2009). Neither the State of Texas nor Hood and Somervell counties have developed noise regulations specifying acceptable community noise levels.

HUD's goal is to have the exterior noise level not to exceed an Ldn of 55 dBA. However, when considering cost and feasibility, HUD suggests an Ldn of 65 dB is acceptable and allowable, below which the noise would be considered acceptable for residential and outdoor recreational uses. (HUD 2009) As discussed earlier, CPNPP noise levels range from 36 dBA to 55 dBA and are below the requirements of 65 dBA established by HUD. Additionally, according to NUREG-1437, noise levels are considered acceptable if the Ldn outside a residence is less than 65 dBA (NRC 2013a, Section 3.3.3).

Because CPNPP is located in a rural area (away from urban areas), it is unlikely that noise levels from CPNPP would affect offsite residences. This is further substantiated by the fact that during the most recent 5 years (2016–2020), no noise complaints related to CPNPP plant operational and outage activities have been received from offsite residences . Therefore, no noise issues affecting offsite residences are anticipated during the LR period because noise levels at CPNPP are expected to remain the same as under current operating conditions.

The CPNPP safety handbook requires all employees, regardless of whether affected or not, to wear approved hearing protection equipment in high noise areas. These areas not only include those that are posted as such, but any area in which the noise level makes normal conversation difficult. Luminant's hearing conservation program is designed to prevent any temporary or permanent noise-induced hearing loss to employees and to comply with federal regulations. As required by the regulations, the body of the standard, 29 CFR 1910.95, is made available to employees on the official bulletin boards located across the site.

Monitoring is routinely performed to measure sound levels throughout the plant. Data developed from monitoring is used to ensure that high noise areas are properly posted. High noise areas are those that could expose employees to an 8-hour time-weighted average of 85 dB or greater. Additionally, as a general rule of thumb, CPNPP requires that hearing protection should also be worn in any area where normal conversational tones cannot be heard. Luminant's hearing conservation program also requires audiometric testing to be performed annually for all employees who have unescorted access to the protected area and have not been excluded from the hearing conservation program, to monitor the health of employee hearing.

A monitoring survey was performed in 2001 for atmospheric relief valves and noise readings were taken near equipment (generators, exciters, main steam isolation valve walkway etc.) and on the roof. The atmospheric relief valves sound survey indicates that noise levels range from 80 dBA to greater than 126 dBA. As discussed earlier, CPNPP requires that hearing protection be worn when noise levels are greater than 85 dBA. Noise from atmospheric relief valves can also be heard at times in plant parking lots, where hearing protection is not readily available. However, it is typically of short duration and rarely occurs. Additionally, the ambient noise study from 2007 showed that noise levels attenuate and were much lower at the fence line and offsite receptors and were within limits set by HUD.

3.5 Geologic Environment

3.5.1 Regional Geology

The CPNPP site is located on the Comanche Plateau, a subdivision of the central Texas section of the Great Plains physiographic province. The relationship of the site to these features and to other physiographic units in the region is shown in Figure 3.5-1. The Great Plains spans 725,000 square kilometers (km) (450,000 square miles) of flat "high plains" bordered to the west by the Rocky Mountains. The eastern border with the Central Lowlands is less distinct; the separation is characterized by the 50 centimeters (20 inches) rainfall divide and changes in vegetation and soils. The Great Plains slope downward to the east with maximum heights in the foothills of the Rockies at 1,700 m (5,500 feet) decreasing to 610 m (2,000 feet). The bedrock is horizontal beds of sandstones, shales, limestones, conglomerates, and lignite. (NPS 2021)

Near the CPNPP, the Great Plains province of Texas is subdivided on the degree of erosion of the resistant Lower Cretaceous limestone cover and on the nature of the older rocks thereby exposed. The Comanche Plateau subdivision in which the CPNPP site is located is a submaturely dissected area that slopes eastward at a gradient confirming the dip of the Lower Cretaceous rocks. The eastern boundary of the Comanche Plateau, from a point near Waco southward, is formed by the Balcones escarpment.

The formations forming the Comanche Peak Plateau and the outlier remnants of the Callahan Divide to the west are principally limestones of Lower Cretaceous age. These more resistant rocks are grouped with associated sands and calcareous clay or marl units into three subdivisions: the Trinity, Fredericksburg, and Washita Groups. South and west of the Brazos River, the youngest (Washita) rocks are thin and have a small extent of a real outcrop. This group is absent in the site vicinity. The Fredericksburg group of formations (Edwards and Comanche Peak limestones and underlying Walnut Clay) are confined to the major drainage divides; the only complete section in the site vicinity is at Comanche Peak, the prominent landmark a little more than five miles north of the plant site. The Trinity rocks are roughly equal in a real extent to those of the Fredericksburg. They crop out in the western marginal area of the plateau and in the valley areas projecting southeastward. Classic exposures are present in the valleys of the Brazos River, Paluxy River, and Squaw Creek in the site area. The plant dams and reservoirs are all within the Glen Rose bedrock outcrop with the overlying Paluxy Sand on the adjacent divides. The underlying basal Trinity sands (Twin Mountains Formation), unexposed in the Squaw Creek drainage, crop out about 8 miles to the southwest of the site in the Paluxy River valley.

The Trinity formations exhibit characteristic terrain aspects. The outcrop area of the Paluxy Sand is confined to the summit regions of the drainage divides and forms gently rolling hills of red, sandy soil, which supports deciduous trees and native grasses. Areas underlain by the Glen Rose Formation are typically prairies having relatively steep, stair-stepped slopes developed on limestone alternating principally with claystone, siltstone, and/or shale. A flat, broadly undulating plain lying to the west of the site characterizes the outcrop area of the Twin

Mountains Formation. Topographic elevations in the site range from about 550 to 1,000 feet above sea level.

The Great Plains province is bordered on the east by the Coastal Plain, Ouachita, and Ozark Plateau provinces. The western and northern boundary of the Coastal Plain province coincides in general with the limit of the Upper/Lower Cretaceous sedimentary boundary. The boundary extent in common with the Great Plans (Comanche Plateau area) is reasonably sharp and marked by the contrast between the harder limestones (Lower Cretaceous) and the softer shale-chalk-sandstone (Upper Cretaceous) to the east. North of the Brazos River, the Central Lowlands-Coastal Plain boundary is less distinct, and the Coastal Plain limit is arbitrarily continued at the same geologic position by placement at the base of Upper Cretaceous units.

The closest point of the Coastal Plain Province is 25 miles east of the site. The Coastal Plain comprises semi-consolidated and unconsolidated sediments of upper Cretaceous, Tertiary, and Quaternary age. The geological materials become progressively younger and are generally softer towards the Gulf of Mexico. All the sediments dip gently seaward.

The Palo Pinto Country adjoins the Comanche Plateau to the northwest. Palo Pinto Country is the locality in which Pennsylvanian-age rocks have been exposed by stripping away of the Edwards Limestone (Upper Cretaceous). It is characterized by steep-sided mesas cut by canyons, the mesas being remnants of strong sandstone beds. Between the mesas, on lower-lying shales, are rolling, mesquite-covered plains.

3.5.2 Site Geology

Within the general 5-mile radius area of the site vicinity, the stratigraphic units exposed consist of Quaternary fluvial deposits exposed in the drainage lowlands and Lower Cretaceous strata. The CPNPP site and surrounding areas are underlain by strata of the Lower Cretaceous Trinity Group. The Cretaceous rocks form a southeastward-thickening wedge extending across the area into a structural feature known as the East Texas Basin. Regional dip of the beds is to the east and southeast at rates of about 15 to 40 feet per mile. The CPNPP site is located on the southern flank of the basin, which is a sedimentary depositional trough formed in mid-Pennsylvanian time. The trough is filled with Pennsylvanian and Permian sediments. A regional unconformity separates these Paleozoic sediments from the Lower Cretaceous sediments underlying the site. Figure 3.5-2 depicts the geologic map of the subject property and surrounding areas (USGS 2021a).

Quaternary deposits in the site areas are on recent floodplain alluvium and Pleistocene fluvial terrace sediments. These deposits consist of gravel, sand, silt, silty clay, and organic material and are confined to the bottoms of the Squaw Creek, Paluxy River, and Brazos River valleys. The scattered patches of Pleistocene fluvial terrace remnants are adjacent to the recent floodplain alluvium, but at a slightly higher elevation.

Three formations of the Trinity Group comprise bedrock in the site region and are approximately equal in thickness. In descending order, they are the Paluxy, the Glen Rose, and the Twin Mountains formations. The Paluxy Formation at the top of the group is a sand that thins southward and eastward (downdip). The Paluxy Formation has been eroded from the immediate plant and reservoir area. However, it crops out on the periphery of the site area and there consists of fine- to very fine-grained, well-sorted, poorly cemented friable sandstone with occasional siltstone and claystone interbeds.

The Glen Rose Formation, which underlies the Paluxy, constitutes the principal bedrock formation in the CPNPP area. It pinches out to the west (updip) and to the north. The Paluxy-Glen Rose contact in this area is abrupt, distinct, and conformable. The Glen Rose Limestone is characterized by stair-step topography resulting from differential weathering of impure, nodular limestones, softer claystone beds, and resistant, sparry-cemented medium-to-thick bedded, hard limestones. The materials of the Glen Rose Formation extend from an elevation 810 feet (plant grade) to elevation 610 feet. The Glen Rose Formation consists of bedded argillaceous limestone alternative with units composed of variable amounts of clay, marl, and sand.

The Twin Mountains Formation underlies the Glen Rose Formation. This stratum forms a gradational contact with the Glen Rose Formation and is composed principally of sandstone, limestone, and claystone. The sandstones are water-bearing and serve as a source for water supplies in the site vicinity. The Twin Mountains Formation is not exposed in the immediate site area. The materials of the Twin Mountains formation extend from elevation 610 feet to elevation 366 feet and consist of interbedded claystone and sandstone sequences. The Twin Mountains Formation consists of fine- to medium-grained sands with pebble and gravel conglomerates and clays and silts throughout. In general, the Twin Mountains Formation is a fining-upward sequence of sandstone and claystone. The Twin Mountains Formation unconformably overlies the Mineral Wells Formation of the Strawn Series (Pennsylvanian) at elevation 366 feet.

The Paleozoic section is not exposed within a five-mile radius of the site. A typical Paleozoic section consists of predominantly sandstone and shale of the Strawn and Atoka Stoke Series (Pennsylvanian); limestones of the Marble Falls Formation (Pennsylvanian) and Ellenburger Formation (Ordovician); and sandstone of the Hickory Formation (Cambrian).

Columnar geologic cross sections are shown in Figures 3.5-3a through 3.5-3e.

3.5.3 Soils

3.5.3.1 Onsite Soils and Geology

Soil units that occur within the CPNPP property boundary are described in detail in Table 3.5-1 and shown in Figure 3.5-4. They are also summarized below (USDA 2021). Approximately 40.4 percent of the CPNPP site is covered in water.

- Bolar clay loam, 1-3 percent slopes
- Bolar clay loam, 3-5 percent slopes

- Bosque loam, occasionally flooded
- Bunyan fine sandy loam, occasionally flooded
- Chaney loamy sand, 1-5 percent slopes
- Chaney loamy sand, 1-5 percent slopes, eroded
- Duffau loamy fine sand, 1-5 percent slopes
- Duffau fine sandy loam, 1-3 percent slopes
- Duffau-Windthorst complex, 1-5 percent slopes
- Duffau-Weatherford complex, 3-8 percent slopes
- Frio silty clay, 0-1 percent slopes, occasionally flooded
- Hassee fine sandy loam, 0-1 percent slopes
- Krum clay, 1-3 percent slopes
- Nimrod fine sand, 0-5 percent slopes
- Pedernales fine sandy loam, 1-3 percent slopes
- Pedernales fine sandy loam, 3-5 percent slopes
- Pedernales fine sandy loam, 1-5 percent slopes, moderately eroded
- Purves clay, 1-3 percent slopes
- Purves clay, 3-5 percent slopes
- Sunev clay loam, cool, 3-5 percent slopes
- Tarrant-Bolar association, hilly
- Tarrant-Purves association, undulating
- Thurber clay loam, 1-3 percent slopes
- Venus loam, 1-3 percent slopes
- Windthorst loamy fine sand, 1-5 percent slopes
- Windthorst very fine sandy loam, 1-3 percent slopes
- Windthorst fine sandy loam, 3-5 percent slopes
- Windthorst fine sandy loam, 1-5 percent slopes, eroded
- Windthorst fine sandy loam, 3-8 percent slopes, eroded
- Windthorst fine sandy loam, 1-8 percent slopes, severely eroded

During construction of CPNPP Units 1 and 2, all soil and weathered rock, along with a significant amount of unweathered Glen Rose Limestone, were excavated and removed. As a result of the excavation, Units 1 and 2 lie directly on unweathered Glen Rose limestone.

3.5.3.2 Erosion Potential

Because CPNPP has been operational since the early 1990s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table 3.5-1 subject to erosion have a slight to moderate erosion potential, except for the Windthorst fine sandy loam, percent slopes, which has severe erosion potential. This soil is mapped south of the plant area on the west side of the SCR in a small undeveloped location adjacent to an easement (USDA 2021).

CPNPP maintains and implements a stormwater pollution prevention plan (SWPPP) that identifies potential sources of pollution reasonably expected to affect the quality of stormwater, such as erosion, and identifies best management practices (BMPs) that will be used to prevent or reduce the pollutants in stormwater discharges. The topography, physical features, activities, and operation of CPNPP do not present a high potential for soil erosion. In addition, the drainage areas and conveyances are well vegetated and contoured in a manner to limit erosion. In addition, any ground disturbance of one or more acres requires a construction stormwater permit to be obtained from the TCEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Although no LR-related refurbishment or construction activities are planned, any such activities would continue to be managed in adherence to the CPNPP SWPPP.

3.5.3.3 Prime Farmland Soils

The USDA's Natural Resources Conservation Service maps show that approximately 11.4 percent of the site is considered prime farmland or farmland of statewide importance. Locations designated as prime farmland are small, isolated patches on the outer boundaries of the site (USDA 2021). These areas would most likely still be considered prime farmland even though they are part of the property owned by CP PowerCo. Even if areas of the property are designated prime farmland, CPNPP would not be subject to the Farmland Protection Policy Act (FPPA) because the act does not include federal permitting or licensing for activities on private or nonfederal lands. Soil units designated as prime farmland are identified in Table 3.5-1.

3.5.4 Seismic History

The site region is located within the Central and Eastern United States, a stable continental region characterized by low rates of crustal deformation and no active plate boundary conditions (Luminant 2013b, Section 2.5.1.1.4). Central and eastern Texas lie within the zone of least seismic activity in the United States. The tectonic features within the site region were most recently active in either the Late Paleozoic (associated with the Ouachita orogeny) or Mesozoic to Eocene (related to the opening of the Gulf of Mexico). (Luminant 2013b, Section 2.5.1.1.4.3)

The site is underlain by undeformed rocks of Cretaceous age more than 80 million years old. No geological faults have been found in these rocks near the site. Their sub-horizontal stratigraphy across hundreds of miles of exposure testifies to the tectonic quiescence of the region for many millions of years. In this region, excepting deformation associated with the Meers fault in Oklahoma, no evidence has been found of tectonic activity at the earth's surface younger than late Miocene age, or about 11 million years ago.

The Meers fault is the only tectonically capable fault within 200 miles of the CPNPP site (Luminant 2013b, Section 2.5.1.1.4.3). Quaternary activity on the Meers fault was recognized in the early 1980s, after CPNPP was constructed. The Meers fault is the southern boundary of the frontal Wichita fault system in southern Oklahoma and is approximately 180 miles from the site. The trace of the Meers fault is easily identified on aerial photographs for a total distance of approximately 23 miles as a south-down topographic escarpment. The scarp is thought to be related to Holocene rupture along the Meers fault. (Luminant 2013b, Section 2.5.1.1.4.3.6.1)

The severity of an earthquake is described by two methods: the modified Mercalli (MM) intensity scale and the Richter magnitude scale. The MM intensity is a subjective measure of observed damage at a particular location caused by an earthquake. The Richter magnitude scale is an estimate of the total amount of energy released by an earthquake. The accuracy of locating the epicenters of earthquakes in the region has improved with the increase in sensitivity and in the number of modern seismographs.

The literature of Texas seismicity reflects a scarcity of recent damaging shocks, or even widely felt shocks. No Texas earthquake with an intensity greater than VI has been reported east of the 100^{th} meridian since 1882. Seventeen seismic events (or series of events) have been reported with epicenters within 200 miles of the site between 1882 and 1975. Three events (or series of events) are within 100 miles to the southeast of the site in 1932 (V-VI) and 1970 (IV), respectively. The highest reported intensity within 200 miles of the site was MM intensity VII, exhibited by both the 1882 Paris and 1891 Rusk events located 155 and 160 miles respectively from the site. Regional seismic events that occurred between 1882 and 1975 are listed in the FSAR for Units 1 and 2, Table 2.5.2-2, with the corresponding MM intensities. (Luminant 2020d)

No earthquakes have been felt at the site since the beginning of site selection activities in the 1960s. Earthquake epicenter locations greater than Richter magnitude 3.0 within a 200-mile radius of the site from 1970 through February 25, 2022, are listed in Table 3.5-2 and shown in Figure 3.5-5 (USGS 2022). The maximum recorded magnitude was 4.5 in 1997. Of the 168 earthquakes reported since 1970, 133 occurred since 2009. Although there have been more frequent earthquakes since 2009, the magnitudes of these earthquakes have been relatively low and decreasing over time, averaging 3.3. Eighteen earthquakes within 50 miles of the site have occurred since 1970, with a maximum magnitude of 3.7. The earthquake epicenters were in northern Texas.

The U.S. Geological Survey's (USGS)'s national seismic hazard map shows that the CPNPP site is in a region with a 2 percent in 50 years (once in 2,500 years) probability of exceeding a peak ground acceleration between 0 and 0.04g (USGS 2015, Figure 1).

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 1 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
10	Bolar clay loam, 1-3% slopes	The Bolar component makes up 0.17% of the map unit. Slopes are 1-3%. This component is found on shoulders and summits of ridges. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 20 to 40 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to high. Available water to a depth of 3.6 inches is low. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 245 days. The depth to water table is more than 80 inches. Non-irrigated land capability classification is 3s. This soil does not meet hydric criteria.	Farmland of statewide importance
11	Bolar clay loam, 3-5% slopes	The Bolar component makes up 0.11% of the map unit. Slopes are 3-5%. This component found on shoulders and backslopes of ridges. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer 20 to 40 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to high. Available water to a depth of 4.3 inches is low. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220-245 days. The depth to water table is more than 80 inches. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Farmland of statewide importance
12	Bosque loam, occasionally flooded	The Bosque component makes up 0.74% of the map unit. Slopes are 0-1%. This component is flood plains. The parent material consists loamy alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 10.5 inches is high. Runoff class is negligible. This soil is occasionally flooded. It is not ponded. The frost-free period is 220-275 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2w. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 2 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
14	Bunyan fine sandy loam, occasionally flooded	The Bunyan component makes up 0.22% of the map unit. Slopes are 0-1%. This component is on flood plains. The parent material consists of loamy alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 9.9 inches is high. The depth to the water table is more than 80 inches. Runoff class is negligible. This soil is occasionally flooded. It is not ponded. The frost-free period is 220-280 days. Non-irrigated land capability classification is 2w. This soil does not meet hydric criteria.	Not prime farmland
15	Chaney loamy sand, 1-5% slopes	The Chaney component makes up 0.88% of the map unit. Slopes are 1-5%. This component is on shoulders and backslopes of ridges. The parent material consists of loamy slope alluvium and/or residuum weathered from sandstone and shale over claystone and/or interbedded sedimentary rock. Depth to a restrictive layer is 40 to 60 inches to densic bedrock. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately high. Available water to a depth of 6.2 inches is moderate. This soil is not flooded or ponded. Runoff class is medium. The frost-free period is 210-240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
16	Chaney loamy sand, 1-5% slopes, eroded	The Chaney component makes up 0.97% of the map unit. Slopes are 1-5%. This component is on ridge shoulders and backslopes. The parent material consists of loamy slope alluvium and/or residuum weathered from sandstone and shale over claystone and/or interbedded sedimentary rock. Depth to a restrictive layer is 40 to 60 inches to densic bedrock. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately high. Available water to a depth of 6.7 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 3 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
21	Duffau loamy fine sand, 1-5% slopes	The Duffau component makes up 0.00% of the map unit. Slopes are 1-5%. This component is on ridge backslopes and footslopes. The parent material consists of sandy and/or loamy residuum weathered from sandstone and/or claystone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
22	Duffau fine sandy loam, 1-3% slopes	The Duffau component makes up 0.52% of the map unit. Slopes are 1-3%. This component is on ridge footslopes and backslopes. The parent material consists of sandy and/or loamy residuum weathered from sandstone and/or claystone. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
23	Duffau-Windthorst complex, 1-5% slopes, moderately eroded	The Duffau and Windthorst components make up 0.19% of the map unit. Slopes are 1-5%. This component is on ridge backslopes and footslopes. The parent material consists of residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 197 to 263 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Farmland of statewide importance

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 4 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
25	Duffau-Weatherford complex, 3-8% slopes	The Duffau and Weatherford components make up 0.05% of the map unit. Slopes are 3-8%. This component is on ridge backslopes. The parent material consists of residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 197 to 263 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland
26	Frio silty clay, 0-1% slopes, occasionally flooded	The Frio component makes up 1.15% of the map unit. Slopes are 0-1%. This component is on flood plains. The parent material consists of calcareous loamy and/or clayey alluvium derived from limestone and shale. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 7.6 inches is moderate. Runoff class is low. This soil is occasionally flooded. It is not ponded. The frost-free period is 220 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3w. The soil does not meet hydric criteria.	All areas are prime farmland
28	Hassee fine sandy loam, 1-3% slopes	The Hassee component makes up 0.35% of the map unit. Slopes are 1-3%. This component is on depressions on stream terraces. The parent material consists of clayey alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately low. Available water to a depth of 8.8 inches is moderate. Runoff class is negligible. This soil is not flooded or ponded. The frost-free period is 230 to 240 days. Depth to the water table is about 6 to 12 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 5 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
31	Krum clay, 1-3% slopes	The Krum component makes up 0.80% of the map unit. Slopes are 1-3%. This component is on linear draws. The parent material consists of clayey alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 9 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 230 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria.	All areas are prime farmland
33	Nimrod fine sand, 0-5% slopes	The Nimrod component makes up 0.38% of the map unit. Slopes are 0-5%. This component is on ridge summits. The parent material consists of locally reworked eolian sands over residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 6.4 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 217 to 243 days. Depth to the water table is about 20 to 29 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
38	Pedernales fine sandy loam, 1-3% slopes	The Pedernales component makes up 1.13% of the map unit. Slopes are 1-3%. This component is on ridge summits, backslopes, and shoulders. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.4 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 6 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
39	Pedernales fine sandy loam, 3-5% slopes	The Pedernales component makes up 0.39% of the map unit. Slopes are 3-5%. This component is on backslope and side slope interfluves. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.3 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
40	Pedernales fine sandy loam, 1-5% slopes, moderately eroded	The Pedernales component makes up 0.66% of the map unit. Slopes are 1-5%. This component is on ridge backslopes, shoulders, and summits. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.4 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
42	Purves clay, 1-3% slopes	The Purves component makes up 0.03% of the map unit. Slopes are 1-3%. This component is on ridge shoulders, summits, and backslopes. The parent material consists of clayey residuum weathered from limestone. Depth to a restrictive layer is 8 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.8 inches is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4s. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 7 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
43	Purves clay, 3-5% slopes	The Purves component makes up 0.04% of the map unit. Slopes are 3-5%. This component is on ridge backslopes. The parent material consists of clayey residuum weathered from limestone. Depth to a restrictive layer is 8 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.9 inches is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4s. The soil does not meet hydric criteria.	Not prime farmland
46	Sunev clay loam, cool, 3-5% slopes	The Sunev component makes up 2.27% of the map unit. Slopes are 3-5%. This component is on footslopes of ridges on hills and stream terraces on hills. The parent material consists of loamy alluvium derived from limestone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 7.7 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 245 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Farmland of statewide importance
48	Tarrant-Bolar association, hilly	The Tarrant and Bolar components make up 21.88% of the map unit. Slopes are 10-30%. This component is on ridge summits. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 6 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.2 inches is very low. Runoff class is very high. This soil is not flooded or ponded. The frost-free period is 220 to 260 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 8 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
49	Tarrant-Purves association, undulating	The Tarrant and Purves components make up 20.15% of the map unit. Slopes are 1-8%. This component is on ridge summits. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 6 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1 inch is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria.	Not prime farmland
50	Thurber clay loam, 1-3% slopes	The Thurber component makes up 0.26% of the map unit. Slopes are 1-3%. This component is on ridge toeslopes. The parent material consists of clayey slope alluvium derived from claystone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately low. Available water to a depth of 6.7 inches is moderate. Runoff class is very high. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3s. The soil does not meet hydric criteria.	Farmland of statewide importance
53	Venus loam, 1-3% slopes	The Venus component makes up 2.88% of the map unit. Slopes are 1-3%. This component is on footslopes and toeslopes of ridges and stream terraces. The parent material consists of loamy slope alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 10.3 inches is high. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 9 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
54	Windthorst loamy fine sand, 1-5% slopes	The Windthorst component makes up 0.11% of the map unit. Slopes are 1-5%. This component is on ridge backslopes, shoulders, and summits. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.1 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
55	Windthorst very fine sandy loam, 1-3% slopes	The Windthorst component makes up 0.48% of the map unit. Slopes are 1-3%. This component is on ridge shoulders and summits. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria.	All areas are prime farmland
56	Windthorst fine sandy loam, 3-5% slopes	The Windthorst component makes up 0.06% of the map unit. Slopes are 3-5%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not occasionally flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 10 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
57	Windthorst fine sandy loam, 1-5% slopes, eroded	The Windthorst component makes up 2.01% of the map unit. Slopes are 1-5%. This component is on ridge summits, backslopes, and shoulders. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.5 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
58	Windthorst fine sandy loam, 3-8% slopes	The Windthorst component makes up 0.16% of the map unit. Slopes are 3-8%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland
59	Windthorst fine sandy loam, 1-8% slopes, severely eroded	The Windthorst component makes up 0.54% of the map unit. Slopes are 1-8%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 11 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
W	Water	Water covers 40.42% of the CPNPP site. The frost-free period is 181 to 270 days. Non-irrigated land capacity classification is 8.	Not prime farmland

(USDA 2021)

a. See Figure 3.5-4 for map unit symbols.

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 1 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
9/12/1975	8:25 PM	34.139	-97.369	3.4 lg	129	Oklahoma
10/11/1975	9:58 PM	34.816	-97.406	3.2 lg	175	Oklahoma
11/29/1975	9:29 AM	34.521	-97.347	3.5 lg	155	Oklahoma
6/7/1977	6:01 PM	33.058	-100.749	4 ml	180	Western Texas
11/27/1977	8:40 PM	32.954	-100.837	3.5 ml	184	Western Texas
6/16/1978	6:46 AM	33.03	-100.766	4.4 mb	181	Western Texas
6/8/1981	8:46 PM	32.142	-94.399	3 mblg	199	Northern Texas
7/11/1981	4:09 PM	34.884	-97.677	3.5 mblg	178	Oklahoma
11/6/1981	7:36 AM	32.021	-95.262	3.2 mblg	149	Northern Texas
3/28/1982	6:24 PM	29.849	-98.465	3 mblg	173	Southern Texas
5/3/1982	2:54 AM	34.07	-96.38	3 mblg	147	Oklahoma
11/27/1982	9:36 PM	33.003	-100.842	3.3 mblg	185	Western Texas
2/2/1984	11:38 PM	34.657	-97.394	3.2 mblg	164	Oklahoma
9/11/1984	9:47 AM	31.991	-100.697	3.2 mblg	172	Western Texas
9/19/1984	1:15 AM	32.027	-100.688	3 mblg	171	Western Texas
9/18/1985	10:54 AM	33.548	-97.051	3.3 mblg	96	Central Texas
1/30/1986	5:26 PM	32.066	-100.693	3.3 mblg	171	Western Texas
11/15/1990	6:44 AM	34.76	-97.59	3.9 mblg	170	Oklahoma
12/17/1992	2:18 AM	34.744	-97.581	3.6 mblg	169	Oklahoma
1/18/1995	10:51 AM	34.774	-97.596	4.2 mblg	171	Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 2 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
5/31/1995	11:49 PM	34.287	-96.732	3 mblg	150	Oklahoma
5/30/1997	10:26 PM	33.182	-95.966	3.4 mblg	122	Central Texas
9/6/1997	6:38 PM	34.66	-96.435	4.5 mblg	180	Oklahoma
4/28/1998	9:13 AM	34.782	-98.416	3.9 mb	175	Oklahoma
7/7/1998	1:44 PM	34.719	-97.589	3.2 mblg	167	Oklahoma
2/8/2002	11:07 AM	34.727	-98.361	3.8 mblg	171	Oklahoma
5/31/2002	4:57 AM	34.025	-97.619	3.3 mblg	119	Oklahoma
10/19/2002	9:18 PM	34.274	-96.079	3.4 mblg	168	Oklahoma
6/7/2004	7:15 PM	34.233	-97.254	3.5 mblg	137	Oklahoma
11/22/2004	6:42 PM	34.864	-97.672	3 mblg	177	Oklahoma
4/22/2005	12:17 AM	34.179	-95.192	3 mblg	198	Oklahoma
4/5/2006	1:46 PM	34.069	-97.314	3 mblg	125	Oklahoma
10/6/2006	5:13 PM	34.122	-97.625	3.5 mblg	126	Oklahoma
1/29/2008	5:24 AM	32.898	-100.842	3.3 mblg	183	Western Texas
10/31/2008	12:01 AM	32.836	-97.029	3 mblg	58	Northern Texas
1/28/2009	6:19 AM	35.163	-97.871	3.4 mblg	197	Oklahoma
2/3/2009	5:23 AM	34.589	-96.34	3.1 mblg	179	22 km NW of Coalgate, Oklahoma
2/24/2009	11:14 PM	34.735	-96.036	3.3 mblg	196	Oklahoma
5/16/2009	11:24 AM	32.795	-97.016	3.3 mblg	56	Northern Texas
5/16/2009	11:58 AM	32.85	-97.095	3 mblg	55	Northern Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 3 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
8/27/2009	3:22 AM	34.942	-96.618	3.4 mblg	194	Oklahoma
11/16/2009	11:00 PM	34.462	-97.532	3.1 mblg	150	Oklahoma
1/26/2010	11:59 PM	32.902	-100.833	3.1 mblg	183	Western Texas
4/14/2010	7:49 PM	34.705	-96.398	3 mblg	184	Oklahoma
4/15/2010	8:22 AM	34.631	-96.268	3.2 mblg	183	Oklahoma
6/14/2010	4:33 PM	34.865	-97.676	3.1 md	177	Oklahoma
8/7/2010	8:12 PM	32.896	-100.851	3.4 Mwr	183	Western Texas
9/25/2010	7:19 AM	34.109	-96.715	3.3 mblg	139	Oklahoma
10/9/2010	2:42 AM	32.929	-100.886	3.1 mblg	186	Western Texas
10/25/2010	3:53 PM	34.874	-97.741	3.2 mblg	177	Oklahoma
10/26/2010	1:56 AM	32.922	-100.85	3.1 mblg	184	Western Texas
12/24/2010	5:49 AM	34.69	-96.361	3 md	184	Oklahoma
12/27/2010	8:49 PM	34.696	-95.893	3.1 md	198	Oklahoma
2/28/2011	10:30 PM	32.876	-100.839	3.1 mblg	182	Western Texas
3/12/2011	10:22 AM	32.882	-100.896	3 mblg	186	Western Texas
3/13/2011	3:16 PM	32.995	-100.767	3.8 Mwr	180	Western Texas
3/13/2011	7:19 PM	32.964	-100.809	3 mblg	182	Western Texas
3/19/2011	6:34 PM	32.978	-100.766	3 mblg	180	Western Texas
3/28/2011	4:12 AM	32.913	-100.816	3 mblg	182	Western Texas
4/2/2011	5:05 PM	33.059	-100.761	3 mblg	181	Western Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 4 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
5/2/2011	2:07 PM	33.064	-100.79	3.2 mblg	183	Western Texas
7/17/2011	1:58 AM	32.424	-97.084	3 mblg	42	Northern Texas
8/18/2011	11:50 AM	34.881	-97.744	3 ml	178	Oklahoma
9/11/2011	7:27 AM	32.848	-100.769	4.3 Mwr	178	Western Texas
9/12/2011	9:18 AM	32.822	-100.871	3.5 Mwr	184	Western Texas
11/24/2011	6:15 PM	32.945	-100.845	3.1 mblg	184	Western Texas
12/9/2011	1:47 PM	32.935	-100.865	3.5 mblg	185	Western Texas
12/17/2011	9:46 AM	32.814	-100.852	3.2 mblg	182	Western Texas
1/18/2012	5:30 PM	32.372	-97.487	3.3 mblg	18	Northern Texas
4/3/2012	2:34 AM	34.635	-95.875	4.1 mb	195	Oklahoma
5/10/2012	10:15 AM	31.964	-94.465	3.9 mwr	196	Eastern Texas
6/15/2012	2:02 AM	32.462	-97.273	3.3 mblg	32	Northern Texas
6/24/2012	12:46 PM	32.474	-97.289	3.5 mblg	31	Northern Texas
9/29/2012	11:05 PM	32.842	-96.976	3.4 mblg	60	Northern Texas
9/29/2012	11:09 PM	32.815	-96.962	3.1 mblg	60	Northern Texas
1/22/2013	11:16 PM	32.894	-97.004	3 mblg	61	Northern Texas
3/4/2013	5:22 AM	34.191	-96.681	3.5 mblg	145	6 km SSE of Tishomingo, Oklahoma
4/27/2013	10:06 PM	34.135	-96.808	3.5 ml	139	13 km ENE of Dickson, Oklahoma
5/6/2013	6:11 PM	32.971	-100.846	3 mblg	184	25 km N of Snyder, Texas
5/27/2013	2:58 AM	34.075	-96.59	3.2 ml	141	15 km ENE of Kingston, Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 5 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
6/24/2013	6:07 PM	34.47	-96.283	3.2 ml	173	9 km SW of Coalgate, Oklahoma
6/29/2013	9:55 PM	34.097	-96.548	3 ml	143	9 km E of Madill, Oklahoma
9/2/2013	4:52 PM	31.9656	-94.5261	4.2 Mwr	193	14 km WNW of Timpson, Texas
9/2/2013	6:51 PM	31.9095	-94.4279	4.3 Mwr	199	3 km WNW of Timpson, Texas
9/23/2013	6:40 AM	33.9544	-97.1107	3.2 ml	121	2 km NNE of Marietta, Oklahoma
9/23/2013	8:56 AM	33.946	-97.161	3.4 ml	119	4 km WNW of Marietta, Oklahoma
10/11/2013	10:25 PM	34.086	-96.579	3 ml	142	16 km NE of Kingston, Oklahoma
11/9/2013	2:54 PM	32.9197	-97.6665	3 mb_lg	43	5 km SSE of Springtown, Texas
11/19/2013	7:40 PM	32.9116	-97.5509	3.6 mb_lg	44	1 km NNW of Azle, Texas
11/25/2013	2:43 AM	32.9195	-97.6182	3.4 mb_lg	44	4 km SW of Reno, Texas
11/28/2013	2:58 AM	32.9735	-98.0894	3.7 mb	50	18 km N of Mineral Wells, Texas
11/29/2013	1:14 AM	32.9093	-97.5205	3.1 mb_lg	45	1 km S of Pelican Bay, Texas
12/8/2013	1:10 AM	32.9144	-97.5817	3.6 mb_lg	44	3 km WNW of Azle, Texas
12/9/2013	4:23 AM	32.9576	-98.0594	3.7 mb_lg	48	17 km NNE of Mineral Wells, Texas
12/22/2013	12:31 PM	32.9619	-97.5552	3.3 mb_lg	48	2 km NE of Reno, Texas
12/23/2013	8:11 AM	32.9284	-97.5789	3.3 mb_lg	45	1 km S of Reno, Texas
1/13/2014	12:40 PM	32.9391	-97.5529	3.1 mb_lg	46	2 km ESE of Reno, Texas
5/14/2014	10:52 AM	32.7823	-100.8802	3.1 mb_lg	184	7 km NNE of Snyder, Texas
5/15/2014	10:35 PM	34.429	-96.3119	3 ml	170	14 km SW of Coalgate, Oklahoma
7/7/2014	9:38 AM	34.0713	-97.468	3.2 ml	124	10 km SSW of Wilson, Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 6 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
9/14/2014	4:18 AM	32.9083	-100.8184	3.2 mb_lg	182	23 km NNE of Snyder, Texas
9/22/2014	2:28 PM	34.6292	-97.5457	3.6 ml	161	23 km SSE of Lindsay, Oklahoma
9/23/2014	8:37 AM	34.6213	-97.556	3 ml	161	24 km S of Lindsay, Oklahoma
11/22/2014	10:15 PM	32.8346	-96.8932	3.3 mb_lg	64	5 km ENE of Irving, Texas
11/30/2014	12:52 AM	32.5035	-97.1328	3.4 mb_lg	41	6 km S of Mansfield, Texas
12/7/2014	3:57 PM	34.1752	-96.7559	3 ml	142	9 km N of Madill, Oklahoma
12/31/2014	1:31 PM	32.9473	-100.8401	3.2 mb_lg	184	26 km NNE of Snyder, Texas
1/6/2015	4:10 PM	32.835	-96.9027	3.5 mb_lg	63	4 km ENE of Irving, Texas
1/6/2015	4:55 PM	32.8662	-100.8647	3.5 mb_lg	184	17 km NNE of Snyder, Texas
1/6/2015	7:52 PM	32.847	-96.8922	3.6 mb_lg	64	6 km NE of Irving, Texas
1/7/2015	1:59 AM	32.8417	-96.9131	3.1 mb_lg	63	4 km NE of Irving, Texas
1/20/2015	3:25 PM	32.8221	-96.9055	3 mb_lg	63	4 km ENE of Irving, Texas
2/27/2015	7:18 AM	32.8336	-96.9098	3.1 mb_lg	63	4 km ENE of Irving, Texas
4/2/2015	5:36 PM	32.8588	-96.9356	3.3 mb_lg	63	5 km NNE of Irving, Texas
5/3/2015	10:11 AM	32.8511	-96.9514	3.2 mb_lg	62	4 km N of Irving, Texas
5/7/2015	5:58 PM	32.4817	-97.1006	4 Mwr	42	5 km N of Venus, Texas
5/18/2015	1:14 PM	32.8675	-96.9566	3.3 mb_lg	62	5 km N of Irving, Texas
7/14/2015	3:22 AM	34.9775	-97.6798	3.2 Mwr	185	17 km S of Blanchard, Oklahoma
12/4/2015	8:14 PM	34.8037	-97.8063	3.1 ml	173	13 km E of Rush Springs, Oklahoma
12/17/2015	5:29 PM	32.965	-97.3421	3 mb_lg	53	1 km SSE of Haslet, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 7 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
1/9/2016	9:03 PM	32.9383	-100.8358	3.6 Mwr	183	25 km NNE of Snyder, Texas
1/17/2016	4:32 AM	32.8689	-100.8623	3.5 mb_lg	184	17 km NNE of Snyder, Texas
5/13/2016	10:39 PM	35.0531	-97.5573	3.1 ml	190	12 km SW of Goldsby, Oklahoma
6/29/2016	9:15 AM	35.0083	-97.795	3 ml	187	13 km ESE of Chickasha, Oklahoma
7/8/2016	2:06 PM	35.059	-97.6064	3.4 ml	191	9 km SSE of Blanchard, Oklahoma
7/31/2016	12:26 PM	35.0752	-97.572	3.1 mb_lg	192	10 km SE of Blanchard, Oklahoma
12/20/2016	4:32 AM	34.6053	-96.2282	3.1 ml	183	7 km N of Coalgate, Oklahoma
6/17/2017	7:06 AM	35.012	-97.5951	3.2 mb_lg	187	15 km SSE of Blanchard, Oklahoma
8/25/2017	6:41 AM	32.8775	-96.8887	3 mb_lg	66	5 km S of Farmers Branch, Texas
11/21/2017	9:04 AM	34.8772	-97.6821	3 ml	178	8 km WNW of Lindsay, Oklahoma
12/19/2017	9:33 AM	34.9544	-97.8208	3 ml	183	9 km E of Ninnekah, Oklahoma
2/4/2018	4:39 AM	34.6722	-97.4959	3.2 ml	164	18 km SSW of Maysville, Oklahoma
5/18/2018	7:45 PM	32.4813	-97.1671	3.4 Mwr	38	8 km NW of Venus, Texas
8/1/2018	5:11 AM	35.0409	-97.5912	3.4 Mwr	189	12 km SSE of Blanchard, Oklahoma
8/13/2018	2:08 PM	34.9882	-97.5381	3 ml	186	16 km W of Purcell, Oklahoma
9/4/2018	10:06 AM	31.9613	-94.4343	3.5 Mwr	198	7 km NNW of Timpson, Texas
9/26/2018	4:47 PM	34.0505	-97.4332	3 ml	122	12 km S of Wilson, Oklahoma
9/28/2018	2:07 AM	35.0418	-97.5829	3 ml	189	12 km SSE of Blanchard, Oklahoma
10/23/2018	6:29 AM	34.0524	-97.4131	3.4 ml	123	12 km S of Wilson, Oklahoma
10/28/2018	9:21 AM	32.9043	-100.9065	3.1 mb_lg	187	20 km N of Snyder, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 8 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
10/31/2018	6:50 PM	32.8871	-100.9162	3 mb_lg	187	18 km N of Snyder, Texas
11/19/2018	1:12 PM	35.0272	-97.623	3 ml	188	12 km SSE of Blanchard, Oklahoma
11/26/2018	8:46 AM	34.6358	-96.3272	3.1 ml	182	14 km NW of Coalgate, Oklahoma
11/26/2018	8:52 AM	34.6437	-96.3232	3 ml	182	15 km NW of Coalgate, Oklahoma
11/26/2018	10:42 AM	34.053	-97.4342	3.1 ml	123	12 km S of Wilson, Oklahoma
11/27/2018	3:07 AM	34.6387	-96.3223	3.2 ml	182	14 km NW of Coalgate, Oklahoma
12/10/2018	1:23 AM	34.0395	-97.406	3 ml	122	13 km S of Wilson, Oklahoma
12/25/2018	11:23 PM	32.9543	-100.9086	3.3 ml	188	26 km N of Snyder, Texas
2/19/2019	1:08 PM	35.1046	-97.8624	3 mb_lg	193	8 km NE of Chickasha, Oklahoma
9/30/2019	4:47 PM	32.9236	-100.8619	4 Mwr	184	23 km NNE of Snyder, Texas
10/1/2019	2:14 AM	32.8939	-100.8895	3.8 Mwr	186	19 km N of Snyder, Texas
10/1/2019	3:21 AM	32.4911	-97.1714	3.2 mb_lg	38	8 km SSW of Mansfield, Texas
3/5/2020	8:42 PM	34.966833	-97.708	3.38 ml	184	18 km SSW of Blanchard, Oklahoma
3/13/2020	8:09 PM	32.877	-100.9283	3 mb_lg	188	17 km N of Snyder, Texas
3/19/2020	3:42 AM	35.105	-97.770833	3.02 ml	193	11 km WSW of Blanchard, Oklahoma
5/1/2020	7:50 PM	35.1015	-97.783667	3.26 ml	193	12 km ENE of Chickasha, Oklahoma
5/17/2020	6:10 AM	34.9745	-97.698833	3.05 ml	184	18 km S of Blanchard, Oklahoma
9/6/2020	6:08 AM	34.745	-97.573	3.43 ml	169	7 km SSE of Erin Springs, Oklahoma
11/14/2020	11:27 PM	32.9113	-100.8806	3.5 Mwr	185	21 km N of Snyder, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 9 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
4/15/2021	9:26 AM	34.9848333	-97.680167	3.26 ml	185	7 km SW of Dibble, Oklahoma
4/18/2021	3:54 PM	32.8646851	-101.00455	3.1 ml	192	18 km NNW of Snyder, Texas
4/19/2021	5:11 PM	34.9736667	-97.694833	3.47 ml	184	8 km SW of Dibble, Oklahoma
4/28/2021	12:51 AM	32.7163696	-100.683	3 ml	172	11 km NE of Hermleigh, Texas
6/3/2021	7:23 AM	34.9795	-97.684	3.31 ml	185	7 km SW of Dibble, Oklahoma
7/1/2021	12:33 AM	32.7145386	-100.68729	3.4 ml	172	11 km NE of Hermleigh, Texas
9/12/2021	6:26 AM	32.7667236	-100.66049	3.6 ml	171	17 km NNE of Hermleigh, Texas
12/29/2021	10:41 AM	31.6049194	-94.792183	3.1 ml	182	12 km W of Nacogdoches, Texas
12/29/2021	10:54 AM	32.7658081	-100.66371	3.1 ml	171	17 km NNE of Hermleigh, Texas

(USGS 2022)

a. All earthquakes within 200 miles (321.9 km) with a Richter magnitude of greater than 3.0.

mb = short-period body wave magnitude
mblg, mb_lg, lg = short-period surface wave magnitude
md = magnitude duration
ml = local magnitude
Mwr = regional magnitude

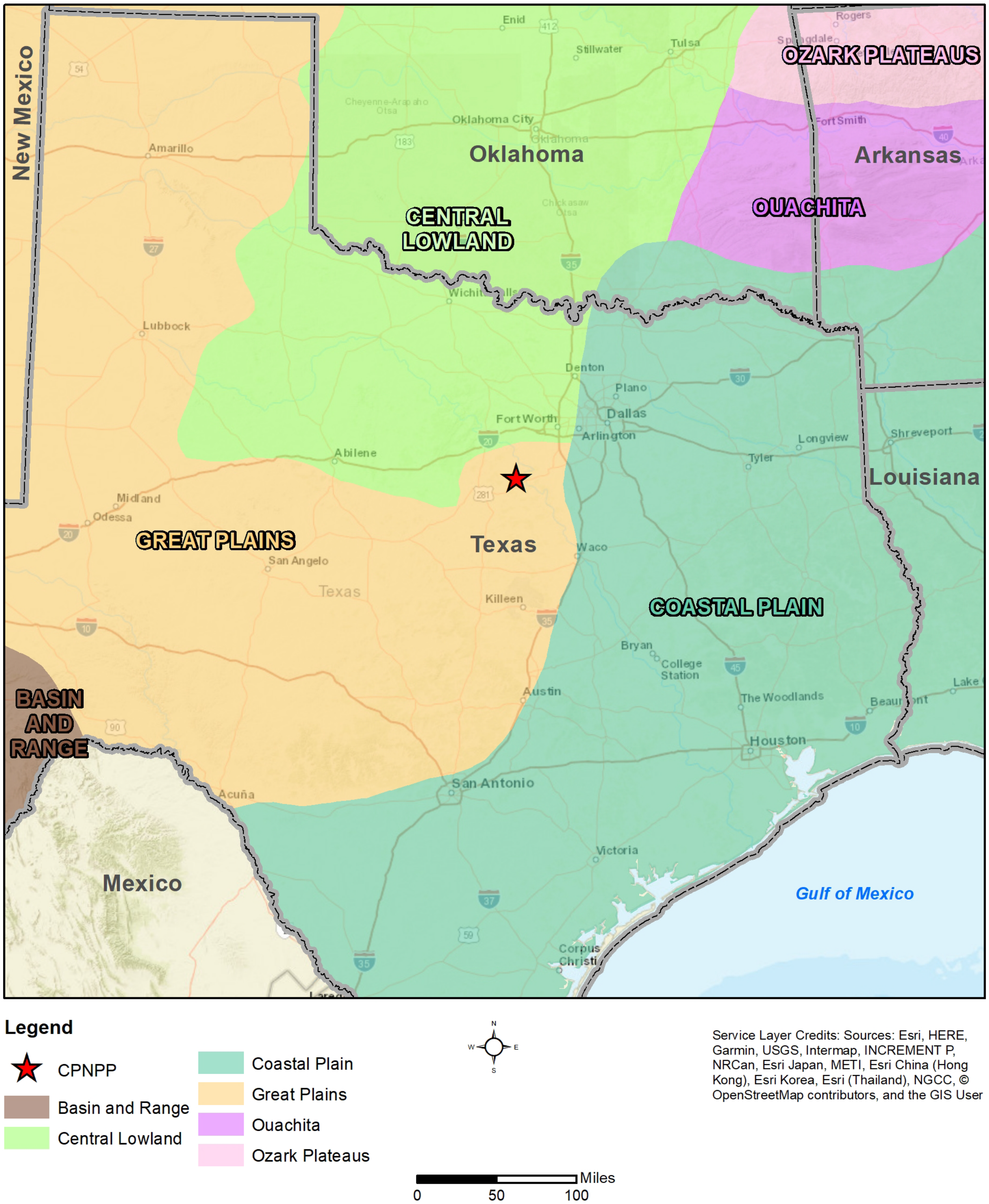


Figure 3.5-1 Physiographic Provinces

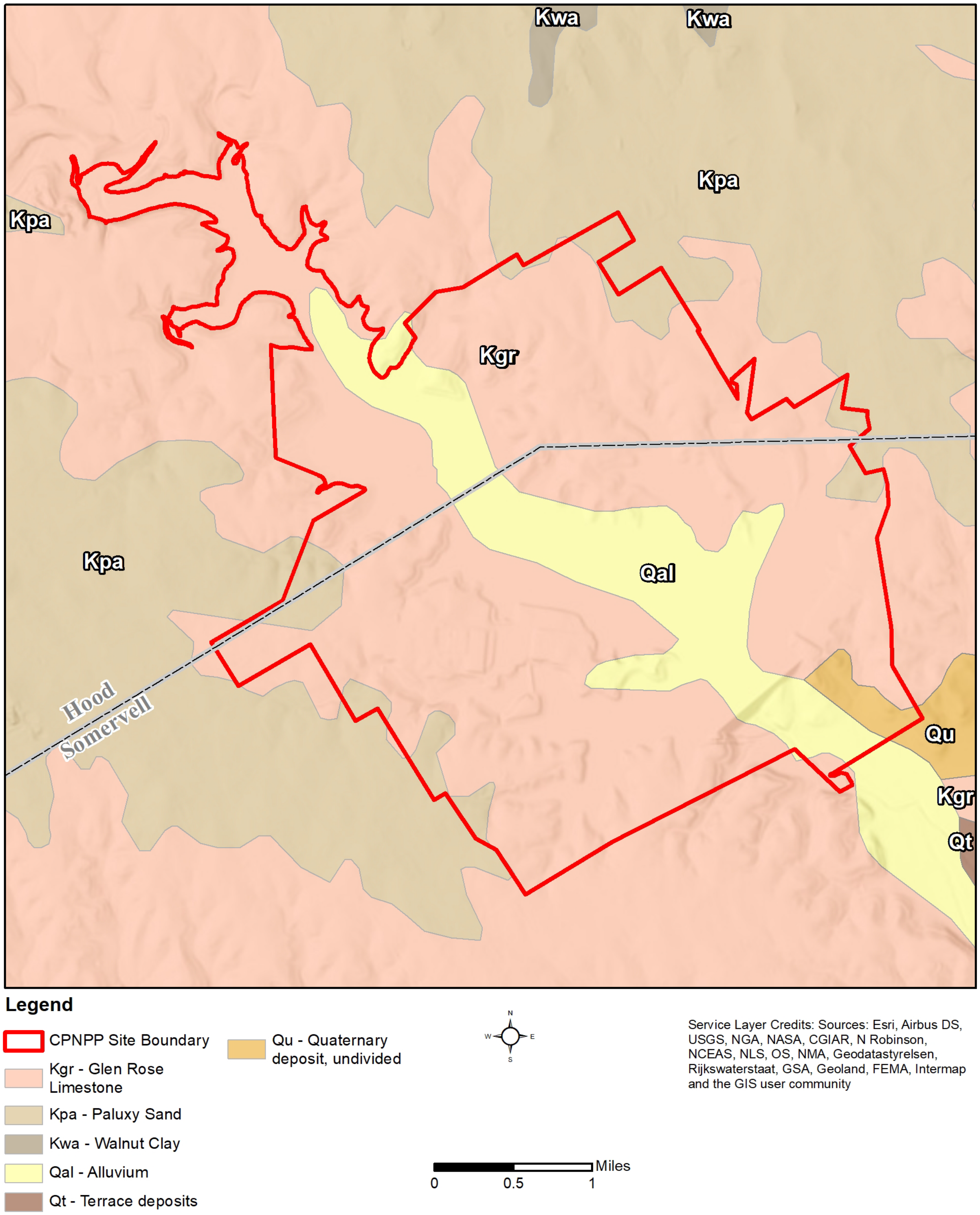


Figure 3.5-2 Surficial Geology

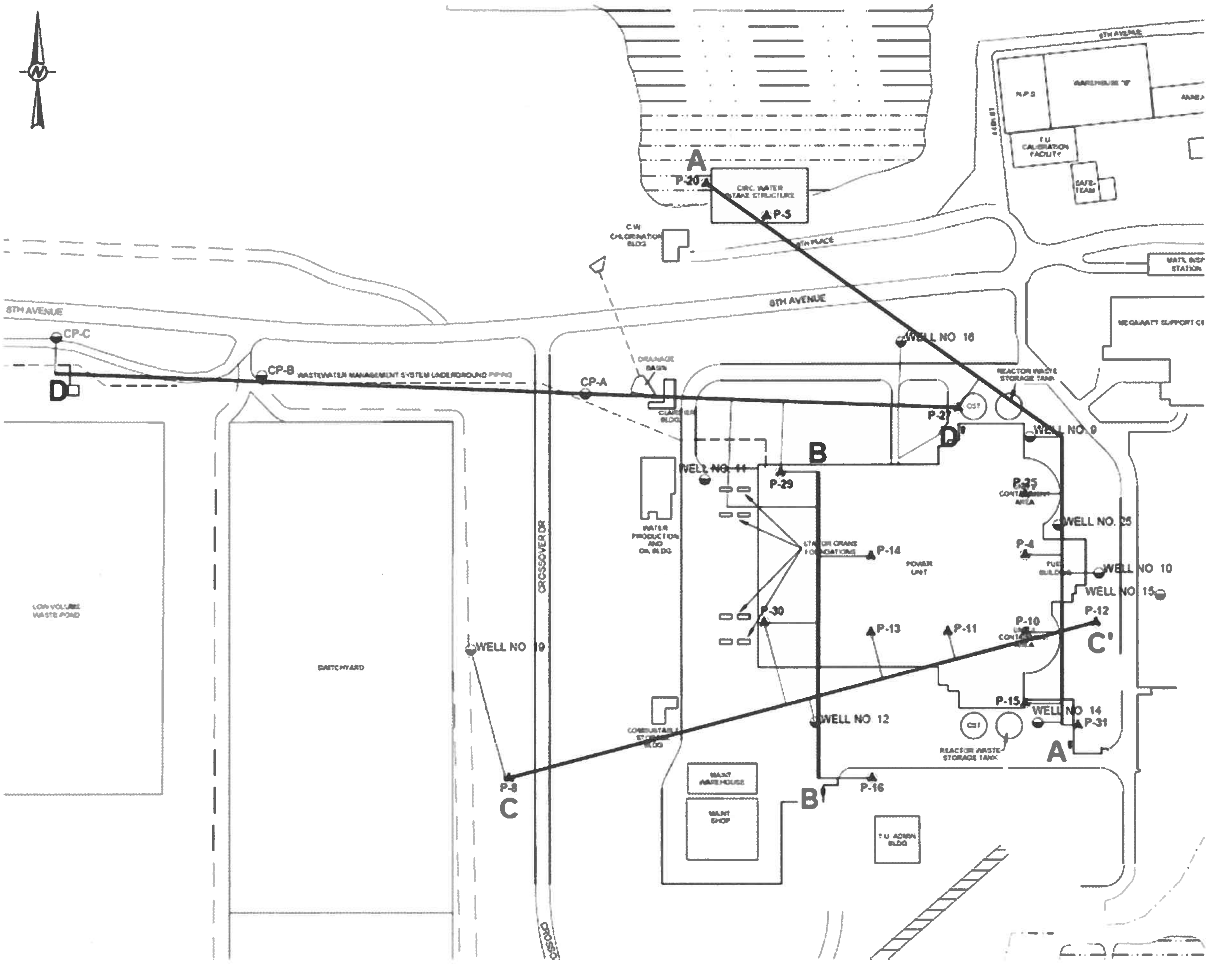


Figure 3.5-3a Cross Section Locations on CPNPP Site

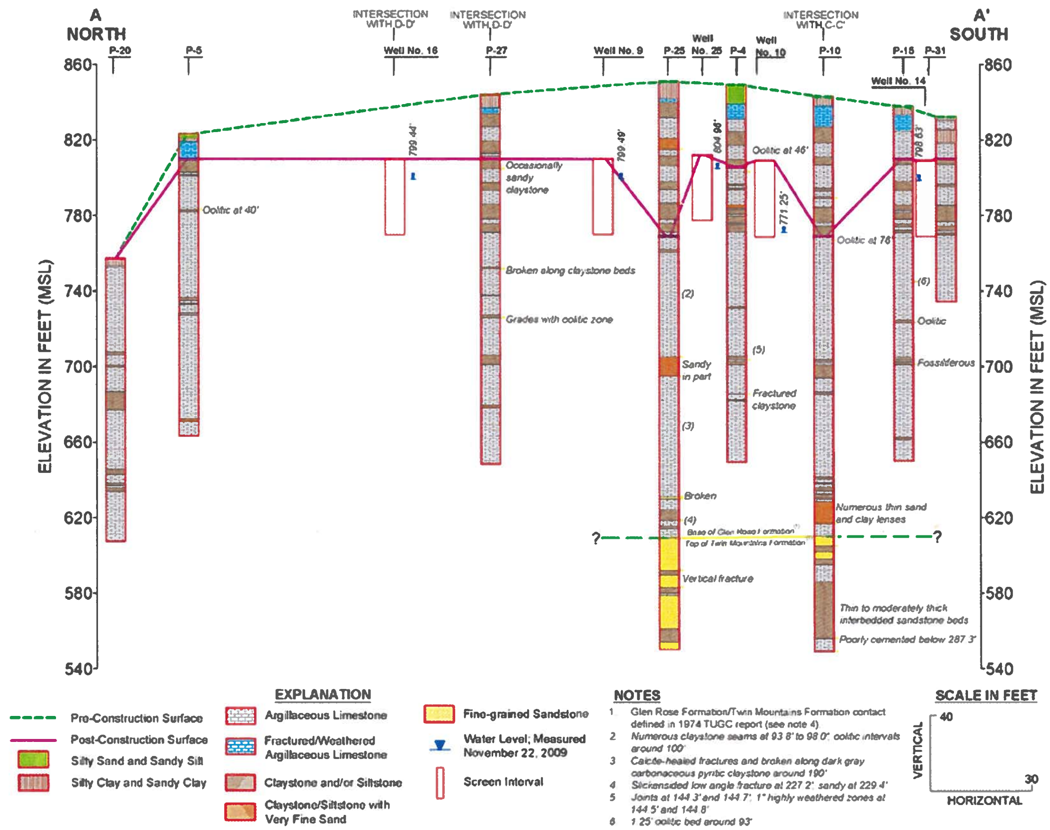


Figure 3.5-3b Cross Section A-A'

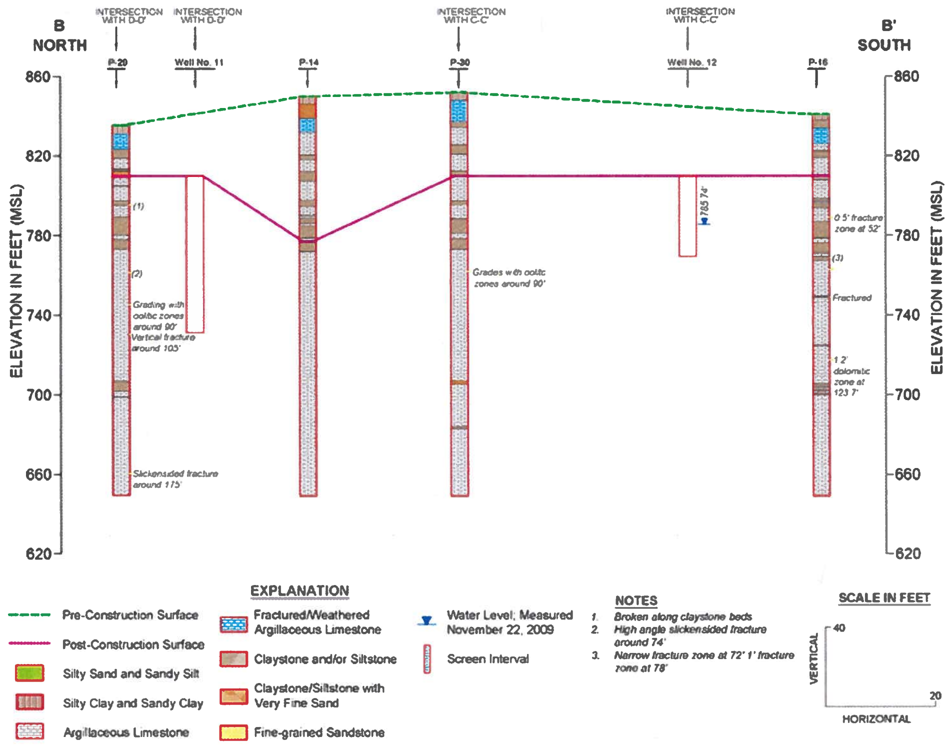


Figure 3.5-3c   Cross Section B-B'

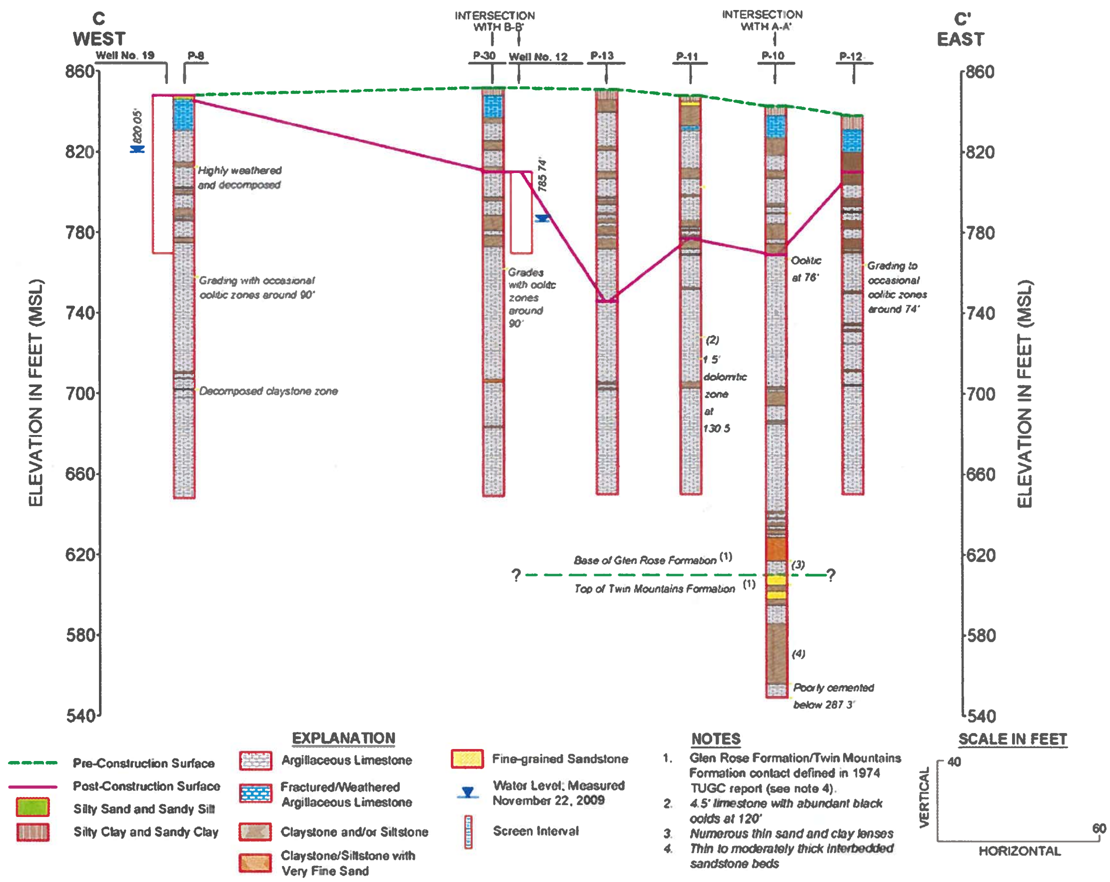


Figure 3.5-3d Cross Section C-C'

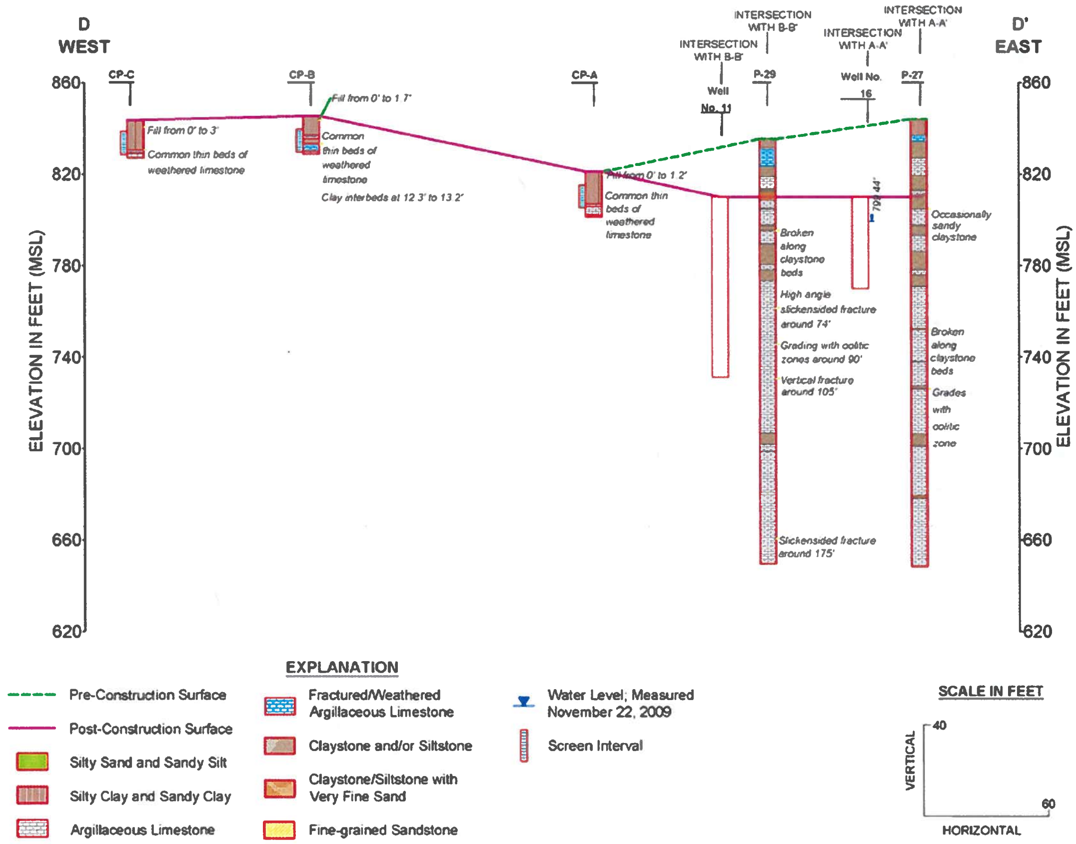


Figure 3.5-3e Cross Section D-D'

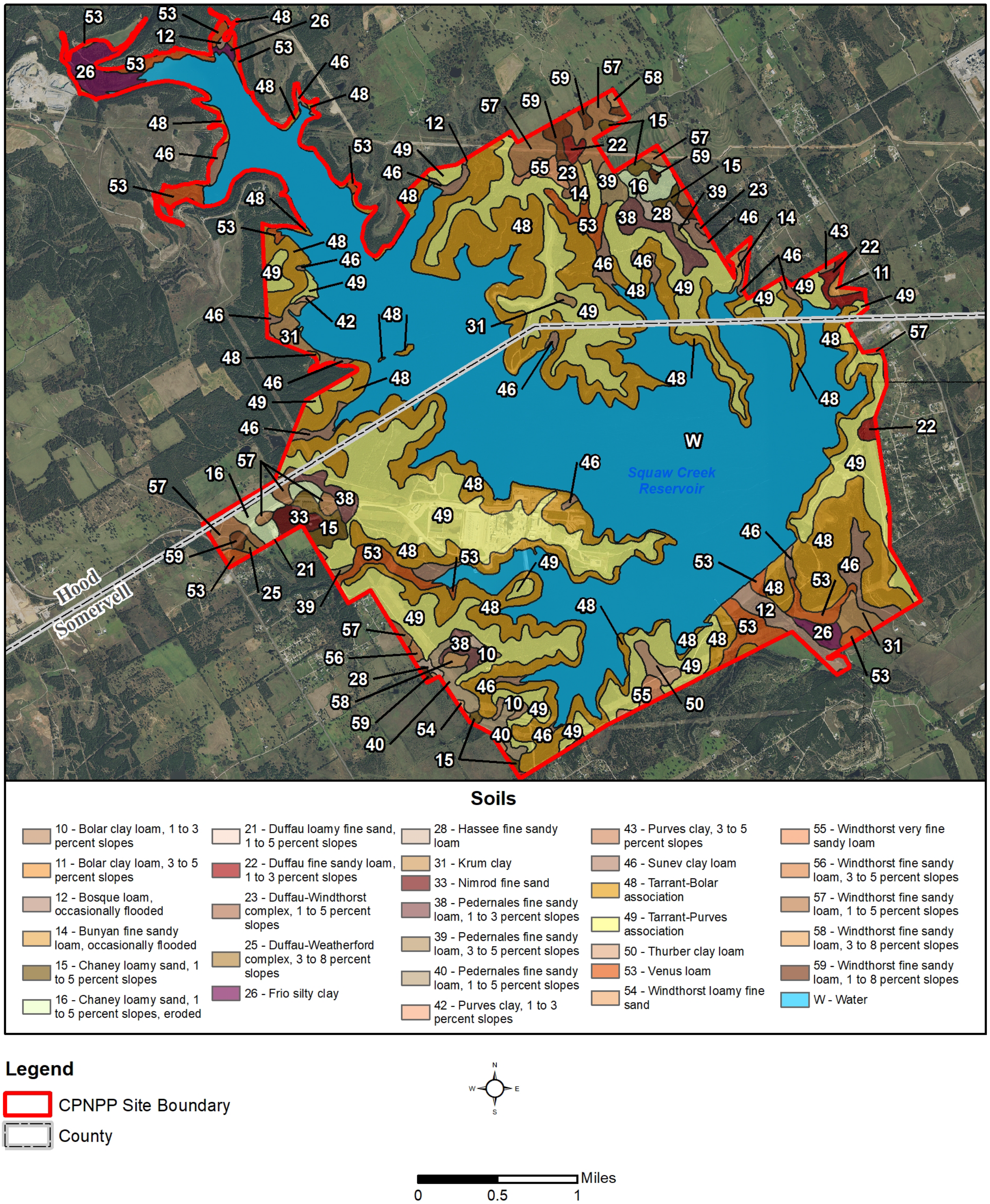


Figure 3.5-4 Distribution of Soil Units

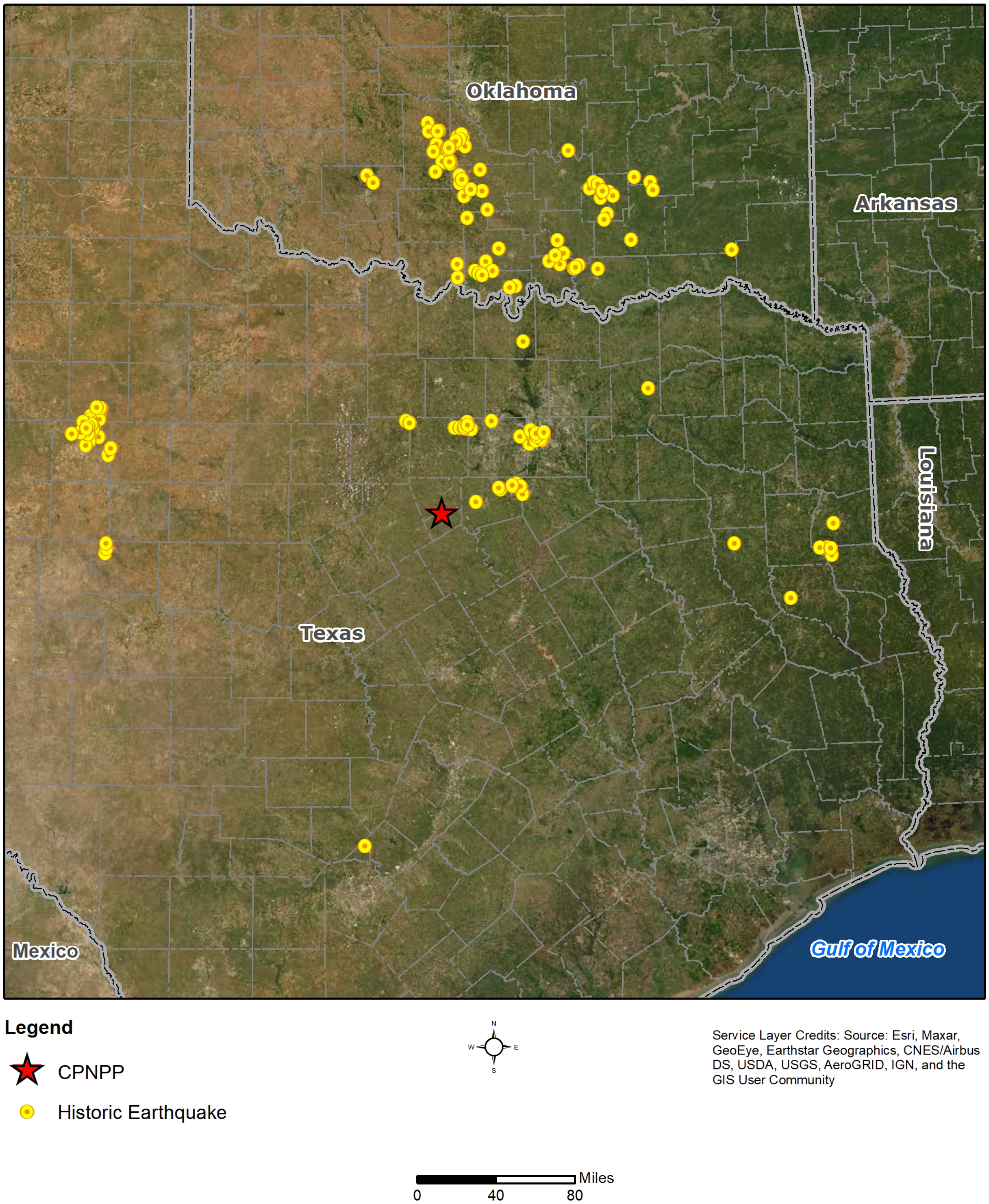


Figure 3.5-5 Historical Earthquakes

3.6 Water Resources

3.6.1 Surface Water Resources

CPNPP is located in rural Somervell and Hood counties in north-central Texas. The CPNPP site is situated on a peninsula formed by land between the southern shore of SCR and the CPNPP SSI. (Luminant 2013b, Section 2.3.1.1.1) The cooling water source for CPNPP is the SCR, an impoundment of the Brazos River (Luminant 2013b, Section 2.3.1.3.5). Lake Granbury, located approximately seven miles northeast of CPNPP, provides make-up water for SCR. The CPNPP site, comprising approximately 7,700 acres, is owned by CP PowerCo, and operated by Vistra OpCo. The SCR and Lake Granbury are the primary hydrologic features with which the plant interacts (Figure 3.6-1).

The Brazos River basin has the largest drainage area of all basins between the Rio Grande and the Red River in Texas. Total basin drainage area is approximately 45,700 square miles, of which approximately 43,000 square miles are in Texas; the remainder are in New Mexico. The CPNPP site, SCR, and Lake Granbury are located within the Brazos River basin, a portion of USGS Region 12 (Texas – Gulf Region). Region 12 is described as the drainage that discharges into the Gulf of Mexico from and including the Sabine Pass to the Rio Grande Basin, and includes parts of Louisiana, Texas, and New Mexico. Within Region 12, the Brazos River basin is divided into three subregions: the Brazos Headwaters, Middle Brazos, and Lower Brazos basins. The CPNPP site is located in the Middle Brazos basin. (Luminant 2013b, Section 2.3.1.1.1)

The Middle Brazos basin encompasses approximately 15,500 square miles and includes the Brazos River basin below the confluence of the Double Mountain Fork Brazos River and the Salt Fork Brazos River basins to and including the Castleman Creek basin. The Brazos River basin is further divided by the USGS into 25 hydrologic cataloging units each of which is assigned a hydrologic unit code (HUC). The CPNPP site is located in the Middle Brazos-Lake Whitney watershed USGS HUC 12060201. (Luminant 2013b, Section 2.3.1.1.1) The Middle Brazos-Lake Whitney watershed has a drainage area of approximately 2,500 square miles, which represent approximately 16 percent of subregion 1206, Middle Brazos, or about 5 percent of the entire Brazos River basin (Luminant 2013b, Section 2.3.1.1.3).

There are six intermittent streams that flow into the SCR within a 6-mile radius of CPNPP upstream of the Squaw Creek Dam. These streams include Squaw Creek, Panter Branch, Lollar Branch, Panther Branch, Million Branch, and an unnamed stream branch. (Luminant 2013b, Section 2.3.1.2) Squaw Creek is a small, intermittent stream which drains parts of Hood and Somervell counties and empties into the Paluxy River, upstream of the confluence of the Brazos and Paluxy rivers. Squaw Creek frequently has no flow during dry periods. Squaw Creek Dam impounds SCR for CPNPP cooling water approximately 4.3 stream miles north of the creek's entrance into the Paluxy River. At the conservation pool elevation (775 feet mean sea level [msl]), the lake has approximately 36 miles of shoreline and is 5 miles long. At the dam site, the reservoir has a drainage area of 64 square miles. Squaw Creek Dam and Reservoir are owned by CP PowerCo and operated by Vistra OpCo. (Luminant 2013b, Section 2.3.1.3.5)

The Texas Water Commission issued Water Rights Permit No. 2871 on September 11, 1973, to Dallas Power and Light Company, Texas Electric Service Company, Texas Power and Light Company, and Texas Utilities Services Inc., Agent. This original permit authorized the permitees to construct a dam and reservoir on Squaw Creek with an impoundment capacity of 151,500 acre-feet of water. Permitees were also granted the right to construct a dam and reservoir (SSI) on Panther Branch. Permitees were authorized to maintain the reservoirs with available waters from Squaw Creek and to divert supplemental water from Lake Granbury. Yield analysis for SCR indicates a firm yield of 8,830 acre-feet in 2000 and 8,710 acre-feet in 2060. (Luminant 2013b, Section 2.3.1.3.5) An agreement with the Brazos River Authority (BRA) provides total use from Lake Granbury and/or Lake Possum Kingdom of 39,350 acre-feet per year (through August 31, 2066) and an additional 10,000 acre-feet per year available from the closed DeCordova Plant on Lake Granbury Contractual Permit CP-235 effective through December 31, 2030.

Squaw Creek Dam, completed in 1977, and appurtenant structures consist of an earthfill embankment 4,360 feet in length with a maximum height of 159 feet and a crest elevation of 796 feet msl. The service spillway is an uncontrolled concrete ogee type located between the right (southwest) end of the embankment and abutment. The crest of the spillway is 100 feet in width at elevation 775 feet msl. The emergency spillway is an earthcut channel through bedrock located at the left abutment, northeast of the embankment. The width of the channel is 2,200 feet with a crest elevation of 783 feet msl. The service outlet structure consists of a concrete tower housing three gate-controlled outlets with invert elevations of 764 feet, 715 feet, and 666.5 feet msl, respectively. The 30-inch diameter low-flow outlet has an invert elevation of 653 feet msl. Provisions for emergency discharges are provided that can discharge from the outlet tower through a 6-foot emergency gate and concrete encased conduit to be released downstream of the embankment. Routine discharges to maintain minimum Squaw Creek streamflow (1.5 cubic feet per second [cfs]) pass through either of these discharges via three roto-cone valves (two 12-inch and one 6-inch). (Luminant 2013b, Section 2.3.1.3.5)

A smaller reservoir known as the SSI is contained within the SCR. The SSI is designed to provide cooling water during an emergency situation to safely shut down CPNPP Units 1 and 2. The SSI dam is located on Panther Branch, a tributary of Squaw Creek. The safety-related dam is composed of a rock-fill embankment, approximately 1,520 feet long. The maximum height of the embankment is 70 feet above the natural streambed. The 40-foot-wide crest is at elevation 796 feet msl. The service/emergency spillway is a 40-foot wide by 400-foot long earthcut channel connecting the SSI facility to the main reservoir. This ingress/egress channel, located to the right (south) of the SSI dam, is also referred to as the equalization channel for the two reservoirs. The flow of water between the two reservoirs is controlled by a three-feet x three-feet concrete submerged weir that extends the width of the channel with a flowline elevation of 769.5 feet msl is provided to ensure sufficient emergency water is available in the event of Squaw Creek Dam failure. (Luminant 2013b, Section 2.3.1.3.5)

The results of a 2017 acoustic bathymetric survey indicate that the SSI alone has a capacity of 653 acre-feet at the conservation pool elevation of 775 feet msl. The survey determined that SCR (including the SSI) has a total capacity of 149,732 acre-feet and extends across 3,272 surface acres at the conservation pool elevation of 775 feet msl.

Current site surface water impoundments include the SCR, the CPNPP SSI, the CPNPP low volume wastewater ponds, and scattered cattle ponds. Six wastewater process impoundments are located on the approximate center of the CPNPP peninsula, west of the switchyard facilities. The impoundments occupy approximately 6 acres and consist of a surge basin and three low volume wastewater flow-through ponds, an oil-water separator, and a metal cleaning waste impoundment. The impoundments are double-lined with a 60-millimeter high-density polyethylene lining and utilize a leachate collection system. Low volume wastewater from CPNPP Units 1 and 2 operations is monitored within three of the ponds prior to discharge into SCR through a TPDES-permitted active process outfall. The metal cleaning waste impoundment, also permitted through the current CPNPP TPDES permit, has no installed discharge and has reportedly been used once to support Unit 1 steam generator cleaning. (Luminant 2013b, Section 2.3.1.3.8)

A number of small man-made ponds in the drainage basin, some of which are in creek channels and others which are off channel, have a total storage volume estimated to be about 1,150 acre-feet. There are three retaining ponds in the drainage basin for the purpose of mitigating potential releases to the SSI from a petroleum pipeline that crosses the CPNPP site. Other than these small ponds, there are no known control structures, weirs, or canals. (Luminant 2013b, Section 2.3. 1.3.8)

3.6.1.1 Potential for Flooding

The Brazos River channel is located in incised meanders, which are flanked by rock slopes that confine the river within a relatively narrow channel. The geometry of the riverbanks is typically characterized as steep on the outside of a meander bend and generally more gently sloping on the inside of a bend. Squaw Creek drains parts of Hood and Somervell counties and empties into the Paluxy River, upstream of the confluence of the Brazos River and Paluxy River. Squaw Creek is a small and intermittent stream, which often has no flow during dry periods and is upstream of SCR.

Historical floods in the Brazos River basin area pertinent to the CPNPP site have been due to precipitation runoff into streams and rivers. Seven floods with discharges greater than 40,000 cfs were recorded at the Brazos River Dennis Station (USGS 08090800) from 1969 to 2006. Four floods resulting in stream level increases above the NWS flood stage (25 feet) were recorded at the Brazos River Dennis Station from July 1987 to September 2007. Data from September 1995 to September 1998 were not available. (Luminant 2013b, Section 2.3.1.2.6) The 25-foot moderate flood stage was exceeded three times since 2006: June 2007, May, and June 2016. However, these events did not exceed the major flood stage of 27 feet. (USGS 2022) One uncertified flood control levee was identified on the Brazos River between Possum Kingdom Lake and Lake Granbury. The levee is within the limits of the City of Granbury and provides flood protection for a park area. No other flood control levees were identified between Possum Kingdom Lake and Lake Granbury. Flow through De Cordova Bend Dam during flood conditions is based upon inflow into the reservoir and is monitored at the Brazos River Dennis Gauging Station. In cases where there is no local runoff, releases would be similar to the USGS Brazos River Dennis Gauging Station hydrograph. There can also be significant inflow to Lake Granbury from rainfall downstream of the Dennis gauge in which cases releases can be significantly higher than the Dennis gauge readings. The primary flood control reservoir in the Brazos River basin is Lake Whitney. Whitney Dam impounds Lake Whitney, approximately 100 river miles downstream of De Cordova Bend Dam and is the largest flood control reservoir in the Brazos River basin. The reservoir was built by the U.S. Army Corps of Engineers (USACE) in the 1950s specifically to hold flood water and provides 1.3 million acre-feet of flood storage minimizing the effects of flooding on downstream communities. In addition to Lake Whitney, there are eight other flood control lakes in the Brazos River basin that were built and are operated by the USACE. These reservoirs are located on tributaries of the Brazos River. (Luminant 2013b, Section 2.3.1.2.6)

The maximum known flood on the Brazos River occurred in 1876 well before flow monitoring began, and consequently, there is little quantitative data available on this flood. Flood records for the Brazos River at gaging station 8-0910, just upstream from the Paluxy River confluence, have been obtained since 1923. These records indicate that the highest water level recorded at gaging station 8-0910 was elevation 601.69 feet (May 27, 1957), corresponding to a discharge of 87,400 cfs. The mean annual, the 50-year, and the historical peak floods on the Brazos River correspond to flows of approximately 40,000 cfs, 110,000 cfs, and 97,600 cfs, respectively, at gaging station 8-0910. The stage reached at station 8-0910 during the 97,600 cfs flood (May 18, 1935) was less than that of the 87,400 cfs flood due to backwater effects from the Paluxy River discharge. The flood of record (elevation 601.69 feet) and the 1876 event are significantly lower than the CPNPP site grade (elevation 810 feet).

There was no monitoring on the Squaw Creek watershed prior to 1966. A crest-stage partial-record station was installed in 1966 on Panter Branch, a tributary to Squaw Creek. In 1973, a continuous recording gage was installed on Squaw Creek at the SH 144 bridge, 2.1 miles upstream from the mouth of the creek. CPNPP safety-related facilities are designed to safely withstand all floods and flood waves which are remotely possible at the site. The crest of the service spillway, elevation 775 feet, has been utilized as the pre-flood condition. The planned design assures that the safety-related facilities of the CPNPP will not be adversely affected by floods and flood waves.

The SCR has a service spillway crest elevation of 775 feet. The calculated probable maximum flood (PMF) level of SCR is 789.7 feet. The plant, which takes cooling water from one side of the peninsula and discharges to the other, has a site grade elevation of 810 feet.

As shown in Figure 3.6-2, the CPNPP property is an area of minimal flood hazard which surrounds the SCR (listed as without base flood elevation) (North American Vertical Datum 1988 [NAVD88]). (FEMA 2020) CPNPP safety-related facilities are designed to safely withstand all floods and flood waves which are remotely possible at the site. The crest of the service spillway, elevation 775 feet, has been utilized as the pre-flood condition. The planned design assures that the safety-related facilities of the CPNPP will not be adversely affected by floods and flood waves.

The onsite drainage system discussed in Section 3.6.1.3, is designed to remove the water resulting from a rainfall of 6 inches in one hour and 7.5 inches in two hours, in such a manner that the runoff is accomplished without ponds forming on the ground. Further, the drainage system is designed to adequately drain a rainfall of 15 inches in one hour and 22 inches in two hours in such a way that there are no ponds which can back up into the structures and affect safety-related systems.

3.6.1.2 TPDES-Permitted Outfalls

Chemical additives approved by the TCEQ are used to control pH, scale, and corrosion in the circulating water system, and to control biofouling of plant equipment. Process wastewaters are monitored and discharged to SCR via TPDES Outfalls 001 and 002, and treated domestic wastewater is discharged to SCR via TPDES Outfall 003 in accordance with the CPNPP TPDES Permit No. WQ0001854000. The current TPDES permit authorizes discharges from five outfalls, three external (Outfalls 001, 002, and 003), and two internal (Outfalls 004 and 104). (Attachment B) The TPDES outfalls are active process discharges that flow into SCR and are depicted in Figure 3.6-3. Their associated effluent limits are listed in (Table 3.6-2).

3.6.1.3 Stormwater Runoff

The CPNPP site covers approximately 7,700 acres, which generally consists of gently to steeply rolling topography. Within the Squaw Creek drainage basin, approximately 64 square miles at the SCR dam site, elevations vary from over 1,100 feet msl near the origin of Squaw Creek to about 650 feet msl near the dam site. The topography is influenced by the underlying geology, which consists of sedimentary rocks of Lower Cretaceous age (poorly cemented sandstones, limestones, and shales) that dip gently to the east. (Luminant 2013b, Section 2.3.1.1.5)

The current onsite drainage system for CPNPP consists of engineered and natural drainage systems. The power block including all safety-related buildings are located at a high point, with the surrounding grounds sloping towards SCR to the north and the south. The ground east and west of the buildings slopes towards drainage ditches that discharge into the reservoir on both sides of the peninsula. (Luminant 2013b, Section 2.3.1.1.5; Attachment B)

The onsite drainage system is further enhanced by the use of an underground storm drain system within the protected area/vehicle barrier system (PA/VBS) boundary which is supported by a series of catch basins, paved swales, and rocked ditches. Surface runoff, including that collected by the storm drain piping within the PA/VBS, is discharged to the reservoirs on both sides of the peninsula either directly by a combination of open channel ditches and underground culverts or is collected at concrete designed drainage basins before being discharged to the applicable reservoirs via large underground pipe culvert systems. Site plan drainage configuration changes and impact including that created by historical implementation and placement of new or modified design features, buildings, security-related features, and other structures have been analyzed to address the adequacy of the onsite drainage system consistent with the design basis rainfall intensities and drainage requirements as described below. A possible clogging of any ditch or storm drainpipe within the PA/VBS boundary has been analyzed to not affect the system's water removal capacity.

There are stormwater outfalls (Outfall SW-001 through Outfall SW-014) that discharge separately from the TPDES permitted wastewater outfalls listed in Section 3.6.1.2. The site is graded such that runoff drains away from the safety-related structures via drainage channels or sheet flow and subsequently to SCR through catch basins or as unobstructed overland flow. (Luminant 2013b, Section 2.3.1.1.5; Attachment B)

Stormwater discharges associated with CPNPP industrial activities are regulated and controlled through TPDES Permit No. WQ0001854000 issued by the TCEQ (Attachment B). CPNPP also has a Multi-Sector General Permit (MSGP) TXR050000 (Table 9.1-1). Vistra OpCo also maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs used to prevent or reduce the pollutants in stormwater discharges. Vistra OpCo collects stormwater runoff samples on a quarterly basis (when there is a flow) at 14 stormwater outfalls which receive runoff from the entire industrial area and conducts screening through visual observations for pollutants as specified in the SWPPP.

3.6.1.4 Sanitary Wastewaters

Sanitary waste is treated at an onsite sanitary wastewater treatment facility. The treated wastewater is discharged to the SCR through the current TPDES permitted Outfall 003 for Units 1 and 2. (Luminant 2013b, Sec. 5.5.1.4; Attachment B) Prior to discharge, the treated sanitary wastewater effluent is routed through an ultraviolet (UV) light disinfection unit and then to a holdup chamber. Disinfection chiefly occurs via UV light disinfection. The permit allows for an alternative disinfection system if the UV light unit is taken offline for repairs.

3.6.1.5 Dredging

No periodic maintenance dredging has occurred at CPNPP and no dredging activities in the vicinity of the intake and discharge are anticipated. The LVW ponds are wastewater treatment facilities and are not waters of the U.S. Removal of sediment does not require any federal or state dredging authorizations. The ponds are cleaned out (as needed), and liners require a 5-year P.E. certified inspection for leaks/releases per TPDES Permit WQ-0001854000.

3.6.1.6 Compliance History

As discussed in Chapter 9, there have been two notices of violation (NOVs) associated with CPNPP wastewater discharges to receiving surface waters. The first NOV was issued for failure to perform analyses of duplicate samples of wastewater analyzed for *E. coli* in October 2019 and July 2020 before discharge to Outfall 3. This NOV was resolved in January 2021 since the collected samples for *E. coli* analysis are not diluted and therefore a blank analysis was not required. The second NOV was issued for the failure to calibrate the onsite sanitary wastewater treatment facility's flow meter at least annually to ensure accuracy. The flow meter was last calibrated on April 10, 2019. This NOV was also resolved in January 2021 after calibration of the flow meter.

3.6.1.7 Lake Water Temperatures Reporting

Cooling water discharge water temperatures for each unit are measured by CPNPP and the raw data are averaged for each month. The averaged values for 2016–2020 are plotted in Figure 3.6-4.

One of the factors that affect water quality in reservoirs is thermal stratification. Some reservoirs become thermally stratified in the summer when solar energy warms the surface water, leaving the bottom portions of the reservoir cooler. An operational study of temperature distribution in SCR was performed in August of 1993. The study showed that past operational surveys of SCR indicated a thermocline characterized by a slightly varying temperature (generally less than 4°F) to a depth of 40–50 feet, followed by a sharp temperature decrease to about 60 feet and then a gradual temperature decrease to bottom. Areas around the Units 1 and 2 discharge also showed influence of the thermal plume with only a 2–4°F decrease in temperature down to 15 feet. The deeper profiles, over 50 feet deep, generally showed a gradually decreasing temperature, 6–10°F, to 50 feet, followed by a steady decrease of about 34°F to bottom. Warmer water and vertical mixing with depth, below 20 feet, have been observed in the SCR since CPNPP Unit 1 became operational. In the first year that CPNPP was operational, temperatures below the thermocline down to 70.0 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1°F warmer, respectively, than 1991. Temperatures at 80 feet, however, remained about 57°F since Unit 1 went online. The study concluded that the decreased thermocline and increased heat budget down to 70 feet appears to be the result of CPNPP Unit 2 operation. (Luminant 2013b, Sections 2.3.1.2.8 and 2.3.1.5.3)

3.6.2 Groundwater Resources

3.6.2.1 Groundwater Aquifers

Most of the groundwater in the site region occurs in bedrock. Some groundwater does exist in the shallow floodplain alluvium along stream valleys but is not withdrawn for use. In the order of increasing age, bedrock aquifers in the site vicinity include the Paluxy Formation, the Glen Rose Formation, the Twin Mountains Formation, and all of the Comanche series, Cretaceous age. Locally, CPNPP and SCR are situated on the Glen Rose Formation outcrop, which in turn, is underlain by the Twin Mountains Formation. The Paluxy Formation is absent at the CPNPP location and within the limits of SCR. (Luminant 2013b, Section 2.3.1.5.3)

The Twin Mountains and Paluxy formations are principally sandstone, but also have shale, limestone, claystone, and siltstone inclusions. Limestone is the dominant rock type in the Glen Rose Formation, but the stratum also contains significant quantities of shale, siltstone, and claystone. In these formations, groundwater percolates slowly along bedrock joints and fractures, and through interstices in the rock fabric. (Luminant 2013b, Section 2.3.1.5.3)

The Twin Mountains Formation is the only moderately productive bedrock zone in the site vicinity, though the Paluxy Formation has nominal pumpage near the site. The Glen Rose Formation yields very little water in the site area and is usually less productive than the others. At distances of 20–50 miles down-dip from the outcrop, the groundwater becomes saline, and the formations lose their importance as sources of fresh water. (Luminant 2013b, Section 2.3.1.5.3)

The principal origins of groundwater in the Twin Mountains Formation are rainfall and streamflow occurring in the outcrop area. Down-dip from the outcrop, groundwater in the Twin Mountains Formation is confined by fine-grained materials of the overlying Glen Rose Formation. Hydrostatic pressure in the Twin Mountains is great enough to create static water levels that rise above the formation and, sometimes, to cause flowing wells. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater loss occurs in the outcrop area by evapotranspiration, localized springs, and seepage into drainage channels incised below the water table. Down-dip from the outcrop area where the formation is confined, the natural discharge is limited to a small upward movement into overlying formations. (Luminant 2013b, Section 2.3.1.5.3)

Although the Twin Mountains Formation is a moderately productive stratum in the site area, packer-pressure tests of 60 feet of this rock in a boring at CPNPP Units 1 and 2 did not result in water take. These data indicate there are essentially impermeable rock zones within this formation. (Luminant 2013b, Section 2.3.1.5.3)

The principal origins of groundwater in the Glen Rose Formation are rainfall in the outcrop area, and minor seepage from both the overlying Paluxy Formation and underlying Twin Mountains Formation. The results of packer tests conducted in 2007 indicated little to no water take into the Glen Rose Formation. These results indicate that this formation is essentially impermeable. The Glen Rose Formation is predominately limestone, but significant amounts of shale, siltstone, and claystone are also present. (Luminant 2013b, Section 2.3.1.5.3)

The Glen Rose limestones are essentially impermeable due to slight amounts of argillaceous impurities present. These limestones are resistant to solution effects: open voids, caverns, joints, collapse features, and fractures, which are frequent in some limestone formations but are notably absent in the Glen Rose Formation near the site. Groundwater, therefore, moves very slowly into and through the formation; entrance is afforded principally through existing joints and fractures. Occasional isolated sand lenses also contain groundwater. (Luminant 2013b, Section 2.3.1.5.3)

The Glen Rose Formation ranges from 160 to 270 feet thick (Vistra OpCo 2020a). The Glen Rose Formation discharges water naturally through springs and seeps. In confined portions of the formation, there is little transfer of water into overlying or underlying formations when differential pressures occur. (Luminant 2013b, Section 2.3.1.5.3)

The Paluxy Formation is predominately sandstone, but shale, siltstone, claystone, and limestone are also present. The top of the Twin Mountains Formation is approximately 230 feet below CPNPP. In the vicinity of the CPNPP site, the Twin Mountains Formation is more than 220 feet thick. Recharge to the Paluxy Formation occurs in the outcrop areas from infiltration of rainfall and seepage from streams. It also receives water from water-bearing units under greater hydraulic heads which adjoin the Paluxy Formation. South of the CPNPP site, the formation is confined by overlying fine-grained strata. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater discharges from the Paluxy Formation as springs and seeps in some outcrop areas. Where the Paluxy Formation is confined, there is a limited water movement into overlying or underlying confining units when those units are at a lower hydraulic head. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater in the Paluxy Formation, the Glen Rose Formation, the Twin Mountains Formation generally occurs under water table (unconfined) conditions at or near the formation outcrop and artesian (confined) conditions in the down dip direction (southeast) from the outcrop. The primary source of recharge to these units is precipitation on the outcrop area. Secondary sources include recharge from streams flowing across the outcrop and seepage from ponds and lakes. The average annual precipitation on the outcrop area is about 31 inches; only a small fraction is available for recharge due to the rate of runoff and high evapotranspiration.

The Twin Mountains Formation, which underlies the Glen Rose Formation, is the primary source of groundwater in the area surrounding CPNPP. The Twin Mountains Formation provides moderate to large quantities of fresh to slightly saline water to public supply, industrial and irrigation wells in north-central Texas. The remaining water supply wells installed at CPNPP are completed in the Twin Mountains Formation. The Glen Rose Formation is not considered a source of groundwater in the site vicinity. The high proportion of argillaceous (clayey) material and the absence of interconnected porosity in the Glen Rose Formation preclude the storage or flow of significant amounts of groundwater. Small amounts of groundwater occur in the Glen Rose Formation in isolated sandy or silty units, as local perched water tables, or in weathered material in the shallow subsurface. Such minor units are not generally tapped by wells. A few domestic water wells produce water from the Glen Rose Formation in counties north of CPNPP where the Glen Rose Formation is covered by outliers of the Paluxy Formation. The source of this water is probably leakage from the overlying Paluxy Formation.

The Paluxy Formation yields small to moderate quantities of fresh to slightly saline water to public supply, industrial, domestic, and livestock wells in the region. The Paluxy, which grades into the Antlers Formation in north Texas, produces water from shallow wells at or near its outcrop in Somervell County. The Paluxy Formation does not occur at the CPNPP facility and is more important as a groundwater supply to the north and east of CPNPP.

3.6.2.2 Hydraulic Properties

The rate of flow (velocity) of groundwater depends on the hydraulic conductivity and porosity of the medium through which it is moving and the hydraulic gradient.

The Glen Rose Formation bedrock has a low overall hydraulic conductivity, as determined from packer tests and slug tests completed at the site. Regolith and undifferentiated fill overlying the bedrock exhibit higher hydraulic conductivity values than the underlying bedrock, consistent with characteristics of a porous medium. A portion of the subsurface flow through the bedrock occurs along bedding and joint planes that are sub-horizontal in orientation. Thus, groundwater movement through the subsurface is limited by the physical properties of the subsurface materials underlying the regolith and undifferentiated fill. (Luminant 2013b, Section 2.3.1.5.6) Section 3.6.2.3 provides a discussion about the general hydraulic gradient in the unweathered Glen Rose Formation and weathered Glen Rose Formation in the vicinity of Units 1 and 2.

The groundwater movement in the Twin Mountains Formation is down-dip to the east at a rate of approximately two feet per day. The current piezometric gradient is about 20 feet per mile. Permeability of the formation ranges from 90–240 gpd per square foot. Because the site is near the recharge area and because of the relatively small projected amount of future pumping, no significant change in groundwater level is expected in the site vicinity.

3.6.2.3 Potentiometric Surfaces

Groundwater flow direction within the regolith is toward SCR. Flow direction of groundwater within the shallow bedrock appears to flow eastward toward SCR. However, based on the limited groundwater availability within the bedrock, depicted by long-term, non-equilibrium water levels within most bedrock monitoring wells, groundwater flow within the upper bedrock is limited and likely linked to flow within the overlying perched groundwater in the regolith. (Luminant 2013b, Section 2.3.1.5.5)

The potentiometric surface maps indicate a general hydraulic gradient from east to west in the unweathered Glen Rose Formation near the power unit area. In contrast, monitoring wells completed in the weathered Glen Rose Formation indicate groundwater flow from west to east, which closely mimics the topography west of the power unit area. Actual groundwater flow paths are likely highly variable due to the presence, extent, orientation, and interconnectedness (if any) of joints, fractures, isolated sand lenses, and other secondary porosity features.

The current monitoring well network at CPNPP consists of eight groundwater monitoring wells (Well Nos. 9, 10, 11, 12, 14, 15, 16, and 25) completed in the unweathered Glen Rose Formation around the power unit block and four groundwater monitoring wells (Well Nos. 19, CP-A, CP-B, and CP-C) completed in the weathered Glen Rose Formation west of the power unit block. Three of the groundwater monitoring wells completed in the weathered Glen Rose

Formation (CP-A, CP-B, and CP-C) are located immediately adjacent to the wastewater management system underground piping system.

Groundwater level data for groundwater monitoring well Nos. 10 and 15, were not used to construct the contours on the potentiometric surface maps. The two monitoring wells are completed in the same zone as the other unweathered Glen Rose monitoring wells, but the water level elevations in well Nos. 10 and 15 were typically about 30 feet lower than those of the other nearby monitoring wells, suggesting a weak or non-existent hydrologic connection between monitoring well Nos. 10 and 15 and the other wells.

Groundwater contour (potentiometric surface) maps of the unweathered Glen Rose and weathered Glen Rose are provided as Figures 3.6-6 and 3.6-7, respectively. These groundwater potentiometric surface maps are based on groundwater level data collected on November 29, 2018, and June 27, 2019, as part of the Nuclear Energy Institute's (NEI)'s groundwater protection initiative (GPI) program, which is discussed in Section 3.6.2.4.

3.6.2.4 Groundwater Protection Program

In May 2006, the NEI implemented the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection (NEI 2007).

Industry implementation of the GPI identifies actions to improve licensee management and response to instances where the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and also describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, Industry Ground Water Protection Initiative-Final Guidance Document (NEI 2007). This guidance was further updated in February 2019. The purpose of NEI 07-07 is to improve the management of situations involving inadvertent radiological releases that get into groundwater and to improve communications with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment. (NEI 2019a)

CPNPP implemented a groundwater protection program in 2008. This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to ground water (NEI 2019a). As part of this program and discussed in Sections 3.6.2.3 and 3.6.4.2, Vistra OpCo monitors 12 wells completed in the un-weathered and weathered portions of the Glen Rose Formation. Several monitoring network wells are located in the immediate vicinity of the Refueling Water Storage Tank (RWST) tanks and the eastern exterior wall of the fuel building. Other monitoring network wells are located in the general down-gradient direction (west) from these areas. Three monitoring wells were placed along the wastewater management system underground piping to more adequately monitor potential radiological releases to groundwater in this area. The leachate basins (A, B, and C), which receive discharge from the underground piping, were sampled quarterly as part of the groundwater sampling program to monitor potential radiological releases in this area prior to 2016. (Vistra OpCo 2020a, Vistra OpCo 2021a)

No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples from 2016 - 2020.

In conjunction with the GPI, Vistra OpCo performs groundwater monitoring from a total of 12 onsite locations to monitor for potential radioactive releases to groundwater, environmental conditions, and groundwater elevation in accordance with site procedures. Figure 3.6-5 shows locations of the groundwater monitoring wells with construction details presented in Table 3.6-3.

3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer which supplies at least 50 percent of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated. The SSA program was created by the U.S. Congress as part of the Safe Drinking Water Act and allows for the protection of these resources. (EPA 2021d)

CPNPP is located in EPA Region 6, which has oversight responsibilities for the public water supply in Texas, Oklahoma, New Mexico, Louisiana, and Arkansas and 66 tribal nations. The EPA has designated four aquifers in Region 6 as SSAs. One of these SSAs, the Edwards Aquifer in Texas, is divided into four zones:

- Edwards Aquifer I (San Antonio Area) SSA – Streamflow Source Area
- Edwards Aquifer I (San Antonio Area) SSA – Recharge Zone
- Edwards Aquifer II (Austin Area) SSA – Streamflow Source Area
- Edwards Aquifer II (Austin Area) SSA – Recharge Zone

This SSA is located approximately 142 miles from CPNPP. Therefore, CPNPP's property is not situated over this designated SSA. (EPA 2021d)

3.6.3 Water Use

3.6.3.1 Surface Water Use

The SCR is a 3,272-acre cooling reservoir located on Squaw Creek, which is not used for navigation. An SSI on the Panther Branch of the SCR impounds water for the SSWS. SCR is the source of water for cooling and auxiliary water systems at CPNPP. The SCR, which has an approximately 64-square mile catchment, is impounded by Squaw Creek Dam approximately 4.3 stream miles north of Squaw Creek's confluence with the Paluxy River. Supplemental water from Lake Granbury on the Brazos River is conveyed by pipeline to SCR. The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. Substantially more than the required amounts will be available to SCR from Lake Granbury under terms of an existing agreement with the BRA. This agreement covers total use from Lake Granbury and/or Lake Possum Kingdom of 39,350 acre-feet per year and an additional 10,000 acre-feet available from the closed DeCordova Plant on Lake Granbury. The dependable yield of Lake Granbury has been evaluated as at least 69,200 acre-feet per year, exclusive of the additional yield which could be made available by releases from Lake Possum Kingdom. The 70,000 acre-feet per year of potential supply is more than adequate to provide the necessary net diversions to SCR, plus anticipated requirements of other facilities which might also draw on Lake Granbury.

As presented in Section 2.2.3.1, CPNPP uses a once-through condenser cooling system. The cooling water for normal plant operation is withdrawn from the SCR by eight 275,000-gpm-capacity circulating water pumps for both units. The circulating water system intake structure is located north of the plant on the SCR and supplies approximately 1,100,000 gpm of cooling water to each unit. The heated water of the circulating water system is discharged to the SCR (at a point southeast of the plant) via a tunnel discharging into an open structure, circulating water discharge structure. The discharge structure is located at an adequate distance from the circulating water intake structure to ensure sufficient water mixing and evaporative cooling.

No water rights have been issued on Squaw Creek, but two potential surface water users (irrigation) have filed claims to withdraw water. In due course, these claims will be evaluated by the Texas Water Rights Commission and either upheld or dismissed. The points of potential withdrawal are located within SCR limits, adjacent to the Hood-Somervell County line. No surface water users are known on the Paluxy River, downstream of the Squaw Creek confluence. Cattle are watered from Squaw Creek and also probably from the Paluxy River.

There are numerous parties on the Brazos River downstream of the site vicinity who have applied for and/or received water allocations (hereafter called water users for non-irrigational and irrigational use). The nearest irrigational water user below Squaw Creek Dam is approximately 3 stream miles downstream from the confluence of the Paluxy and Brazos rivers. The nearest extraction of water for public supply is at Waco, approximately 109 stream miles downstream of this confluence. There are no other known extractors of water for potable uses between Squaw Creek Dam and Waco.

According to the 2017 acoustic bathymetry survey discussed in Section 3.6.1, the reservoir, including the SSI, has a capacity of 149,732 acre-feet encompassing a surface area of 3,272 acres at the conservation elevation of 775 feet above msl. As mentioned earlier, the dam controls a drainage area of about 64 square miles. Table 3.6-1a presents monthly water levels for SCR in 2020 along with long-term mean, maximum, and minimum for 2008 through 2020. In addition, Table 3.6-1b presents monthly water levels for Lake Granbury in 2020 along with long-term mean, maximum, and minimum for 1987 through 2020.

The average surface water withdrawal rate for SCR by CPNPP in 2020 was reported as 2,880.23 MGD and averaged 2,916.69 MGD between 2016 and 2020 (Table 3.6-4a). For Lake Granbury, the average surface water withdrawal rate by CPNPP is 43.74 MGD and averaged 42.38 MGD between 2016 and 2020 (Table 3.6-5a). A summary of monthly surface water withdrawals reported by CPNPP from 2016–2020 is included as Table 3.6-4b for SCR and Table 3.6-5b for Lake Granbury.

In 2015, total surface water withdrawals in Somervell County were reported as 2,106.2 MGD, of which 2,105.15 MGD was used for power generation. The total surface water withdrawals in Hood County to the north were reported as 7.63 MGD, of which 4.59 MGD was withdrawn for irrigation, with 2.49 MGD for power generation. Excluding power generation, surface water use for Somervell County in 2015 was reported as 1.05 MGD. (USGS 2021b) A summary of surface water use in Somervell and Hood counties is presented in Table 3.6-6.

3.6.3.2 Groundwater Use

Generally, in the CPNPP site vicinity water use from the Paluxy and Glen Rose formations is small and individual wells are of very limited capacity. The recharge areas (outcrop areas) of the Paluxy and Glen Rose formations are located near CPNPP to the west. The aquifers are variable in their hydraulic characteristics and also in the quality of water they yield. Water extraction from these formations has no identifiable effect on regional piezometric levels. Groundwater use is not expected to increase significantly in the future because these formations are poor aquifers and would probably not be developed for water supply by either cities or industries, or for large scale irrigation. More favorable water supplies are available from surface sources or from the Twin Mountains. (Luminant 2013b, Section 2.3.1.5.4)

The Twin Mountains Formation is the primary source of groundwater used in the region although this use is not extensive.

North of the site, a few wells are completed in the Glen Rose Formation. The presence of adequate and reliable supplies of groundwater in the Glen Rose Formation is dependent on a sandstone cover (the Paluxy Formation). This sandstone cap results in prolonged percolation to the Glen Rose and results in relatively high-water levels, even during drought conditions.

There are currently no discharges to groundwater from CPNPP requiring permits by regulatory agencies and none are expected during the PEO.

Four onsite water supply wells were plugged on November 20, 2013, and the CPNPP site public water system (PWS) was deactivated on December 12, 2013. As of November 1, 2013, all connections to onsite treatment, pressure maintenance, and storage facilities were physically removed and the Somervell Training Center water supply well (PWS #2130042) became the sole source of potable water for the CPNPP facility. The TCEQ approved of the regulatory status change (inactivating CPNPP's PWS) on May 16, 2014.

The Somervell Training Center PWS (#2130042) was deactivated on September 27, 2018, and the Somervell Training Center water well is used to supply water for cattle with groundwater withdrawal limited by the Prairie Lands Groundwater Conservation District to 281,750 gallons per year (gpy). Two other PWSs located in SCP were deactivated on November 5, 2018. The SCP Office and Boat Dock water wells associated with the deactivated PWSs are non-potable (with non-potable signs posted). The SCP Office water well had a maximum withdrawal of 32,104 gallons in 2017 and 44,740 gallons in 2018. The SCP Boat Dock water well had a maximum withdrawal of 162,060 gallons in 2017 and 97,200 gallons in 2018. SCP is currently closed to the public but is expected to reopen to visitors on a seasonal basis in the future. On August 24, 2021, the one remaining PWS (PW#2130037) associated with the recreation/training water supply well (also referred to as the Rifle Range Well) was deactivated. The Rifle Range Well had a permitted maximum withdrawal rate of 82,000 gpy (0.16 gpm). The locations of these wells are shown on Figure 3.6-5.

As presented in Table 3.6-9a, the average groundwater withdrawal rate for the CPNPP Rifle Range Well in 2020 was reported as 98.09 gpd and averaged 143.27 gpd between 2016 and 2020. Table 3.6-9b shows the monthly withdrawal quantities reported from 2016–2020.

In 2015, groundwater withdrawals in Somervell County were reported as 1.16 MGD with no withdrawal for power generation. Domestic supply and mining withdrawals are reported as the largest consumer of groundwater, reported at 0.41 MGD each in Somervell County. Public water supply is the largest consumer of groundwater in Hood County, reported at 4.66 MGD and the next largest in Somervell County reporting withdrawals of 0.21 MGD. (USGS 2021b) A summary of groundwater use in Somervell and Hood counties is presented in Table 3.6-7.

A list of 39 offsite registered groundwater wells within 2 miles of the CPNPP boundary (Figure 3.6-8) is presented in Table 3.6-8. The majority of these wells withdraw groundwater from the Twin Mountains Formation aquifer and are primarily used for public water supply and some domestic purposes.

3.6.4 Water Quality

3.6.4.1 Surface Water Quality

No impaired waters were identified on the TCEQ's 2020 303(d) list of impaired waters for the SCR and Lake Granbury or their tributaries within Somervell and Hood counties (TCEQ 2020).

The known permitted discharges to the SCR are limited to those from the existing units. These sources and permitted discharge limits are described in the TPDES permit. (Attachment B) CPNPP is in compliance with its TPDES permit, as discussed in Section 3.6.1.2.

3.6.4.2 Groundwater Quality

The quality of water obtained from the Glen Rose Formation is variable; in localized areas it is not potable. Northwest of the site, water is produced from the Glen Rose Formation where it is capped by an outlier of Paluxy Formation.

Water in the Twin Mountains Formation is a sodium bicarbonate type with a dissolved solids content varying generally from 200 to 900 mg/L. In and near the outcrop areas, Twin Mountains water is used for irrigation. At the site, however, the water is unsuitable for irrigation due to the local soil conditions and the increased sodium content of the water. The results of physical and chemical analyses performed on groundwater samples taken from production and observation wells during the years of 1975–1976 show the sodium content of the water samples ranges from 100 to 150 mg/L, with dissolved solids content varying from 300–500 mg/L. The temperature of groundwater follows the seasonal atmospheric average temperature values, and ranges from 20° to 26°C (68° to 79°F). The conductivity values vary between 550 to 1,300 mhos. In addition, groundwater samples were collected from five monitoring wells (MW-9 through MW-12 and MW-14) on July 27, 2021, and analyzed for chloride and sulfate. The pH of each groundwater sample was recorded. Chloride results ranged from 51.5 to 152 mg/l, which are below the Secondary Drinking Water Standard Maximum Contaminant Level (SMCL) of 250 mg/l. pH ranged from 7.46 to 7.86 Standard Units (SU), which is within the SMCL range of 6.5-8.5 SU. Sulfate results ranged from 328 to 983 mg/l versus an SMCL of 250 mg/l. Sulfates cause a salty taste and are not toxic.

The monitoring well network for the Groundwater Protection Program (GPP) at CPNPP includes 12 wells completed in the unweathered and weathered portions of the Glen Rose Formation. Two monitoring wells are located near the refueling water storage tank (one at each RWST). Three wells are near or down-gradient of the fuel building (east side). Four other wells are situated on the periphery north, south, and west of the power block. Three monitoring wells were placed along the wastewater management system underground piping to more adequately monitor potential radiological releases to groundwater in this area. Each well is sampled on a quarterly frequency to test for contamination via gamma spectroscopy and liquid scintillation. The leachate basins, which receive discharge from the underground piping, are also sampled quarterly as part of the groundwater sampling program to monitor potential radiological releases in this area. (Vistra OpCo 2020a; Vistra OpCo 2021a)

In 2013, the source of tritium in groundwater was found to be from a leaking pipe that goes from the water treatment plant and microfiltration building sumps to the LVW pond. The leaking pipe was repaired in January of 2017. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2016; Vistra OpCo 2018a)

In 2015, the water treatment plant's filter water storage tank (FWST) lining began leaking treated SCR water. Because SCR water contains a low background tritium concentration, SCR water that leaks from the water plant will contain a similar concentration of tritium. The sentinel well CP-A near the water plant and groundwater monitoring well No. 11 (MW-11, which is located directly down gradient from CP-A) had intermittent positive results detected for tritium. The FWST leak was repaired mid-2016. (Vistra OpCo 2016; Vistra OpCo 2017a)

In 2016, wells CP-A and MW-11 continued showing intermittent positive results for tritium from the leak in the FWST and from a leak in piping from the LVW pond to the water treatment waste sump. The FWST leak was repaired mid-2016 and the LVW pipeline leak was repaired in January of 2017. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2017a)

Following the LVW pipeline leak repair in January 2017, the sentinel well CP-A's tritium decreased to less than detectable. Samples collected from sentinel well CP-A in the third and fourth quarters of 2017 continued to indicate the tritium concentration was less than detectable. Wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than detectable during 2018 and 2019. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2018a)

During 2020 and 2021, wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than the minimum detectable activity (MDA) of 1,040 pCi/L, with the exception of MW-11. Tritium levels detected in MW-11 indicated slightly positive results above the MDA with detections ranging from 1,040 to 1,890 pCi/L in 2020 and 3,360 pCi/L to less than the MDA in December 2021. The primary source of tritium intrusion to MW-11 is likely from the percolation of treated SCR water from the water treatment plant's FWST. Because SCR water always contains low background concentrations of tritium, SCR water used in the plant will contain similar concentrations. All of these sample results were much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2021a)

Other areas also monitored, but not considered part of the groundwater monitoring program included storm water catch basin, evaporation pond storm drain and the old steam generator storage facility. These sample points are from surface water and not indicative of groundwater tritium. (Vistra OpCo 2021a)

Hydrogeology studies showed that CPNPP has perched water above an impermeable layer of bedrock. The 160- to 270-foot-thick Glen Rose Formation (the top layer) is not considered a source of useful groundwater in the vicinity of CPNPP as it carries very little water and is unreliable in times of drought. The thickness and mostly impermeable nature of the Glen Rose Formation prevents migration of potentially contaminated groundwater to the underlying Twin Mountains Formation. (Vistra OpCo 2020a)

As part of the CPNPP Radiological Environmental Monitoring Program (REMP), groundwater samples are collected from five groundwater monitoring locations. Groundwater supplies in the site area are not affected by plant effluents and are sampled only to provide confirmation that groundwater is not affected by plant discharges. Groundwater samples were collected quarterly, in accordance with CPNPP's GPP procedure and analyzed for gamma isotopes and tritium at each location. (Vistra OpCo 2021b)

A total of 20 groundwater samples were collected from the five different monitoring locations per year as part of the REMP. There were no radionuclides identified in any of the groundwater samples collected in 2016–2020 samples. All required lower limits of detection (LLDs) were met for each required gamma emitting radionuclide. Tritium analysis was performed on twenty samples, all indicated less than the required LLD. The results confirm that plant discharges are having no effect on groundwater in the area surrounding CPNPP. (Vistra OpCo 2017b, 2018b, 2019b, 2020b, 2021b)

Industrial practices at CPNPP that involve the use of chemicals are those activities typically associated with painting, cleaning of parts/equipment, refueling of onsite vehicles/generators, fuel oil and gasoline storage, and the storage and use of water treatment additives. The use and storage of chemicals at CPNPP are controlled in accordance with Vistra OpCo procedures and a site-specific spill prevention plan. In addition, as presented in Section 2.2.7, nonradioactive waste is managed in accordance with CPNPP's waste management procedure, which contains preparedness and prevention control measures.

3.6.4.2.1 History of Radioactive Releases

As presented in Section 3.6.4.2, a tritium release occurred in 2013 from a leaking pipe (LVW line) and in 2015 when the water treatment plant's FWST lining began leaking treated SCR water. The FWST leak was repaired mid-2016 and the LVW pipeline leak was repaired in January of 2017.

For 2018 and 2019, there were no radionuclides identified in any of the groundwater samples. All required LLDs were met for each required gamma emitting radionuclide. No unplanned radioactive liquid or gaseous releases were reported in 2018 and 2019. In 2020, as presented in Section 3.6.4.2, tritium levels detected in MW-11 with detections ranging from 1,040 to 1,890 pCi/L were less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2019a; Vistra OpCo 2020a; Vistra OpCo 2021a).

Based on this information and the guidance in NEI 07-07, there is no requirement for notification to the NRC or local officials and no requirement for remediation as it is considered previously monitored licensed material. Continued monitoring of these perched water sample points will occur as part of the groundwater monitoring program and any new sources of tritium or increase in the activity will be evaluated and remediated, as necessary. These perched water sample points (the seepage pump and Leachate Basins A, B, and C) are part of the GPP. (Vistra OpCo 2020a)

An inadvertent release of tritium in a demineralized water and resin mixture occurred on November 6, 2021. A courtesy notification, provided to the TCEQ on November 29, 2021, states that approximately 2.7 millicuries of tritium was released from a quantity of over 100 gallons of demineralized water from a buried pipe (four feet deep). This amount of tritium is well below the reportable quantity of 100 Curies. The release occurred just outside the Unit 2 Turbine Building within the fenced protected area. The cause of the release was a pipe failure during a routine transfer of resin from the Condensate Polishing System to a decant basin. No further transfers of resin are planned until the pipe has been repaired. The demineralized water consists of microfiltered lake water with a tritium concentration ranging from 10,000 to 14,200 pCi/L. The demineralized water and resin mixture released was analyzed for a tritium concentration of 72,100 pCi/L. The release material was excavated and the resin/water mixture that could be recovered was collected/containerized and taken to waste management area and either placed in the dewatering area that discharges to Outfall 004 after normal monitoring via permanent plant piping/system or if solid material, disposed via normal processes (containerized) to Class I landfill in Itasca Texas.

3.6.4.2.2 History of Nonradioactive Releases

Based on the review of site records from the five years from 2016–2020, there has been no inadvertent nonradioactive release that would be classified as an incidental spill.

More recently on June 8, 2021, Vistra OpCo provided the TCEQ a courtesy notification that approximately 100 gallons of mineral oil was released on June 7, 2021. The spill was caused by a Unit 2 transformer fire due to mineral oil overflow of containment for the transformer when the deluge system was initiated. Clean up of the spill was completed on June 11, 2021, and the TCEQ acknowledged by e-mail that the spill did not meet the criteria for a reportable-quantity spill.

Table 3.6-1a SCR Water Levels, 2008–2020

Month	2020	Mean	Maximum		Minimum	
			Level	Year	Level	Year
January	774.01	775.12	777.15	2012	773.47	2020
February	774.34	774.87	775.78	2012	773.69	2015
March	774.51	774.54	775.69	2008	773.46	2015
April	775.45	774.93	776.58	2019	773.64	2015
May	775.50	775.41	775.61	2016	774.27	2014
June	775.42	775.36	778.61	2016	774.63	2014
July	775.31	775.22	775.87	2017	774.42	2014
August	775.19	775.12	775.58	2017	774.00	2019
September	775.51	775.11	775.89	2020	773.43	2019
October	775.26	775.11	777.62	2018	773.40	2019
November	775.38	775.09	777.12	2015	773.48	2019
December	775.21	775.04	776.67	2015	773.38	2019
Annual	775.09	775.08	—	—	—	—

(USGS 2021c)

Table 3.6-1b Lake Granbury Water Levels, 1987–2020

Month	2020	Mean	Maximum		Minimum	
			Level	Year(s)	Level	Year
January	692.65	691.4	692.84	1988, 2020	682.49	2015
February	692.73	691.6	692.91	1997	682.83	2015
March	692.55	691.67	692.87	1997, 2018	682.98	2014
April	692.65	691.71	692.82	2018	682.31	2014
May	692.65	691.79	692.96	1989	681.79	2014
June	692.61	691.83	692.82	2017	681.5	2014
July	692.49	691.78	692.82	2004	685.4	2013
August	691.96	691.82	692.81	1995	685.36	2013
September	692.5	691.38	692.81	1996	684.34	2014
October	692.63	691.33	692.86	1991	683.12	2014
November	692.61	691.37	692.95	1994	682.66	2014
December	692.55	691.34	692.84	2015	682.49	2014
Annual	692.53	691.56	—	—	—	—

(USGS 2021d)

Table 3.6-2 TPDES Water Quality Monitoring Program (Sheet 1 of 2)

Outfall	Description	Parameter	Permit Requirement	Frequency
001	Unit 1 & Unit 2 once-through and auxiliary cooling waters discharge to SCR	Flow rate	3,168 MGD daily average and daily maximum	Record continuously
		Temperature	113°F daily average 116°F daily maximum	Record continuously
		Free available chlorine	440 lbs/day, 0.2 mg/L daily average 1,101 lbs/day, 0.5 mg/L daily maximum	Weekly grab
		Total residual chlorine	880 lbs/day daily maximum 0.2 mg/L daily maximum	Weekly grab
002	Auxiliary cooling water from the service water system and stormwater runoff from the SSI discharge to SCR	Flow rate	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Total suspended solids	30 mg/L daily average, 100 mg/L daily maximum	Weekly grab
		Oil and grease	15 mg/L daily average, 20 mg/L daily maximum	Weekly grab
		pH	6.0–9.0 SU	Weekly grab
003	Treated domestic wastewater discharge to SCR	Flow rate	No limit, monitor and report total daily in MGD	Daily estimate
		Total suspended solids	20 mg/L limit, daily average 45 mg/L limit, daily max, single grab	Twice monthly
		BOD 5-day	20 mg/L limit, daily average 45 mg/L limit, daily max, single grab	Twice monthly
		Escherichia coli 2	126 mg/L limit, daily average 399 mg/L limit, daily max, single grab	Weekly
		pH	6.0–9.0 SU	Twice monthly

Table 3.6-2 TPDES Water Quality Monitoring Program (Sheet 2 of 2)

Outfall	Description	Parameter	Permit Requirement	Frequency
004	Stormwater runoff, low-volume waste sources 1 and previously monitored effluent (metal cleaning waste) discharge to SCR	Flow	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Total suspended solids	30 mg/L limit, daily average 100 mg/L limit, daily max	Weekly grab
		Oil and grease	15 mg/L limit, daily average 20 mg/L limit, daily max	Weekly grab
		pH	6.0–9.0 SU	Daily estimate
104	Metal cleaning waste discharge to SCR	Flow	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Iron, total	1 mg/L limit, daily average 1 mg/L limit, daily max	Weekly grab
		Copper, total	0.5 mg/L limit, daily average 1 mg/L limit, daily max	Weekly grab

(Attachment B)

Table 3.6-3 CPNPP Groundwater Monitoring Well Details

Well	Well Diameter[(a)]	Elevations (feet msl)					
		Top of Casing	Top of Filter[(b)]	Top of Screen[(b)]	Bottom of Screen[(b)]	Bottom of Filter[(b)]	Well Construction Material
MW-9	2	810.29	--	--	--	--	PVC
MW-10	2	809.55	--	--	--	--	PVC
MW-11	2	809.46	--	--	--	--	PVC
MW-12	2	810.44	--	--	--	--	PVC
MW-14	2	809.43	--	--	--	--	PVC
MW-15	2	808.88	--	--	--	--	PVC
MW-16	2	810.14	--	--	--	--	PVC
MW-19	2	848.15	--	--	--	--	PVC
MW-25	2	812.26	--	--	--	--	PVC
CP-A	2	823.75	819.75	817.75	807.75	806.75	PVC
CP-B	2	845.59	841.59	839.79	829.79	828.89	PVC
CP-C	2	843.76	839.76	838.76	828.76	827.06	PVC

a. Measured in inches.

b. Approximate measurement.

c. Dashed cells indicate data were not reported.

Table 3.6-4a CPNPP Yearly Surface Water Withdrawal Summary, SCR

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	MGM	101,330.72	101,336.77	101,332.32	101,337.99	101,234.91	101,337.99
	gpm_a	2,270,210	2,270,089	2,270,169	2,270,278	2,270,089	2,270,278
Monthly Average	MGM	91,330.29	85,319.76	90,583.11	89,222.63	87,847.09	88,860.58
	gpm_a	2,080,016	1,946,567	2,067,471	2,036,035	1,999,890	2,025,996
Monthly Minimum	MGM	66,930.12	64,395.32	59,629.71	69,568.59	71,833.37	59,629.71
	gpm_a	1,499,331	1,490,632	1,335,791	1,558,436	1,720,148	1,335,791
Yearly Total	MGY	1,095,964	1,023,837	1,086,997	1,070,672	1,054,165	1,066,327
	MGD	2,994.44	2,797.37	2,978.07	2,933.35	2,880.23	2,918.22

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table 3.6-4b CPNPP Monthly Surface Water Withdrawal Summary, SCR (Sheet 1 of 2)

Month-Year	CW Intake 004 (MGM)	Total (gpm)
January-2016	76,742.30	1,719,137.54
February-2016	75,156.00	1,799,712.64
March-2016	89,585.55	2,006,844.76
April-2016	98,073.05	2,270,209.57
May-2016	66,930.12	1,499,330.65
June-2016	98,071.80	2,270,180.56
July-2016	101,313.62	2,269,570.34
August-2016	101,327.65	2,269,884.63
September-2016	98,068.16	2,270,096.24
October-2016	101,330.72	2,269,953.41
November-2016	98,070.30	2,270,145.83
December-2016	91,294.26	2,045,122.34
January-2017	76,845.66	1,721,452.99
February-2017	70,360.09	1,745,041.91
March-2017	92,704.49	2,076,713.49
April-2017	64,395.32	1,490,632.41
May-2017	101,336.77	2,270,089.00
June-2017	83,830.06	1,940,510.65
July-2017	76,774.41	1,719,856.85
August-2017	97,254.47	2,178,639.56
September-2017	98,060.22	2,269,912.44
October-2017	69,135.34	1,548,730.76
November-2017	94,562.22	2,188,940.28
December-2017	98,578.05	2,208,289.65
January-2018	76,459.84	1,712,810.04
February-2018	69,356.59	1,720,153.52
March-2018	84,120.66	1,884,423.39
April-2018	98,049.15	2,269,656.25
May-2018	101,220.36	2,267,481.16
June-2018	98,054.84	2,269,787.96
July-2018	101,319.68	2,269,706.09
August-2018	101,326.72	2,269,863.80

Table 3.6-4b CPNPP Monthly Surface Water Withdrawal Summary, SCR (Sheet 2 of 2)

Month-Year	CW Intake 004 (MGM)	Total (gpm)
September-2018	98,056.13	2,269,817.82
October-2018	101,332.32	2,269,989.25
November-2018	98,071.32	2,270,169.44
December-2018	59,629.71	1,335,790.99
January-2019	69,568.59	1,558,436.15
February-2019	70,174.40	1,740,436.51
March-2019	80,546.04	1,804,346.74
April-2019	80,033.88	1,852,636.11
May-2019	70,816.97	1,587,409.72
June-2019	98,076.03	2,270,278.47
July-2019	101,336.69	2,270,278.47
August-2019	101,332.60	2,269,995.52
September-2019	98,058.41	2,269,870.60
October-2019	101,337.99	2,270,116.26
November-2019	98,018.89	2,268,955.79
December-2019	101,326.10	2,269,849.91
January-2020	83,392.12	1,868,103.05
February-2020	71,833.37	1,720,147.75
March-2020	78,965.43	1,768,938.84
April-2020	72,235.10	1,672,108.80
May-2020	95,095.50	2,130,275.54
June-2020	98,073.79	2,270,226.62
July-2020	101,234.22	2,267,791.67
August-2020	101,234.91	2,267,807.12
September-2020	98,040.55	2,269,457.18
October-2020	78,089.16	1,749,309.21
November-2020	97,101.18	2,247,712.44
December-2020	78,869.79	1,766,796.37

MG = millions of gallons

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table 3.6-5a CPNPP Yearly Surface Water Withdrawal Summary, Lake Granbury

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	MGM	1,869.02	1,795.99	1,787.00	1,721.01	1,775.01	1,869.02
	gpm_a	41,869	41,574	41,366	39,537	39,763	41,869
Monthly Average	MGM	1,222.67	1,338.34	1,223.33	1,338.09	957.50	1,215.98
	gpm_a	27,743	30,387	27,785	30,565	21,557	27,608
Monthly Minimum	MGM	0	82.99	0	625	139.99	0
	gpm_a	0	2,058	0	14,001	3,352	0
Yearly Total	MGY	14,672	16,060	14,680	16,057	16,010	15,496
	MGD	40.09	44.00	40.22	43.99	43.74	42.38

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table 3.6-5b CPNPP Monthly Surface Water Withdrawal Summary, Lake Granbury (Sheet 1 of 2)

Month-Year	Intake (MGM)	Total (gpm)
January-2016	474.99	10,640.52
February-2016	0	0
March-2016	1.01	22.63
April-2016	1,226.99	28,402.59
May-2016	1,421.00	31,832.52
June-2016	952.98	22,059.81
July-2016	1,650.99	36,984.53
August-2016	1,734.99	38,866.35
September-2016	1,714.00	39,675.93
October-2016	1,839.00	41,196.24
November-2016	1,787.00	41,365.74
December-2016	1,869.02	41,868.64
January-2017	1,789.00	40,076.16
February-2017	82.99	2,058.39
March-2017	586.01	13,127.47
April-2017	1,795.99	41,573.91
May-2017	1,621.01	36,312.97
June-2017	1,718.99	39,791.54
July-2017	1,736.00	38,888.97
August-2017	1,495.00	33,490.24
September-2017	1,369.00	31,689.81
October-2017	1,405.00	31,474.11
November-2017	1,380.01	31,944.71
December-2017	1,081.01	21,216.19
January-2018	953.99	21,370.83
February-2018	0	0
March-2018	165.01	3,696.48
April-2018	1,787.00	41,365.74
May-2018	1,605.00	35,954.30
June-2018	1,724.00	39,907.70
July-2018	1,684.00	37,723.97
August-2018	1,746.98	39,134.97

Table 3.6-5b CPNPP Monthly Surface Water Withdrawal Summary, Lake Granbury (Sheet 2 of 2)

Month-Year	Intake (MGM)	Total (gpm)
September-2018	1,641.00	37,986.11
October-2018	646.00	14,471.32
November-2018	972.00	22,500.00
December-2018	1,755.00	39,314.54
January-2019	1,721.01	38,553.20
February-2019	1,338.99	33,209.00
March-2019	625.00	14,000.90
April-2019	1,685.00	39,004.63
May-2019	1,676.99	37,029.78
June-2019	976.00	22,592.56
July-2019	1,338.99	29,995.23
August-2019	1,653.01	37,029.78
September-2019	1,708.01	39,537.34
October-2019	1,644.02	36,828.32
November-2019	808.01	18,704.00
December-2019	882.01	19,758.37
January-2020	1,775.01	39,762.73
February-2020	139.99	3,352.15
March-2020	894.00	20,026.88
April-2020	1,717.00	39,745.37
May-2020	1,717.98	38,485.31
June-2020	1,531.99	35,462.70
July-2020	1,634.01	36,604.22
August-2020	1,703.00	38,149.53
September-2020	1,457.99	33,749.72
October-2020	1,395.00	31,250.02
November-2020	1,336.00	30,925.93
December-2020	708.01	15,860.42

MG = millions of gallons

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table 3.6-6 Surface Water Usage Summary in MGD, 2015

Category	Somervell County	Hood County
Public Supply	0.97	0.19
Domestic, Self-Supplied	0.00	0.00
Industrial, Self-Supplied	0.00	0.00
Irrigation	0.00	4.59
Livestock	0.08	0.24
Aquaculture	0.00	0.00
Mining	0.00	0.12
Power Generation (Thermoelectric)	2105.15	2.49
Total	**2106.20**	**7.63**

(USGS 2021b)

Table 3.6-7 Groundwater Usage Summary in MGD, 2015

Category	Somervell County	Hood County
Public Supply	0.21	4.66
Domestic, Self-Supplied	0.41	1.14
Industrial, Self-Supplied	0.00	0.01
Irrigation	0.10	1.84
Livestock	0.03	0.20
Aquaculture	0.00	0.00
Mining	0.41	0.78
Power Generation (Thermoelectric)	0.00	0.00
Total	**1.16**	**8.63**

(USGS 2021b)

Table 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP Site Boundary (Sheet 1 of 2)

TWDB[a] Unique ID	Distance[b] (miles)	Well Depth (feet)	Use Description	Aquifer Name
3242903	1.4	479	Unknown	Twin Mountains Formation
3242803	1.5	360	Public Supply	Twin Mountains Formation
3242802	1.5	360	Public Supply	Twin Mountains Formation
3242805	1.6	396	Unknown	Twin Mountains Formation
3242502	1.7	352	Domestic	Twin Mountains Formation
3242804	1.8	420	Public Supply	Twin Mountains Formation
3242901	1.9	350	Stock	Twin Mountains Formation
3242902	2.0	318	Unknown	Twin Mountains Formation
3242801	2.1	352	Domestic	Twin Mountains Formation
3242501	2.3	300	Unknown	Twin Mountains Formation
3242907	2.4	Not reported	Unknown	Not reported
3243415	2.6	383	Public Supply	Twin Mountains Formation
3243407	2.7	383	Public Supply	Twin Mountains Formation
3243706	2.8	400	Public Supply	Twin Mountains Formation
3243707	2.8	340	Public Supply	Twin Mountains Formation
3243413	2.8	400	Public Supply	Twin Mountains Formation
3243412	2.8	378	Public Supply	Twin Mountains Formation
3243414	2.8	517	Public Supply	Twin Mountains Formation
3243401	3.0	330	Domestic	Hensell Sand Member of Travis Peak Formation
3242904	3.1	500	Public Supply	Twin Mountains Formation
3242905	3.1	340	Public Supply	Twin Mountains Formation
3242906	3.3	281	Unknown	Twin Mountains Formation
3243701	3.5	230	Domestic	Travis Peak Formation
3243402	3.6	200	Stock	Hensell Sand Member of Travis Peak Formation
3243404	3.6	200	Stock	Hensell Sand Member of Travis Peak Formation
3243104	3.6	500	Irrigation	Twin Mountains Formation

Table 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP Site Boundary (Sheet 2 of 2)

TWDB(a) Unique ID	Distance(b) (miles)	Well Depth (feet)	Use Description	Aquifer Name
3243416	3.7	512	Public Supply	Twin Mountains Formation
3243103	3.7	360	Domestic	Twin Mountains Formation
3242401	3.7	352	Domestic	Twin Mountains Formation
3243417	3.9	425	Domestic	Hosston Formation
3243418	3.9	255	Domestic	Unknown
3243410	3.9	420	Public Safety	Twin Mountains Formation
3242402	4.1	335	Domestic	Twin Mountains Formation
3243419	4.1	400	Unknown	Unknown
3243405	4.2	Unknown	Stock	Quaternary Alluvium
3243411	4.2	260	Industrial	Twin Mountains Formation
3242302	4.6	396	Private, potable	Twin Mountains Formation
3242203	5.5	344	Potable domestic(d)	Twin Mountains Formation
3242101	5.9	331	Potable domestic(d)	Twin Mountains Formation

(TWDB 2020)

a. Well information provided in this table were retrieved from the Texas Water Development Board (TWDB).

b. Distance is from the CPNPP center point and rounded to the nearest tenth of a mile. Wells listed are limited to those within a 2-mile radius from the site boundary.

Table 3.6-9a CPNPP Yearly Groundwater Withdrawal Summary, Recreation/Training (Rifle Range) Well

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	gallons	13,600	6,100	12,100	4,400	7,500	13,600
	gpm_a	0.305	0.137	0.280	0.099	0.168	0.305
Monthly Average	gallons	4,292	4,375	6,833	3,317	2,992	4,362
	gpm_a	0.098	0.100	0.156	0.076	0.068	0.100
Monthly Minimum	gallons	2,200	2,300	2,700	2,200	800	800
	gpm_a	0.049	0.052	0.060	0.051	0.018	0.018
Yearly Total	gallons/year	51,500	52,500	82,000	39,800	35,900	52,340
	gpd_a	140.71	143.84	224.66	109.04	98.09	143.27

MGY = millions of gallons per year

gpm_a = average gallons per minute for the month

Table 3.6-9b CPNPP Monthly Groundwater Withdrawal Summary (Sheet 1 of 2)

Month-Year	Recreation/Training Well (gals)	Total (gpma)
January-2016	3,500	0.078
February-2016	4,600	0.114
March-2016	2,800	0.063
April-2016	3,800	0.088
May-2016	4,500	0.101
June-2016	4,100	0.095
July-2016	13,600	0.305
August-2016	4,100	0.095
September-2016	2,800	0.063
October-2016	3,300	0.074
November-2016	2,200	0.051
December-2016	2,200	0.049
January-2017	3,200	0.072
February-2017	2,800	0.069
March-2017	6,100	0.137
April-2017	5,400	0.125
May-2017	2,300	0.052
June-2017	4,700	0.109
July-2017	3,900	0.087
August-2017	3,800	0.088
September-2017	4,400	0.099
October-2017	5,500	0.123
November-2017	4,400	0.102
December-2017	6,000	0.134
January-2018	4,940	0.111
February-2018	4,360	0.108
March-2018	5,800	0.130
April-2018	12,100	0.280
May-2018	10,100	0.226
June-2018	7,900	0.183
July-2018	7,400	0.166
August-2018	6,300	0.146

Table 3.6-9b CPNPP Monthly Groundwater Withdrawal Summary (Sheet 2 of 2)

Month-Year	Recreation/Training Well (gals)	Total (gpm_a)
September-2018	4,600	0.103
October-2018	8,000	0.179
November-2018	7,800	0.181
December-2018	2,700	0.060
January-2019	3,200	0.072
February-2019	3,700	0.092
March-2019	3,300	0.074
April-2019	3,700	0.086
May-2019	2,900	0.065
June-2019	3,500	0.081
July-2019	4,400	0.099
August-2019	3,300	0.076
September-2019	3,400	0.076
October-2019	3,600	0.081
November-2019	2,200	0.051
December-2019	2,600	0.058
January-2020	1,500	0.034
February-2020	1,100	0.026
March-2020	800	0.018
April-2020	1,300	0.030
May-2020	1,500	0.034
June-2020	3,700	0.086
July-2020	2,200	0.049
August-2020	3,200	0.074
September-2020	1,100	0.025
October-2020	7,500	0.168
November-2020	5,300	0.123
December-2020	6,700	0.150

gpm_a = average gallons per minute for the month

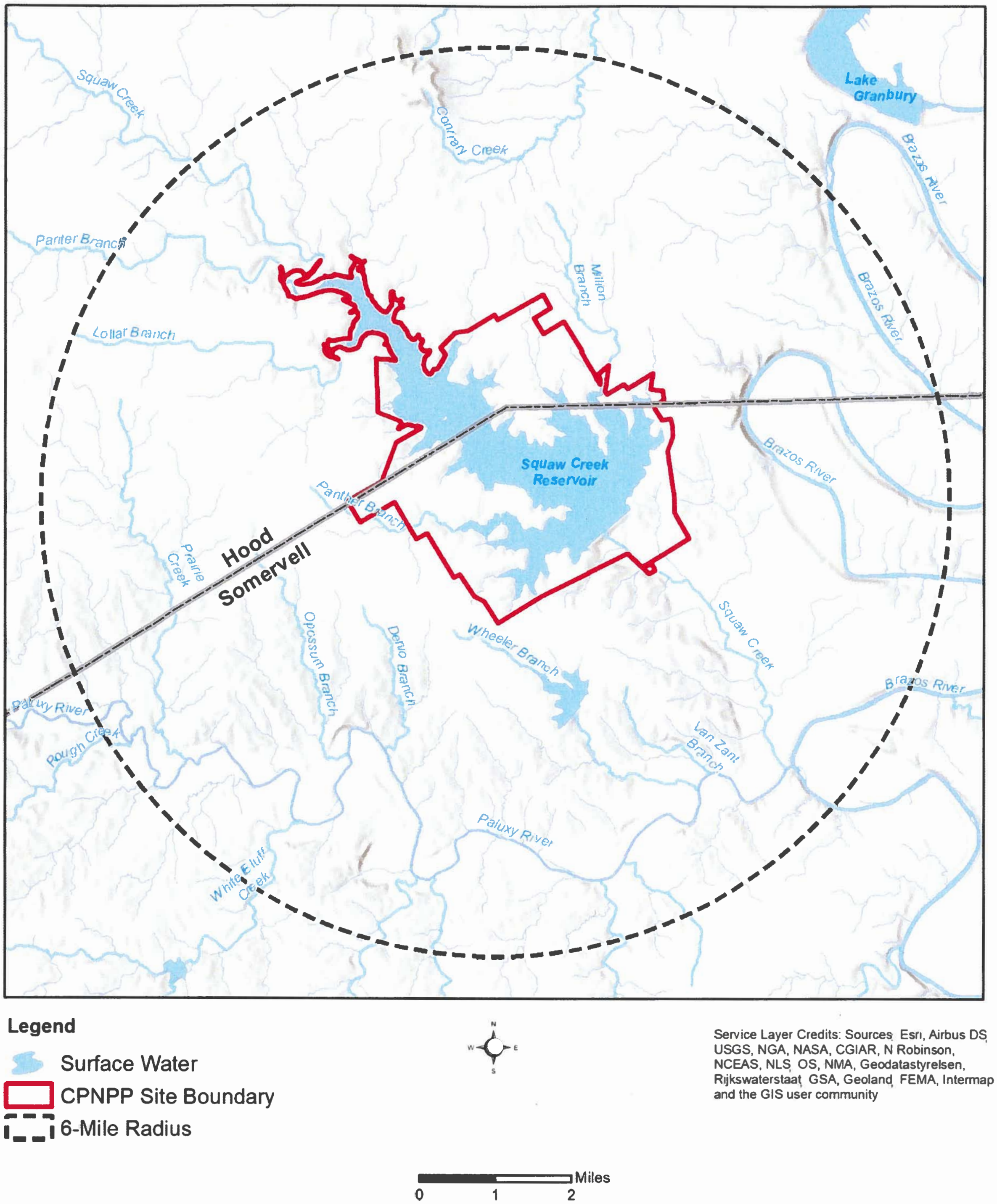


Figure 3.6-1 Vicinity Hydrological Features

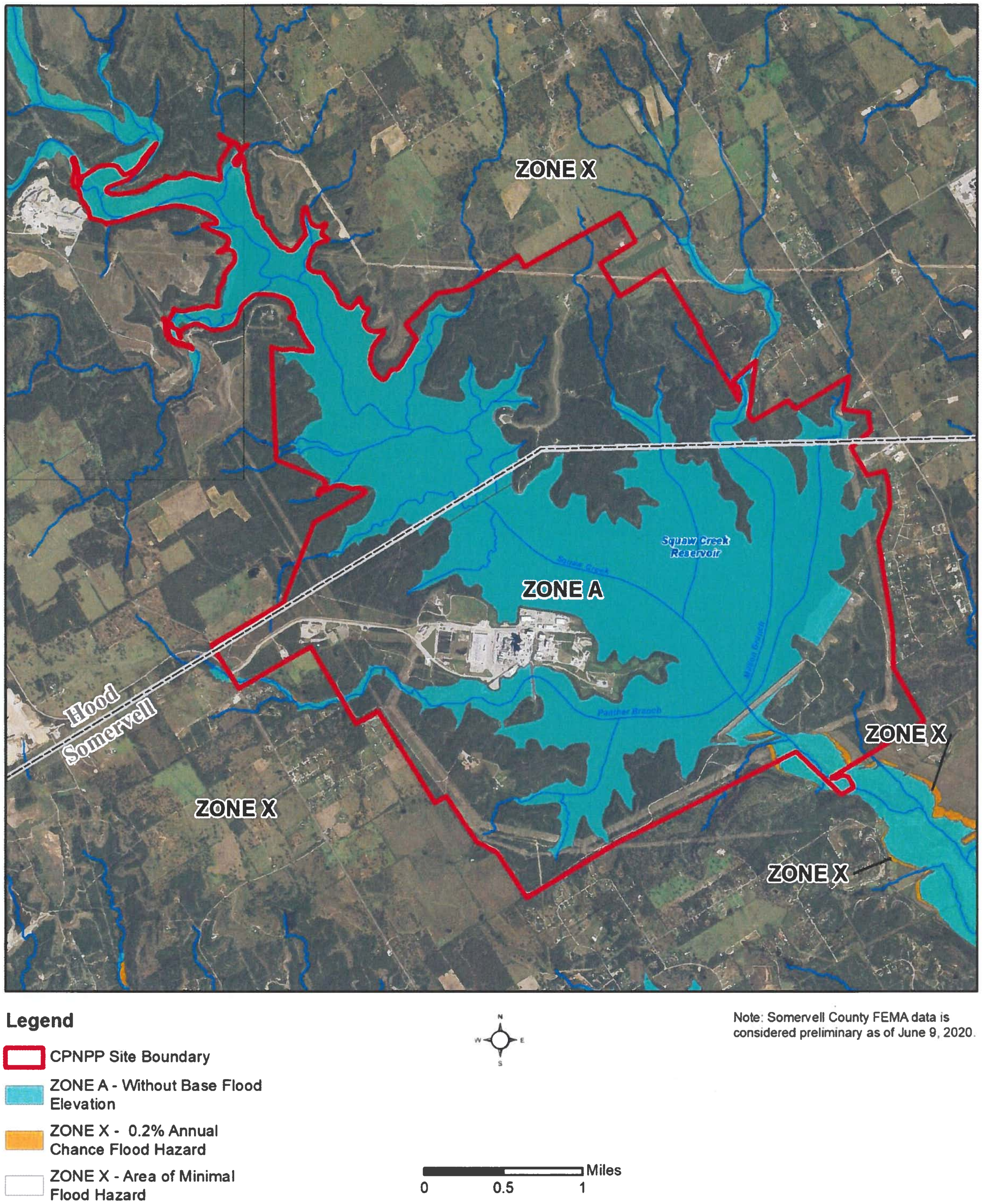


Figure 3.6-2 FEMA Floodplain Zones at CPNPP

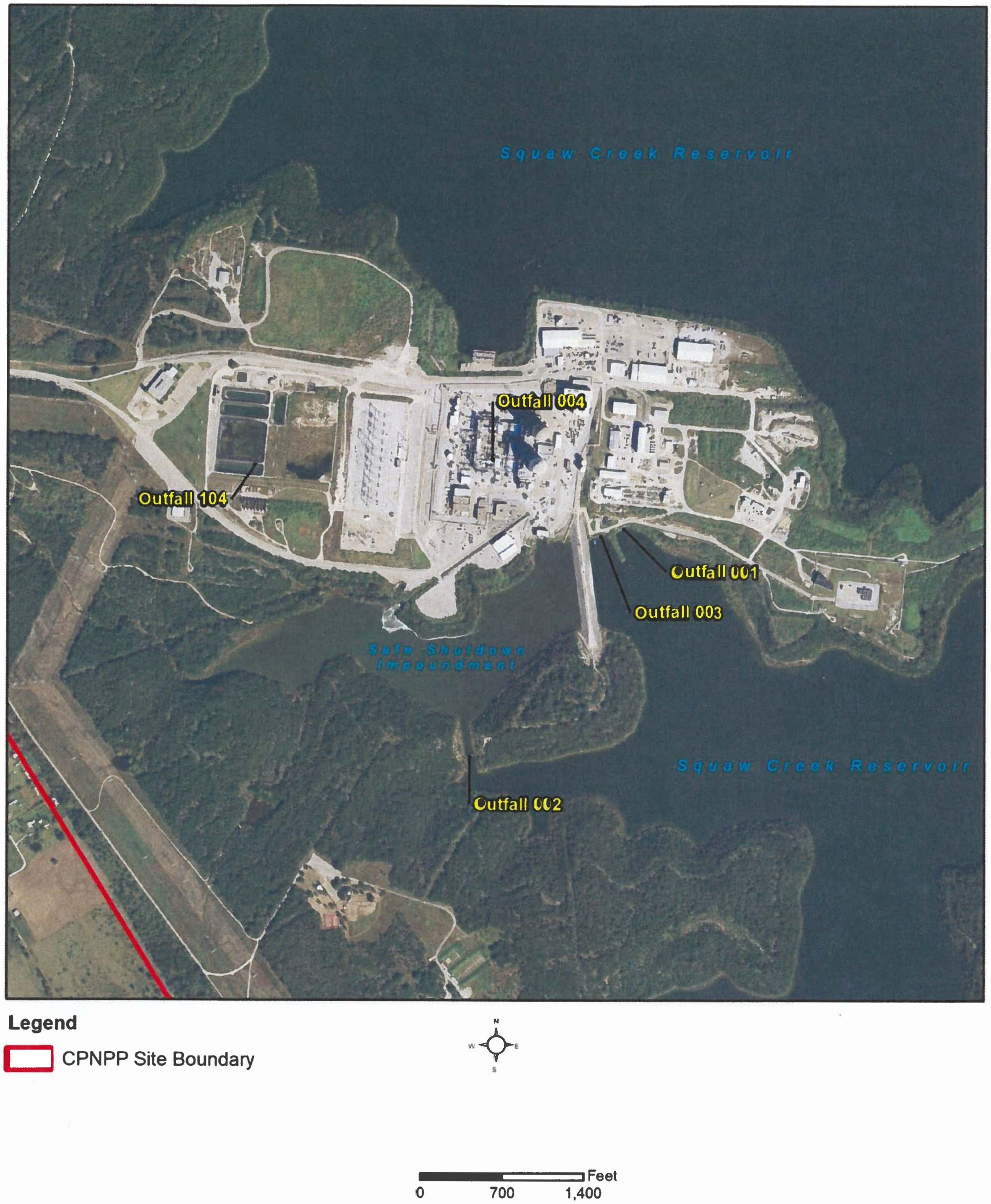


Figure 3.6-3 TPDES Outfalls

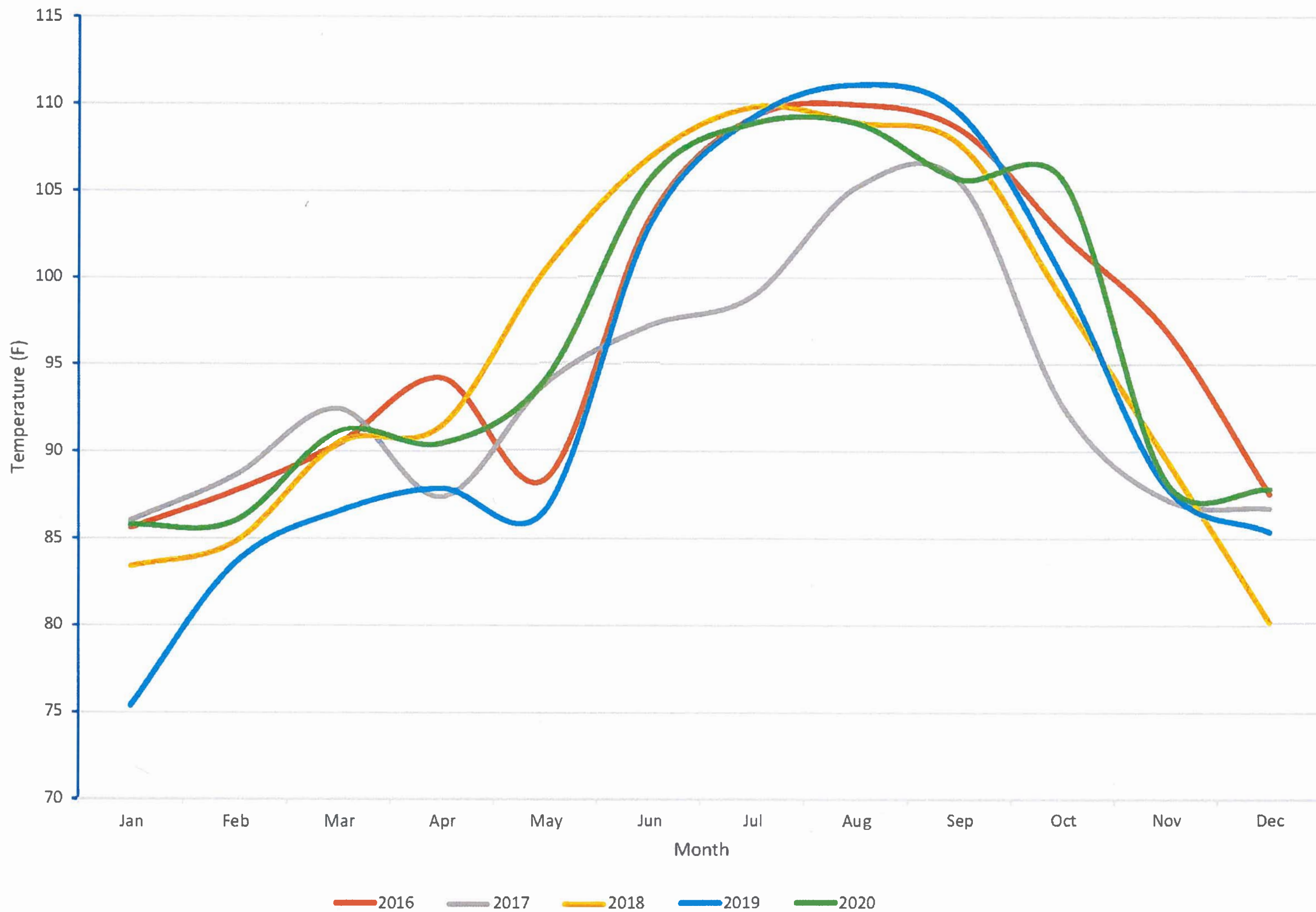


Figure 3.6-4 Average Condenser Discharge Temperatures

Figure 3.6-5 Onsite Wells

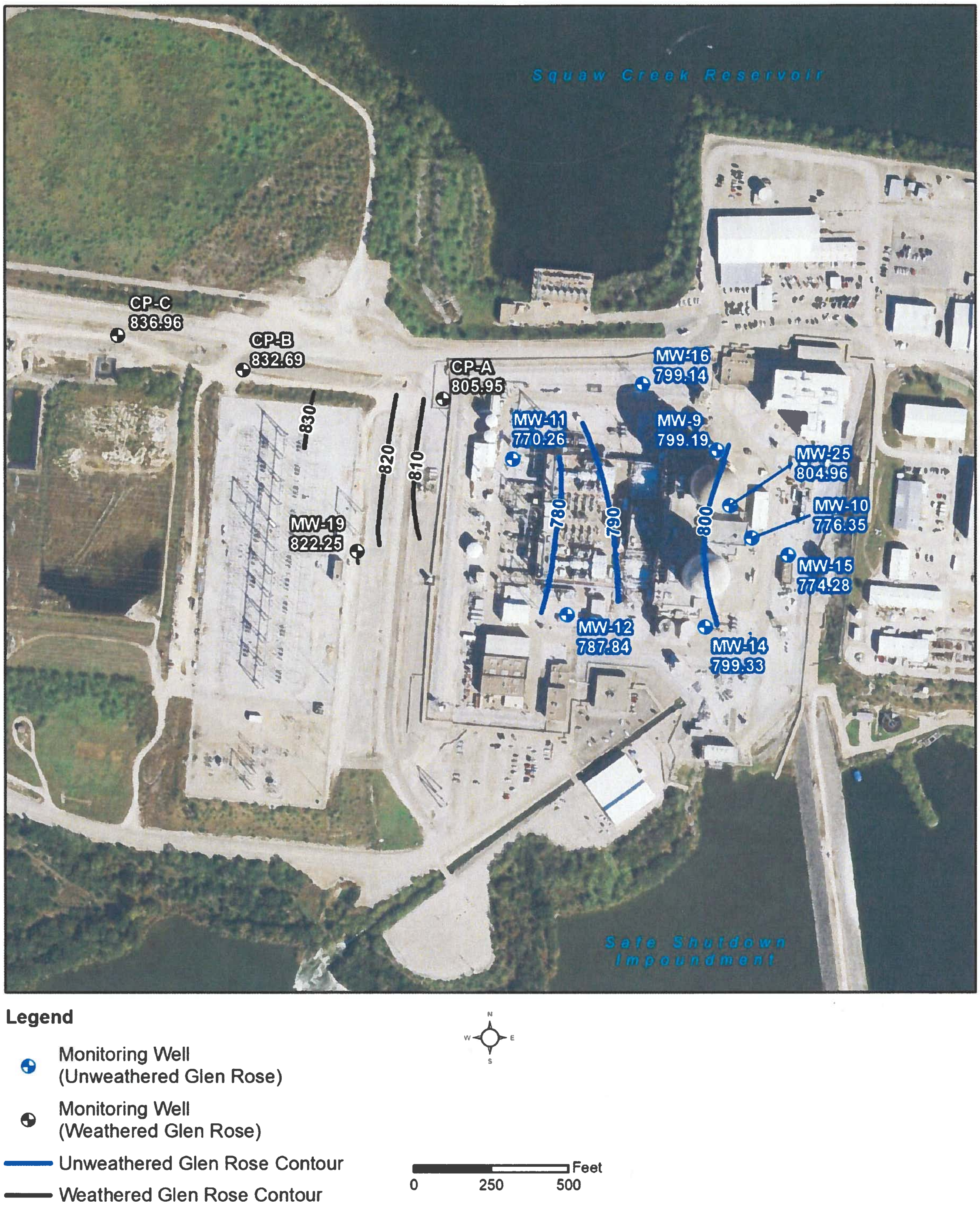
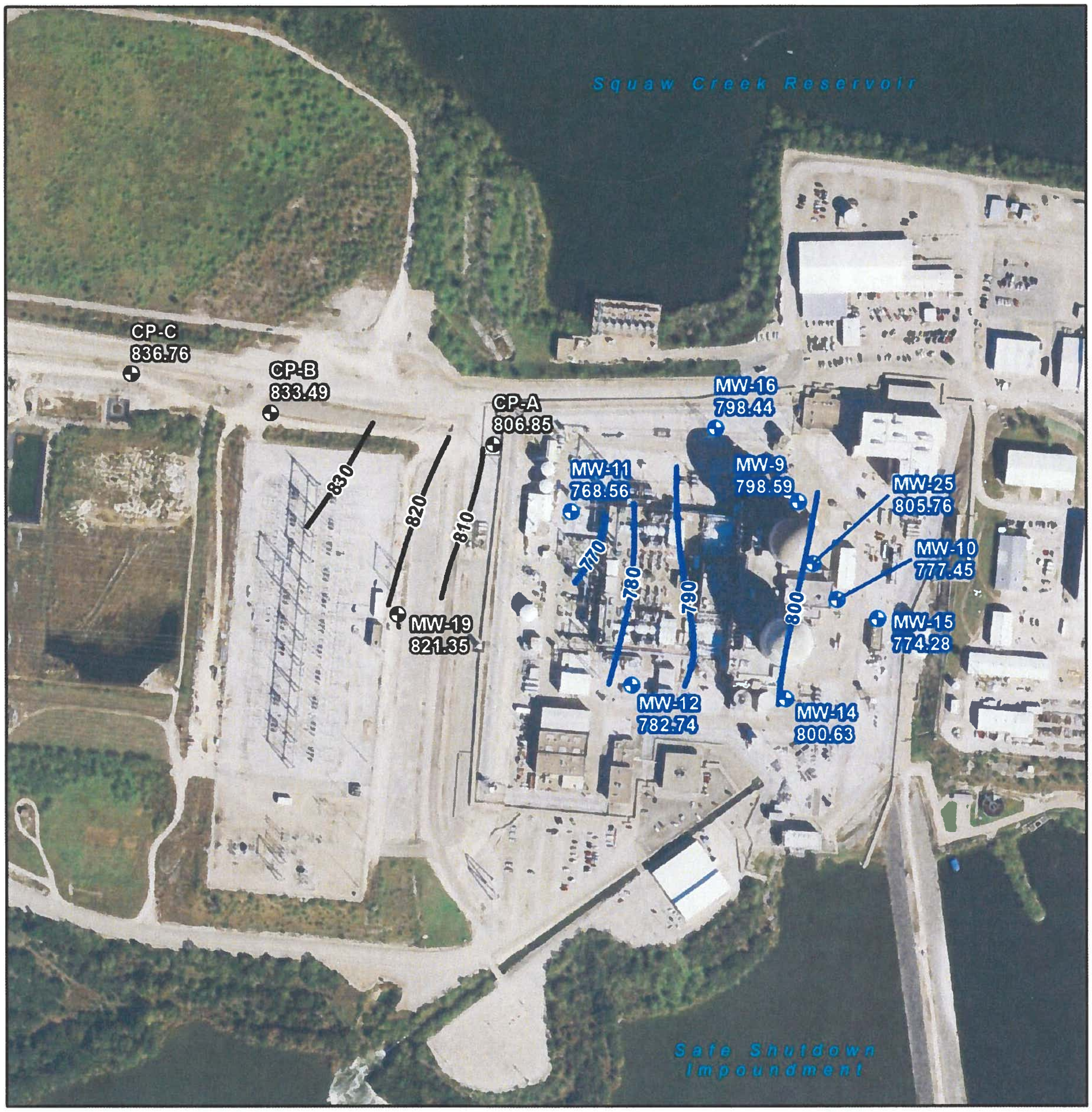


Figure 3.6-6 November 29, 2018, Potentiometric Map



Legend

- Monitoring Well (Unweathered Glen Rose)
- Monitoring Well (Weathered Glen Rose)
- Unweathered Glen Rose Contour
- Weathered Glen Rose Contour

Feet: 0, 250, 500

Figure 3.6-7 June 27, 2019, Potentiometric Map

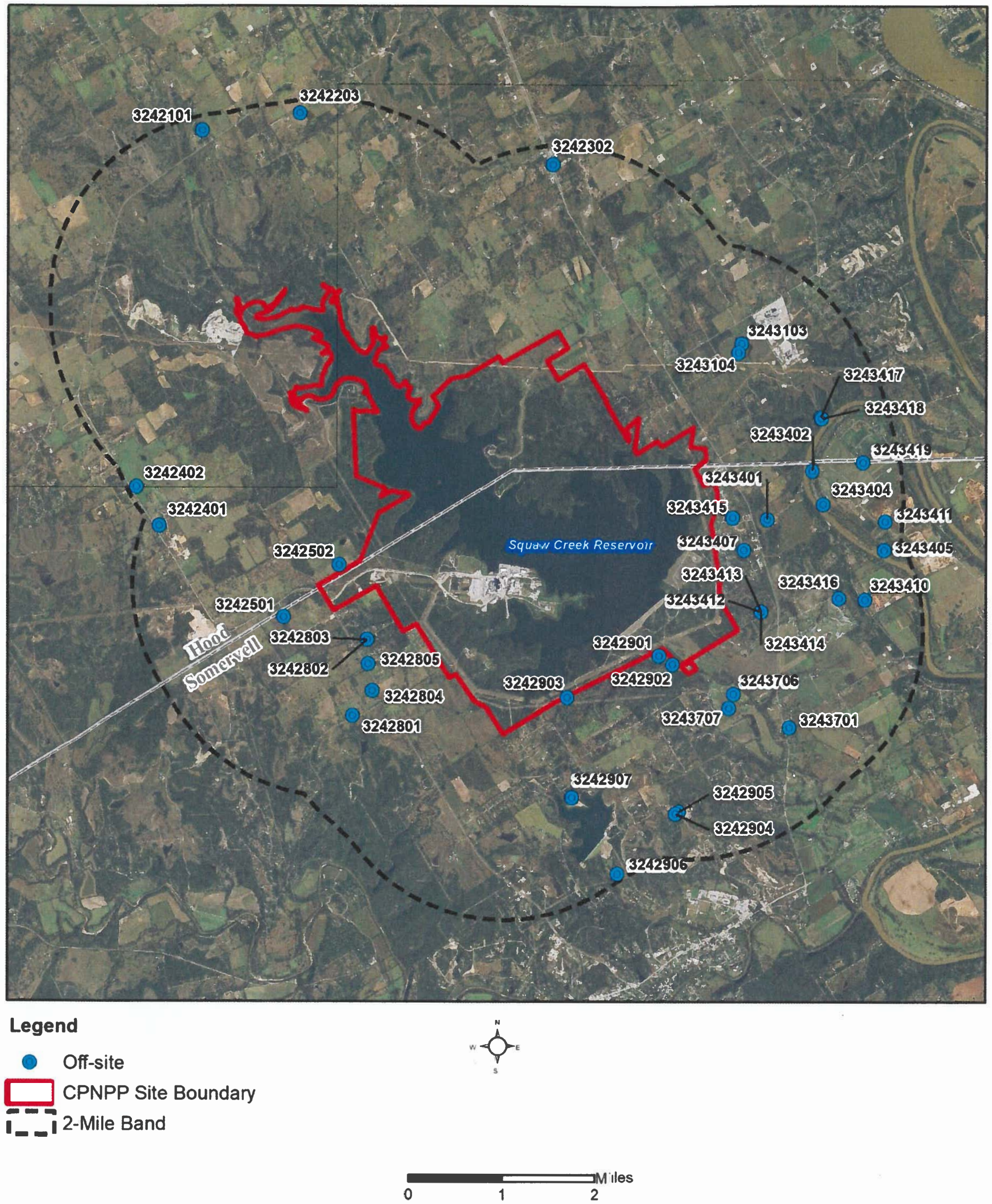


Figure 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP

3.7 Ecological Resources

Local ecology is greatly influenced by the geomorphic and physiographic characteristics of the region. Soils determine the basic fertility of the land, which in turn determines the types of plants that may grow there. Further, the vegetation present greatly influences the type and number of animals that reside in the region. Climatological factors such as temperature, day length, and precipitation further refine the plants and animals that may live in a locale. The following sections detail the ecological resources present at or within six miles of CPNPP.

3.7.1 Aquatic Communities

The aquatic environment near the CPNPP site is associated with the Brazos River basin. The Brazos River basin encompasses about 45,700 square miles and extends from northeastern New Mexico through northwestern Texas and continues south to the Gulf of Mexico. Major tributaries of the Brazos River include the Salt Fork Brazos River, Clear Fork Brazos River, Paluxy River, Nolan River, North Bosque River, Leon River, Lampasas River, San Gabriel River, Little River, and Navasota River. (Luminant 2013b)

CPNPP is located on Squaw Creek, a tributary of the Paluxy River and therefore the Brazos River. SCR was impounded for station cooling by the construction of a dam approximately 4.5 miles upstream of its confluence with the Paluxy and Brazos rivers. SCR serves as both the cooling water source and discharge source for CPNPP.

This section describes the aquatic environment and biota near the CPNPP site and other areas potentially affected by the continued operation of CPNPP. It includes a description of the aquatic ecosystems at or near the site, a description of representative important species that are present or are expected to occur, and the location of critical habitats or other areas carrying special designations.

3.7.1.1 Squaw Creek Reservoir

SCR is located about four miles north of the city of Glen Rose in Somervell County. The reservoir is owned and operated by Vistra OpCo, for condenser's cooling for CPNPP. Construction of the reservoir began in 1970s and was completed in 1979. The dam is an earth-filled embankment approximately 4,700 feet long, with a maximum height of 158 feet from the streambed. The top of the dam is at elevation of 796 feet above mean sea level. The uncontrolled emergency spillway is located near the left end of the dam and is cut on the natural ground with crest of 2,200 feet in length at elevation of 783 feet above mean sea level. The service spillway is located beside the right end of the dam and is a type of broad-crested weir with crest of 100 feet in length at elevation of 775 feet above mean sea level. The results of a 2017 acoustic bathymetric survey indicate that the SSI alone has a capacity of 653 acre-feet at the conservation pool elevation of 775 feet msl. The survey determined that SCR (including the SSI) has a total capacity of 149,732 acre-feet and extends across 3,272 surface acres at the conservation pool elevation of 775 ft. msl.

A screenhouse structure is recessed from the shoreline, on the north side of the peninsula in the area of the circulation water intake structure. Trash racks are installed across the screenhouse to prevent large debris from entering the intake bays. Traveling water screens are located behind the trash racks to strain out smaller debris. Circulating water pumps are located downstream of the traveling water screens to convey screened flow to the condensers. Circulating water is withdrawn through a single screenhouse with 12 intake bays. Each bay is 11 feet, 2 inches wide and has a vertical traveling water screen. A trash rack is located along the upstream face of the structure. The trash rack consists of 4-inch x 1/2-inch-wide steel bars with a 2-inch clear spacing. Twelve 10-foot-wide traveling water screens with bottom are located downstream from the trash racks. The screens have 3/8-inch square mesh openings. The screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every four hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures reach below 38°F. Screen wash water for each screen is at 329 gpm with a pressure of 100 pounds per square inch (psi). Fish and debris from the screens are washed into a trough located directly upstream of the screens and collected in a bin and disposed.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd) for the eight pumps for both units. Under normal conditions, four pumps operate per unit; however, with lower winter lake temperatures, three pumps operate per unit. The plant can operate at reduced loads operating two or three pumps per unit.

SCR is stocked and managed by Texas Parks and Wildlife Department (TPWD). Fish stocking began in 1979 by the TPWD and was completed in 1996. Fish stocked in the impoundment included: smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), palmetto bass (*Morone saxatilis* x *Morone chrysops*), threadfin shad (*Dorosoma petenense*), channel catfish (*Ictalurus punctatus*), and walleye (*Sander vitreus*). (BWI 2008)

Ecological studies on SCR were performed in 1981 and 1987 prior to the start of operations of CPNPP. The results from these studies showed that the fish community was young but stabilizing. In the 1981 survey, 21 species of fish were collected. The dominant game fishes were hybrid striped bass and largemouth bass. Although smallmouth bass were stocked in the reservoir, they were not doing well, and further stocking of the species was not recommended. The 1987 study of SCR revealed 26 species of fish (Table 3.7-2). Species composition changed slightly from 1981 with bluegill sunfish (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), black bullhead (*Ameiurus melas*), redear sunfish (*Lepomis microlophus*), largemouth bass, longear sunfish (*Lepomis megalotis*), and yellow bullhead (*Ameiurus natalis*) being the most abundant. Predominant predatory fish in the reservoir were hybrid striped bass, channel catfish, walleye, and largemouth bass. (Luminant 2013b)

A four-season ecological study to characterize the aquatic vegetation, fish, benthic, and plankton communities, and general water quality within SCR was initiated in February 2007. All field sampling efforts were completed on January 9, 2008 (BWI 2008). A total of 458 fishes representing 12 different species were captured at all sites combined in 2007 and 2008. The most common fish identified in the gill nets were channel catfish, largemouth bass, and freshwater drum. No smallmouth bass, walleye, or hybrid striped bass were found in 2007. Further, the study found that while the reservoir cannot support a cool water fish community, it does support a warmwater fish community and that community appears stable. (BWI 2008; Luminant 2013b)

A total of 3,117 benthic invertebrates representing at least 59 different genera were collected in Squaw Creek and SCR in 2007. In every season, chironomids (midges) were the most numerous (2,198 individuals) and most diverse (18 genera) invertebrates discovered in the study sites. Chironomids are a very diverse family and occupy a wide variety of habitats, which is why they are so numerous. In addition, they can tolerate a wider range of water quality than most other invertebrates. *Parachironomus* were the most common genera in this family and were found in each season except winter. (BWI 2008)

The planktonic communities of SCR were also characterized in the 2007 study (Table 3.7-1). Sampling results revealed rotifers to be the dominant organism followed by juvenile copepods in all seasons except summer. Summer samples revealed that juvenile copepods far outnumbered all other taxa. Other taxa found in the samples included two families of water fleas (Bosminidae and Daphniidae). No golden algae were found in the summer samples which may be attributable to the water temperature in SCR. (BWI 2008; Luminant 2013b)

Current sport fish in SCR include largemouth bass and channel catfish. Palmetto Bass were the last species stocked into the main reservoir in 1996. Palmetto Bass are still stocked privately into the stilling basin for biological control of shad populations but are rarely observed in surveys. The reservoir was closed from 2001 to 2010 following security concerns following 9/11, and no fisheries work was conducted during that time. Electrofishing was discontinued in 2011 due to increasing water conductivity and historically poor electrofishing results for target species. Data were collected on largemouth bass (in addition to catfishes and temperate bass) during 2015, and beginning in 2019, gill netting became the only monitoring tool used to collect data on sport and forage fishes. Recent management efforts include maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS, especially zebra mussels, whenever possible. (Baird and Tibbs 2019)

Several incidents related to fish kills have been documented at CPNPP over the last 5 years. All events were not environmentally reportable. One of the largest contributors is the makeup pump tripping during the summer months. This creates hypoxic water conditions and a rapid increase in water temperature, resulting in fish die-off. Another report in 2017 identified a "milky white" appearance of water within SCR and a small associated fish kill. It was determined that the cloudy appearance was due to a higher hydrogen sulfide concentration, compounded by low flow conditions, reacting with the natural occurring limestone minerals in the creek bed forming a colloidal suspension of gypsum (i.e., calcium sulfate).

Further, the SSI experienced fish kills prior to 2013, some of which were attributed to blooms of the toxin-producing golden alga (*Prymnesium parvum*). The NRC questioned potential impacts of a massive fish kill in the SSI on its ability to provide water during an emergency. This concern focused on the large numbers of threadfin shad inhabiting the SSI. As a result, the facility decided to reduce threadfin shad biomass in the SSI. Measures to control shad have included applications of rotenone (a pesticide used to kill fish) in 2012 and 2013 and stocking of palmetto bass in 2013 and 2014. However, shad numbers may also have rebounded in 2018 since the last rotenone treatment in May 2013. Golden algae monitoring was implemented in 2013-2014 to help understand its potential to cause major fish kills in the SSI. Golden algae were not observed in the plankton in the eight samples collected from March 2018 through January 2019. Further details of invasive species and their monitoring and management are discussed in Section 3.7.5. All events, regardless of if reportable, are reported to the TPWD kills and spills team.

In order to capture debris and dead fish in the SSI and minimize fish population and migration from SCR, a debris/fish barrier is installed approximately 200 feet from the intake structure within the SSI.

Aquatic life monitoring in the SSI was conducted in 2011–2013, 2015, 2016, and 2018–2019 as part of the tri-annual aquatic studies completed at CPNPP. The sampling conducted in the SSI in 2018–2019 analyzed water quality, adult mud crabs, zebra mussels, larval fish and mud crabs, golden algae, filamentous algae, and zooplankton. Data were collected quarterly adjacent to the buoy in front of the intake. Results from the 2018 and January 2019 sampling yielded that golden alga were not observed. If present, their concentration was less than 110 cells per milliliter. Large filamentous algae were only detected in the December ichthyoplankton sample and were at a concentration less than one filament per liter. Larval zebra mussels and Asiatic clams were not observed in plankton samples. In regard to zooplankton, rotifers, and copepod nauplii were common. Large crustacean zooplankton, like adult and subadult copepods and Cladocera, were present in low concentrations. Further, larval mud crabs were present at a concentration of 110 per liter in the April 2018 sample. *Daphnia lumholtzii* were observed at concentrations below 1 per liter in September and December 2018 ichthyoplankton samples. *D. lumholtzii* is an exotic species of cladoceran from Africa that was first detected in Texas in 1990. The average density of pelagic fish in 2018 was 3,200 acre-feet, which was considerably higher than surveys in 2015 and 2016. The total number of fish estimated in the upper 13 feet of the reservoir in June 2018 was 1.4 million (average total length of 4 inches). The upper 13 feet of the reservoir contain about 68 percent of the reservoir volume. The increase in pelagic fish density (and likely biomass) result from several factors. Tilapia numbers have increased substantially since 2012. The reservoir system has also gradually become more eutrophic since it was constructed in the 1970s. As water evaporated, nutrients and dissolved minerals have been concentrated, which support higher fish biomass. Shad numbers may have also returned to levels documented in 2012 since the rotenone applications have ceased.

Similarly, the numbers of Palmetto Bass appear to have decreased, likely through natural attrition and escape from the SSI. Reduced numbers of Palmetto Bass would reduce predation on smaller, pelagic species.

3.7.1.2 Wheeler Branch Reservoir

Wheeler Branch Reservoir is a 180-acre impoundment located within the Paluxy River system in Somervell County, Texas. It has a maximum depth of 85 feet. The water level is maintained by pumping water from the Paluxy River during periods of high flow. Wheeler Branch Reservoir is an oligotrophic reservoir with water transparencies typically ranging from 10 to 15 feet. Habitat features consist of flooded cedars around the periphery, flooded standing timber in deeper water, brush piles, rock piles and ledges. (Tibbs and Baird 2018)

Similar to SCR, Wheeler Branch is stocked and managed by TPWD. It opened to the public on September 1, 2011. Prior to opening, the reservoir was stocked with Florida largemouth bass, smallmouth bass, walleye, bluegill, threadfin shad, inland silverside, longear and redear sunfish, and was sampled extensively with electrofishing and gill netting. Since the reservoir's opening, Wheeler Branch has been sampled annually with one or more years including fall electrofishing, spring gill netting, and spring bass-only electrofishing. Additionally, a year-long angler creel survey was implemented from June 2013 through May 2014. A public relations campaign began within the district to inform and educate constituents about zebra mussels in order to prevent their spread into Wheeler Branch Reservoir. Somervell County employees were trained about zebra mussels, and how to inspect boats and trailers entering the reservoir. (Tibbs and Baird 2018)

Within the results of the 2018 survey, the forage base consisted primarily of bluegill. Gizzard shad are present in low density. Channel catfish were collected in good numbers, and all individuals approached or exceeded the preferred size category of 24 inches. Largemouth bass catch rate declined, but size structure improved. Smallmouth bass are present in the reservoir but weren't collected in the most recent electrofishing survey. Walleye were collected in low numbers in the 2015 and 2017 gill netting surveys, but none were collected in the 2018 gill netting survey. (Tibbs and Baird 2018)

3.7.1.3 Paluxy River

Rising in northeast Erath County, the Paluxy River flows southeast for 38 miles through Hood and Somervell counties to join the Brazos River. The river is formed by the junction of the North and South Forks, both of which are small streams that contain insufficient water flows for normal recreational use. In addition, the primary stream is feasible for recreational use only during periods of heavy rains. The Paluxy River is a scenic waterway containing clean, clear water flowing over sand and rocks, and surrounded by cedar-covered hills and limestone bluffs. (TPWD 2020a)

The stretch between Paluxy and Glen Rose contains the famous Dinosaur Valley State Park where well-exposed dinosaur tracks have been found in the riverbed. The river at the park is a small, narrow waterway which occasionally has sufficient water for recreational use. During periods of heavy rainfall, the river reportedly contains numerous rapids. Scenic hardwood bottomlands consisting of oak, elm, and cedar are common along the entire section. Many outcroppings of limestone exist, and in some places, the riverbed itself is composed entirely of limestone. Many sand bars are present which, when combined with the state park, insure ample areas for camping and day use. Access, however, remains somewhat of a problem since some of the road crossings are fenced. In general, the Paluxy River is a picturesque river providing excellent recreational conditions when sufficient water levels are present. (TPWD 2020a)

The TWDB completed construction of a dam on the Paluxy River in 2007 to hold back (seasonal) flow near Glen Rose. This dam catches the water and pumps it north of Glen Rose into Wheeler Branch Reservoir. Somervell County utilizes this water for its drinking water supply. The pool above the dam is stocked with trout in the winter by TPWD. Summer stocking largely includes catfish. (Crise 2009)

The Paluxy River is known for its colorful green perch. These are often crossed between "natives" and fish that came in from stocking trucks supplying fish from fish farms to local farm ponds and tanks after the spring floods and natural flows relocate or wash the fish, fish eggs, and fry into the river. There is a natural restocking of the river when the floods come bringing rising waters from the Brazos River and Lake Whitney. The Paluxy River is known as the fastest rising river in Texas. The floodwaters bring sand bass, catfish, gar, spotted bass, and others to gravitate up to holding pools that are formed in the bottom of this river. (Crise 2009)

3.7.1.4 Brazos River

The Brazos River is the largest river between the Rio Grande and the Red River and has a total length of about 840 miles from the source of its longest fork. The river comprises approximately 45,700 square miles, 43,000 of which are located in Texas, and flows through most of the major physiographic regions in the state (Luminant 2013b, TPWD 2020b). The Brazos has three distinct segments: the upper, middle, and lower Brazos. Portions of the Brazos within 6 miles of CPNPP are classified as the middle Brazos. (TWDB 2012)

The Brazos River largely supports riparian vegetation, including bottomland hardwoods consisting of flood tolerant tree and shrub species. Riparian vegetation is an important component of maintaining the health of aquatic ecosystems. Riparian vegetation stabilizes stream banks, reduces sediment by filtration, moderates water temperature through shading during periods of high ambient air temperatures, and provides woody debris to the aquatic environment that may be used by aquatic organisms for a variety of life functions. (TWDB 2012) A 2004 middle Brazos River watershed riparian wildlife habitat evaluation indicated that common riparian species included black walnut (*Juglans nigra*), bur oak (*Quercus macrocarpa*), pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), sugar hackberry (*Celtis laevigata*), Ashe juniper (*Juniperus ashei*), cottonwood (*Populus deltoides*), Bois d' Arc (*Maclura pomifera*), American elm (*Ulmus americana*), post oak (*Quercus stellata*), and live oak (*Quercus virginiana*). Common understory species were characterized as black walnut, pecan, live oak, and red oak (*Quercus* spp.). Soft mast species found in the shrub layer included gum bumelia

(*Sideroxylon lanuginosum*), greenbrier (*Smilax* spp.), sugar hackberry, poison ivy (*Toxicodendron radicans*), tickletongue (*Zanthoxylum* spp.), Ashe juniper, yaupon (*Ilex vomitoria*), Eve's necklace (*Styphnolobium affine*), buttonbush (*Cephalanthus occidentalis*), sumac (*Rhus* spp.), chinaberry (*Melia azedarach*), red mulberry (*Morus rubra*), mustang grape (*Vitis mustangensis*). (Hale 2004) The riparian corridor has been highly encroached upon and fragmented throughout the Brazos River basin as a result of land clearing for a variety of human purposes and therefore riparian vegetation management and studies will continue to play an important role in understanding the Brazos River aquatic systems. (TWDB 2012)

The freshwater fish community within the Middle Brazos includes upland, plains, and lowland forms and a diversity of trophic (piscivore, invertivore, omnivore, herbivore) and reproductive (broadcast, substrate, floodplain, nest-building guilds). The mainstream of the middle Brazos River supports a limited number of fluvial specialists and a high abundance of habitat generalists. Four federal candidate species are known to occur in the Brazos River basin including two fishes, the smalleye shiner (*Notropis buccula*) and the sharpnose shiner (*Notropis oxyrhynchus*), and two mussels, the Texas fawnsfoot (*Truncilla macrodon*) and the smooth pimpleback (*Quadrula houstonensis*). However, the sharpnose shiner and smalleye shiner are considered extirpated from the middle Brazos River. In addition, the Brazos water snake (*Nerodia harteri*) is currently on the state's threatened list due to its limited range in the middle reaches of the Brazos River. (TWDB 2012)

Of these, the Texas fawnsfoot (Section 3.7.8.1.5) and the Brazos water snake (Section 3.7.8.2.5) have been identified within a 6-mile radius of CPNPP.

3.7.1.5 Lake Granbury

Lake Granbury is an 8,700-acre impoundment of the Brazos River and is operated by the BRA. Primary water uses include storage of flood and storm waters, municipal water supply, makeup water for CPNPP, and recreation. The lake is eutrophic, with a mean depth of 18 feet and maximum depth of 75. Lake features consist of bulk heading, natural shoreline, boat docks and piers, and emergent aquatic vegetation. Littoral vegetation is dominated by stands of giant reed (*Arundo donax*), cattail (*Typha* spp.), American water-willow (*Justicia americana*), and bulrush (*Scirpus* spp.). (Baird and Tibbs 2018)

No problematic species of aquatic vegetation currently exist in the reservoir. Habitat management work, funded by the BRA, includes the installation of crappie condos and mossback safe haven structures to enhance fish habitat. Sport fish include largemouth bass, channel catfish, white bass, and striped bass. Sport fishes are currently managed with statewide regulations with the exception of a 16-inch minimum length limit on largemouth bass. In 2013, management efforts began focusing on invasive species education and prevention. Recent management efforts include aquatic vegetation and boater access surveys conducted during summer 2017, a tier III largemouth bass age and growth sample during fall 2017, trap netting in winter 2017, and additional trap netting and standard gill netting during spring 2018. (Baird and Tibbs 2018)

Frequent golden algae blooms from 2001 to 2012 severely impacted sport fish populations in the lake. Efforts to mitigate these losses included increasing sampling effort, stocking striped bass annually, as well as stocking Florida largemouth bass to supplement the population. Golden alga blooms have not caused any major fish kills in recent years. (Baird and Tibbs 2018, TPWD 2020e)

A total of 49,350 acre-feet/year of supplemental water is pumped from Lake Granbury to SCR via an underground pipeline for the operation of CPNPP Units 1 and 2 (Luminant 2013b) and to control the concentration of dissolved solids in SCR. The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. To allow for one pumping unit being temporarily out of service, the pumping station on Lake Granbury includes four pumps with 21.7 MGD of rated capacity each, for a total installed name-plate capacity of 86.8 MGD. The Lake Granbury diversion pump intakes contain protective screens. The screens contain 1/4-inch diameter bars, spaced 2 inches apart in each direction. The outer face of the screen is curved in a cylindrical configuration, 4 feet high by 8 feet in diameter. The outer surface area of the screen is approximately 68.5 square feet for each pump, so that the maximum velocity attained by the approaching water immediately before passage through the screen is 0.49 fps. A return water pipeline from SCR to Lake Granbury exists but has reportedly never been used. (Luminant 2013b) The current TPDES permit for the CPNPP site only permits discharges to SCR.

3.7.2 Terrestrial and Wetland Communities

CPNPP consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. A large portion of the site also consists of SCR, which is bordered by an intermixed mosaic of woodland and grassland habitats. Grounds maintenance consists of mowing roadside habitat periodically during the growing season, tree trimming in the spring and fall, as well as regular cleaning of the yards. Pipeline maintenance is not regularly scheduled; however, vegetation management and leak repairs were performed in 2019. Additional maintenance outside of scheduled activities is completed through a preventative maintenance work order.

CPNPP's stormwater management procedure implements the SWPPP that includes BMPs for any ground-disturbing activities. This procedure provides guidance for meeting the terms and conditions of TPDES general permit No. TXR050000 for monitoring and reporting stormwater outfall discharges. In addition, monthly monitoring activities identified in the procedure are intended to go beyond SWPPP compliance by including proactive measures to minimize potential environmental impacts of station activities. These measures include quarterly visual monitoring, a monthly comprehensive site evaluation, as well as weekly equipment inspections.

These following sections identify terrestrial and wetland ecological resources and describes species composition and other structural and functional attributes of terrestrial biotic assemblages that could be affected by the continued operation and maintenance of the facilities.

3.7.2.1 Physiographic Province

CPNPP is located within the Great Plains physiographic province of the United States. This province stretches from Montana south through Texas and is bordered on the west by the Rocky Mountains. It covers portions of Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas. The province is 450,000 square miles and slopes downward to the east. The region is underlain by bedrock composed of shales, limestones, sandstones, conglomerates, and lignite. (NPS 2018)

3.7.2.2 Ecoregion

CPNPP is situated within the Grand Prairie ecoregion, a subset of the larger Crosstimbers ecoregion. The Grand Prairie ecoregion is an undulating plain that exists on lower cretaceous limestones with embedded marl and clay. The landscape consists of wide lowlands and limestone mesa uplands. The topography is generally considered hilly with well drained soils. (Griffith et. al 2004)

The area used to predominantly consist of tallgrass prairie, where fire was historically dominant on the landscape and helped keep woody plant growth abated. However, fire suppression following settlement of the region has allowed for species such as Ashe juniper and mesquite (*Prosopis glandulosa*) to become more common. Rainfall averages between 20 and 30 inches per year. The ecoregion is not as arable as others to the east and west, therefore land is often used as rangeland or pastureland including grazing on ridges with shallow soils and farming of corn, grain sorghum, and wheat on the deeper soils on the flats. (Griffith et al. 2004; Griffith et al. 2007; TAMFS 2020)

Grand Prairie grasses include big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), hairy grama (*Bouteloua hirsute*), Texas wintergrass (*Nassella leucotricha*), sideoats grama (*Bouteloua curtipendula*), and Texas cupgrass (*Eriochloa sericea*). Some common Great Plains animals, such as black-tailed jackrabbit and the scissortail flycatcher, range farther east through the Grand Prairie, creating an overlap in Great Plains and eastern forest species. (Griffith et al. 2007)

Ten dominant habitat types exist within a 6-mile radius of CPNPP (TEAM 2021). Six other habitat types were mapped but were not considered dominant (each occupies less than 1 percent of the total habitat types) and are outlined in Section 3.7.2.2.11. A brief description of habitat types and subsystems, including state listed natural communities, is provided below.

3.7.2.2.1 Edwards Plateau Limestone Savanna and Woodland

The Edwards Plateau Limestone Savanna and Woodland is the largest habitat type within the 6-mile radius consisting of approximately 25,022 acres. It contains a rolling to level topography, often on plateau tops but can also be found on gentle slopes. It is primarily found on Cretaceous limestones of the Edward Plateau and Lampasas Cutplain. The soils generally consist of loams, clay loams, or clays with a typical limestone parent material. The upland system of this ecosystem is typified by a mosaic of evergreen oak and juniper forests, woodlands, and savannas over shallow soils of rolling uplands and adjacent upper slopes within the Edwards Plateau and some adjacent ecoregions where limestone is present. (Elliott 2014; TEAM 2021)

Significant open areas dominated by grasses may resemble prairies. Species such as plateau live oak (*Quercus fusiformis*) or Ashe juniper often dominate the canopy of this system. Other canopy species may include Texas oak (*Quercus buckleyi*), lacey oak (*Quercus laceyi*), cedar elm (*Ulmus crassifolia*), Texas ash (*Fraxinus texensis*), white shin oak (*Quercus sinuata* var. breviloba), and Vasey shin oak (*Quercus vaseyana*). The shrub layer may be fairly well-developed, containing overstory species, as well as midstory species such as Texas persimmon (*Diospyros texana*), agarito (*Mahonia trifoliolata*), Texas mountain laurel (*Sophora secundiflora*), and honey mesquite (*Prosopis glandulosa*). The understory can contain various graminoid species, such as little bluestem, sideoats grama, cane blustem (*Bothriochloa barbinodis*), silver bluestem (*Bothriochloa laguroides* ssp. torreyana), Texas wintergrass (*Nassella leucotricha*), Indiangrass, curlymesquite (*Hilaria belangeri*), buffalograss (*Bouteloua dactyloides*), big bluestem, hairy grama, Texas grama (*Bouteloua rigidiseta*), seep muhly (*Muhlenbergia reverchonii*), Lindheimer muhly (*Muhlenbergia lindheimeri*), purple threeawn (*Aristida purpurea*), and/or cedar sedge (*Carex planostachys*). The composition of the grassland component is driven by grazing, fire, and climate. (Elliott 2014)

3.7.2.2.2 Crosstimbers Oak Forest and Woodland

The Crosstimbers oak forest and woodland ecosystem type is the second largest habitat within the 6-mile radius of CPNPP, consisting of approximately 21,692 acres, and contains gently rolling, moderately dissected uplands, and irregular plains. The soils largely consist of sandy loams, some with a claypan. This system is generally described as a savanna or woodland dominated by post oak and/or blackjack oak (*Quercus marilandica*). Other species in the canopy may include cedar elm, plateau live oak, sugarberry (*Celtis laevigata*), and eastern redcedar (*Juniperus virginiana*). The understory may have been historically dominated by little bluestem, but current understory composition may be largely determined by land use history and grazing pressure. (Elliott 2014; TEAM 2021)

In the east, where precipitation is greater, tallgrass species such as big bluestem and Indiangrass may be important components of the understory or occupy prairie patches. In the drier west, shortgrass species such as buffalograss become dominant. Non-native species such as rescuegrass (*Bromus catharticus*), bermudagrass (*Cynodon dactylon*) and King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*) frequently dominate the herbaceous layer. Fire suppression has significantly converted the composition of this ecotype, altering the once open understory into a near continuous to ground level closed canopy. (Elliot 2014)

3.7.2.2.3 Edwards Plateau Limestone Shrubland

This habitat type is the third largest, consisting of approximately 4,924 acres, and is often found on massive limestone formations. It may occur on plateaus of slopes and can form a discontinuous band around a plateau edge. It can occur as extensive continuous shrub cover or occur as discontinuous shrubland. White shin oak (*Quercus sinuata* var. *breviloba*), plateau live oak, and/or Ashe juniper may be dominant within this ecotype. Evergreen sumac (*Rhus virens*), prairie sumac (*Rhus lanceolata*), Texas redbud (*Cercis canadensis* var. *texensis*), elbowbush (*Forestiera pubescens*), netlead forestiera (*Forestiera reticulata*), Mexican buckeye (*Ungnadia speciosa*), Texas mountain laurel, Texas persimmon, mejorana (*Salvia ballotiflora)*, fragrant mimosa (*Mimosa borealis*), brasil (*Condalia hookeri*), skunkbrush sumac (*Rhus trilobata*), Lindheimer pricklypear (*Opuntia engelmannii* var. *lindheimeri*), and agarito may also be dominant shrub species. Herbaceous cover may be patchy and consists of species including little bluestem, sideoats grama, Texas grama (*Bouteloua rigidiseta*), red grama (*Bouteloua trifida*), curlymesquite (*Hilaria belangeri*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), Texas wintergrass (*Nassella leucotricha*), hairy tridens (*Erioneuron pilosum*), and threeawn (*Aristida* spp.). Disturbances such as fire can be an important process in maintaining this system. (EMST n.d.; TEAM 2021)

3.7.2.2.4 Southeastern Great Plains Floodplain Forest

The Southeastern Great Plains Floodplain Forest habitat type is typically found in relatively broad flats at low topographic positions along large streams and rivers, such as the Brazos, where alluvial deposition dominates. Approximately 4,655 acres of this habitat type exist within the 6-mile radius. It is characterized by bottomland ecological sites with loamy, sandy, and clayey soils. Canopy dominants may include pecan, white ash (*Fraxinus americana*), water oak (*Quercus nigra*), cedar elm, sugarberry, American elm, live oak, American sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), common honey locust (*Gleditsia triacanthos*), bur oak, red mulberry (*Morus rubra*), green ash (*Fraxinus pennsylvanica*), and western soapberry (*Sapindus saponaria* var. *drummondii*). Along river margins, species such as American sycamore, eastern cottonwood (*Populus deltoides*), and black willow (*Salix nigra*) may dominate. (Elliott 2014)

Overgrazing and/or over-browsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include American beautyberry (*Callicarpa americana*), common buttonbush (*Cephalanthus occidentalis*), deciduous holly (*Ilex decidua*), yaupon, gum bumelia, common persimmon (*Diospyros virginiana*), farkleberry (*Vaccinium arboreum*), eastern redcedar, roughleaf dogwood (*Cornus drummondii*), and rusty blackhaw (*Viburnum rufidulum*). These species may occur as dense patches in areas of disturbance but are otherwise fairly sparse. Non-native grasses that may dominate these sites include bermudagrass, King Ranch bluestem, and Johnsongrass (*Sorghum halepense*). Herbaceous cover may be quite high, especially in areas where shrub cover is low. The non-native trees such as Chinese tallow (*Triadica sebifera*) and chinaberry (*Melia azedarach*) may be present. (Elliott 2014)

3.7.2.2.5 Urban Low Intensity

This type includes areas that are built-up but not entirely covered by impervious cover, including most of the area within cities and towns. Approximately 4,520 acres of the 6-mile radius are considered urban low intensity. (Elliott 2014; TEAM 2021)

3.7.2.2.6 Open Water

In addition to large lakes, rivers, and marine water, ephemeral ponds may be mapped as open water. Some mapped areas may support vegetation with pioneering species such as black willow, eastern cottonwood, Chinese tallow, seepweeds (*Suaeda* spp.), sea ox-eye daisy (*Borrichia frutescens*), saltwort (*Batis maritima*), rushes (*Juncus* spp.), sedges (*Carex* spp.), cattails (*Typha* spp.), and spikerushes (*Eleocharis* spp.). The majority of this habitat type is identified as SCR. Approximately 3,517 acres of this habitat type exists within the 6-mile radius. (Elliott 2014; TEAM 2021)

3.7.2.2.7 Southeastern Great Plains Riparian Forest

This habitat type is found within buffer zones of headwater streams. Approximately 2,450 acres of Southeastern Great Plains Riparian Forest exist within the 6-mile radius. Typically, this habitat type is found in areas with erosional processes that dominate over alluvial deposition. Trees that may be present in stands of this system include sugarberry, cedar elm, American sycamore, eastern cottonwood, plateau live oak, water oak, willow oak (*Quercus phellos*), western soapberry, black willow, white ash, green ash, common honey locust, honey mesquite, and pecan. Shrub layer development is variable, sometimes with species such as indigo bush (*Amorpha fruticosa*), swamp privet (*Forestiera acuminata*), deciduous holly, yaupon, gum bumelia, eastern redcedar, common persimmon, roughleaf dogwood, brasil, huisache (*Acacia farnesiana*), and/or rusty blackhaw. A few sites may be shrub-dominated without an overstory canopy. (Elliott 2014; TEAM 2021)

Herbaceous cover can be variable and depends on overstory and shrub canopies and recent flooding history. Herbaceous species may include Virginia wildrye (*Elymus virginicus*), frostweed (*Verbesina virginica*), woodoats (*Chasmanthium latifolium*), narrowleaf woodoats (*Chasmanthium sessiliflorum*), eastern gammagrass (*Tripsacum dactyloides*), Drummond's aster (*Symphyotrichum drummondii* var. *texanum*), common broomweed (*Amphiachyris dracunculoides*), western ragweed (*Ambrosia psilostachya*), white avens (*Geum canadense*), Canada snakeroot (*Sanicula canadensis*), switchgrass (*Panicum virgatum*), beadstraw (*Galium* spp.), and sedges. Upland species such as little bluestem, Texas wintergrass (*Nassella leucotricha*), and Indiangrass may be common. Woody vines such as saw greenbrier (*Smilax bona-nox*), poison ivy, peppervine (*Ampelopsis arborea*), and grapes (*Vitis* spp.) may be common. (Elliott 2014)

Non-native grass species that may be common to dominant on these sites include giant reed, bermudagrass, and Johnsongrass. Non-native shrubs, such as privets (*Ligustrum* spp.) and Chinese tallow, may also be encountered. (Elliott 2014)

3.7.2.2.8 Edwards Plateau Dry-Mesic Slope Forest and Woodland

Approximately 1,795 acres of this habitat type exists within the 6-mile radius. The Edwards Plateau Dry-Mesic Slope Forest and Woodland habitat type is found on slopes within the Edwards Plateau and adjacent ecoregions. Cuestas of cretaceous chalk in the Blackland Prairie and calcareous slopes of the Crosstimbers may also be occupied by this system. Soils are generally dark clay to clay loam and are typically shallow. The canopy is typically dominated or co-dominated by Texas oak, lacey oak, white shin oak, Texas ash, cedar elm, escarpment black cherry (*Prunus serotina* ssp. *eximia*), Arizona walnut (*Juglans major*), and/or netleaf hackberry (*Celtis laevigata* var. *reticulata*). Plateau live oak and Ashe juniper are often present and are sometimes co-dominant with deciduous species of this system. (Elliott 2014; TEAM 2021)

Canopy closure is variable, and this ecotype can either be categorized as forests or woodlands. The shrub layer may be well-represented, especially where the overstory canopy is discontinuous. Species such as red buckeye (*Aesculus pavia* var. *flavescens*), Texas redbud, elbowbush, Mexican buckeye, Jersey tea (*Ceanothus herbaceus*), Carolina buckthorn (*Frangula caroliniana*), Texas mountain laurel, rusty blackhaw, sumac, grape, and silktassel (*Garrya ovata*) may be present in the shrub layer. With the large amount of exposed rock, frequent accumulation of leaf litter, and significant canopy closure, herbaceous cover is generally sparse, with cedar sedge often present. Woodland forbs such as widowstears (*Tinantia anomala*), silver-puff (*Chaptalia texana*), baby blue-eyes (*Nemophila phacelioides*), cedar sage (*Salvia roemeriana*), Texas lespedeza (*Lespedeza texana*), and various ferns may also be present, if patchy. Grasses such as little bluestem and gramas (*Bouteloua* spp.) may occur, typically scattered and patchy. (Elliott 2014)

3.7.2.2.9 Native Invasive: Mesquite Shrubland

This habitat type comprises approximately 1,341 acres within the 6-mile radius. The Mesquite Shrubland type is characterized by a dominantly invasive honey mesquite landscape. In addition, species such as huisache, sugar hackberry, Ashe juniper, cedar elm, lotebush (*Ziziphus obtusifolia*), agarito, winged elm (*Ulmus alata*), sumacs, brasil, common persimmon, Texas persimmon, granjelo (*Celtis ehrenbergiana*), and Lindheimer prickly pear (*Opuntia engelmannii* var. *lindheimeri*) may also be important. Trees such as plateau live oak, live oak, or post oak may form a sparse canopy. (Elliott 2014; TEAM 2021)

3.7.2.2.10 Row Crops

Row crops include all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops are generally mapped as grassland. Approximately 1,162 acres of row crops exist within a 6-mile radius of CPNPP. (Elliott 2014; TEAM 2021)

3.7.2.2.11 Other Habitat Types

Six additional habitat types make up the remainder of the acreage within the 6-mile radius but were not considered dominant (these types occupy less than 1 percent of the total radius or 660 acres or less). The remaining habitat includes urban high intensity, barren land, grass farms, swamps, marshes, and southeastern coastal plain cliff types. (TEAM 2021)

3.7.2.3 <u>Wetlands</u>

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (USACE 1999).

Thirteen functions and values are typically considered by regulatory and conservation agencies when evaluating wetlands. These are used as part of the New England method. These include groundwater recharge/discharge; flood flow alteration; fish and shellfish habitat; sediment/toxicant/pathogen retention; nutrient removal/retention/transformation; production export (nutrient); sediment/shoreline stabilization; wildlife habitat; recreation (consumptive and non-consumptive); educational/scientific value; uniqueness/heritage/visual quality/aesthetics; and threatened or endangered species habitat. (USACE 1999)

The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics, and functions of wetland, riparian, and deepwater habitats in the United States. (USFWS 2002)

Based on a review of USFWS NWI maps of the site (USFWS 2020a), there are approximately 4,869.06 acres of wetlands within a 6-mile radius of CPNPP, composed of the following types (Figure 3.7-1):

- Freshwater emergent wetlands covering approximately 43.78 acres (0.90 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 335.64 acres (6.89 percent of total wetland habitat)
- Freshwater ponds covering approximately 256.39 acres (5.27 percent of total wetland habitat)
- Lakes covering approximately 2,904.26 acres (59.65 percent of total wetland habitat)
- Riverine waters covering approximately 1328.99 acres (27.29 percent of total wetland habitat)

The CPNPP property is approximately 7,700 acres in size and completely contains SCR. Based on the NWI data (USFWS 2020a), a total of 3,268.26 acres of wetlands, lakes, ponds, and riverine waters are located on the CPNPP site (Figure 3.7-2). Several freshwater forested/shrub wetlands are mapped as occurring along the edge of SCR.

Based on the NWI data, the following wetland water types are located on the CPNPP site:

- Freshwater emergent wetlands covering approximately 30.24 acres (0.93 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 285.36 acres (8.73 percent of total wetland habitat)
- Freshwater ponds covering approximately 17.8 acres (0.54 percent of total wetland habitat)

- Lakes covering approximately 2,902.74 (88.82 percent of total wetland habitat)
- Riverine waters covering approximately 32.12 acres (0.98 percent of total wetland habitat)

3.7.2.4 Terrestrial Animal Communities

The terrestrial community at CPNPP consists of savannas and forested areas interspersed with mesquite woodland and shrublands, developed open space, and developed areas (TEAM 2021). Wildlife species found primarily in the wooded areas are those typically found in the central Texas ecological landscape. Terrestrial species that are federally and/or state listed as endangered or threatened and known to occur in the vicinity of CPNPP are discussed in detail in Section 3.7.8. Suitable habitat likely exists within the vicinity of CPNPP for several state and federally listed protected terrestrial species, including black rail (*Laterallus jamaicensi*), golden cheeked warbler (*Setophaga chrysoparia*), interior least terns (*Sternula antillarum athalassos*), piping plovers (*Charadrius melodus*), rufa red knots (*Calidris canutus rufa*), white-faced ibis (*Plegadis chihi*), whooping cranes (*Grus americana*), Brazos water snakes, and Texas horned lizards (*Phrynosoma cornutum*) (THL). Table 3.7-3 includes terrestrial species that are likely to be observed in Hood and Somervell counties. None of the species observed or reported at the site are unusual for the region.

Mammals commonly seen on and in the vicinity of CPNPP or animals suited to the habitat surrounding the site include white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), bobcats (*Lynx* spp.), raccoons (*Procyon lotor*), beavers (*Castor* spp.), skunks (*Mephitis mephitis*), opossums (*Didelphis Virginiana*), armadillos (*Dasypus* spp.), fox-squirrels (*Sciurus niger*), rabbits (*Oryctolagus cuniculus*), small rodents and wild boars (*Sus scrofa*).

Reptiles and amphibians likely to inhabit the CPNPP site and its surrounding areas include common grass snakes (*Natrix* spp.), rattlesnakes (*Crotalus* spp.), Texas spiny lizard (*Sceloporus olivaceus*), western ratsnake (*Pantherophis obsoletus*), eastern hognose snake (*Heterodon platirhinos*), Blanchard's cricket frog (*Acris crepitans*), and gulf coast toad (*Incilius valliceps*) (iNaturalist 2020a; iNaturalist 2020b).

Bird populations on the CPNPP site include year-round residents, seasonal residents, and transients (birds stopping briefly during migration). Year-round residents include Carolina chickadees (*Poecile carolinensis*), Bewick's wrens (*Thryomanes bewickii*), northern mockingbirds (*Mimus polyglottos*), mallards (*Anas platyrhynchos*), rufous-crowned sparrow (*Aimophila ruficeps*), and great-tailed grackles (*Quiscalus mexicanus*). (Haynie 2017) Summer seasonal residents include common nighthawks (*Chordeiles minor*), eastern kingbirds (*Tyrannus tyrannus*), ash-throated flycatchers (*Myiarchus cinerascens*), white-throated swifts (*Aeronautes saxatalis*), cliff swallows (*Petrochelidon pyrrhonota*), and chimney swifts (*Chaetura pelagica*). Winter seasonal residents include sandhill cranes (*Antigone canadensis*), common loons (*Gavia immer*), Canada geese (*Branta canadensis*), peregrine falcons (*Falco peregrinus*), American coots (*Fulica americana*), brown thrashers (*Fulica americana*), and blue-headed vireos (*Fulica americana*) (Lockwood 1997)

In addition, the Texas Natural Diversity Database (TXNDD) identified one wading bird rookery at the north end of SCR. The exact species assemblage is not identified (TPWD 2020c).

While there are resident bird populations, the region serves as a pass-through area for semi-annual migrations of neotropical birds that may range between South America and Canada, as well as seasonal migrations of waterfowl. The CPNPP site is located within the central flyway, a major migratory route for birds during the spring and fall. The central flyway extends from northern Canada south through Texas. Migrating birds often fly these routes at night and land to rest early in the morning. Before dawn they seek out suitable habitat, called stopovers, in which to feed and avoid predators. Large natural barriers such as mountains and deserts, or large bodies of water, create especially crowded stopovers. These stopovers are very important because flight over the barrier will mean a long stretch without any opportunity to stop for food, rest, or cover. Along the central flyway, rivers and lakes often provide stopover habitat for migratory birds. Common migrants that pass through the area include, but are not limited to, American golden-plovers (*Pluvialis dominica*), chimney swifts (*Chaetura pelagica*), ruby-throated hummingbirds (*Archilochus colubris*), purple martins (*Progne subis*), Northern parulas (*Setophaga americana*), black-throated green warblers (*Setophaga virens*), yellow-throated warblers (*Setophaga dominica*), black-and-white warblers (*Mniotilta varia*), Hudsonian godwits (*Limosa haemastica*), buff-breasted sandpipers (*Tryngites subruficollis*), olive-sided flycatchers (*Contopus cooperi*), yellow-billed cuckoo (*Coccyzus americanus*), golden-winged warblers (*Vermivora chrysoptera*), cerulean warblers (*Setophaga cerulea*) (Shackelford et al. 2005).

3.7.2.5 Transmission Lines

Physical features (e.g., length, width, route) of each of the in-scope transmission lines are described in Section 2.2.5.1. Only those transmission lines that connect the power plant to the switchyard where electricity is fed into the regional distribution system (encompassing those lines that connect the nuclear plant to the first substation of the regional electric power grid) and power lines that feed the plant from the grid during outages are considered within the regulatory scope of license renewal environmental review (NRC 2013a, Section 3.1.6.5). The transmission corridors are situated within the Great Plains physiographic province. All in-scope transmission lines are located completely within the CPNPP EAB as shown in Figure 2.2-2. The in-scope transmission line corridors consist almost entirely of developed land; however, there is some vegetation present within the northern and southern transmission line corridors. The transmission corridors do not cross any state or federal parks or sensitive resources.

3.7.3 Potentially Affected Water Bodies

The major water resource in the vicinity of CPNPP is SCR. SCR is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell counties. As previously mentioned, the reservoir was built in 1979 by Vistra OpCo to serve as a cooling reservoir for CPNPP. The reservoir has a mean and maximum depth of 46 and 135 feet and is considered mesotrophic. Within SCR, an SSI was created by Vistra OpCo to form a separate enclosed water compartment to provide cooling water for normal and emergency purposes. The water level within the SSI is maintained by an equalization channel between the SSI and SCR. If the water level in SCR is depleted, a concrete weir, approximately 4 feet below the surface of the equalization channel, will prevent the SSI from draining. The primary source of water for both reservoirs is water pumped from Lake Granbury on the Brazos River (via an intake structure containing vertically mounted pumps housed on a pier) into the northeast cove of SCR.

Approximately 43,350 acre-feet/year of supplemental water is pumped from Lake Granbury to SCR for the operation of CPNPP Units 1 and 2 (Luminant 2013b). The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. To allow for one pumping unit being temporarily out of service, the station includes four pumps with 21.7 MGD of rated capacity each, for a total installed name-plate capacity of 86.8 MGD. The Lake Granbury diversion pump intakes contain protective screens. The screens contain 1/4-inch diameter bars, spaced 2 inches apart in each direction. The outer face of the screen is curved in a cylindrical configuration, 4 feet high by 8 feet in diameter. The outer surface area of the screen is approximately 68.5 square feet for each pump, so that the maximum velocity attained by the approaching water immediately before passage through the screen is 0.49 fps. A return water pipeline from SCR to Lake Granbury also exists but has reportedly never been used. (Luminant 2013b)

The plant has two nuclear generating units and is located on a peninsula surrounded by SCR. CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula in the area of the circulating water intake structure. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps are located downstream of the traveling water screens to transport the screened flow to the condensers.

CPNPP utilizes a once-through cooling system. CPNPP withdraws cooling water from SCR at a peak rate of about 3,168 MGD for both units, which is equivalent to recirculating the entire volume of water in the reservoir every 16 days. Make-up water is permitted to be diverted from Lake Granbury on the Brazos River to maintain conservation pool level. The power plant intakes cooling water from about the midpoint of the main axis of the reservoir and discharges to the south arm through a submerged discharge structure. Circulating water is pumped through the condenser tubes, where its temperature will increase approximately 15°F above the temperature at the intake. It is then routed back to the reservoir via a discharge tunnel which terminates in an open discharge structure. The discharge velocity of the water re-entering the reservoir is approximately 9.8 ft/sec. The low discharge velocity encourages stratification of the heated circulating water. CPNPP operates all four pumps per unit for the rate of 3,168 MGD; during the winter, three pumps per unit are operated for a rate of 2,376 MGD.

The travelling screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every 4 hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures drop below 38°F. Wash water for each screen is employed at 329 gpm with a pressure of 100 psi. Fish and debris from the screens are washed into a trough located directly upstream of the screens and collected in a bin and disposed.

Of note, the circulating water system is treated with chlorine on a daily basis to prevent bacterial and algal growth, however, residual chlorine will be monitored and limited to a maximum of 0.5 mg/L to minimize effects on the aquatic system.

Both SCR and Lake Granbury are subject to stratification in the summer months. Stratification will begin as surface temperatures approach 75°F. Accompanying this stratification will be a lowering of dissolved oxygen (DO) at levels below the thermocline. Low amounts of DO often result in the exclusion of most aquatic biota from the affected area. Make-up water received from Lake Granbury during warm weather periods can have low DO levels, and therefore a cascade system is utilized to reaerate the water before entry to SCR.

Temperature distribution was studied shortly after initial operation of Units 1 and 2 in 1993. The results indicated that the thermocline decreased very slightly (less than 4°F) from 40 to 50 feet and then temperatures dropped sharply at 60 feet and then decreased slowly to the bottom of the reservoir. The area around the thermal plume at the time decreased only 2-4°F down to 15 feet. Warmer water and vertical mixing with depth, below 20 feet, have been observed in SCR since CPNPP Unit 1 became operational. In the first year that Units 1 and 2 were operational, temperatures below the thermocline down to 70 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1°F warmer, respectively, than 1991. Temperatures at 80 feet, however, have remained about 57°F since Unit 1 became operational. The study concluded that the decreased thermocline and increased heat budget down to 70 feet is likely result of CPNPP Unit 2 operation. (Luminant 2013b).

A thermal study was conducted in 2007 to assess increasing the thermal uprate to 3,650 MWt. The report utilized a compilation of previous studies as well as additional modelling techniques to evaluate intake temperatures and evaporation rates from the increase in thermal output. The three-dimensional model was run with full load conditions using the current reactor thermal output of approximately 3,458 MWt per unit with a waste heat load of 2,260 MWt per unit, also called the "base case." The base case was used for comparison of intake temperatures and evaporation rates against the "uprate case." The uprate case includes the nominal 3,650 MWt thermal output per unit and an equivalent waste heat load of 2,400 MWt per unit. The results indicated that there was a small increase in temperature at both the intake and discharge locations. The difference between the base case and the uprate case at the discharge and intake structures, respectively were 1.2 and 0.6 degrees F, respectively. Another study in 2017 was conducted to model the temperature changes in SCR due to the thermal plume. Results from the models indicated that the dilution effect of the submerged outfall location reduced the discharge temperature rise. The plume is estimated to be the largest during the mid-winter and smallest during the hottest part of the summer. The differential heat loss from the plume is driven by hydrometeorology. Colder temperatures imply a lower rate of heat dissipation and a correspondingly larger plume. Similarly, a higher wind speed entails higher heat transfer and a smaller plume. The mid-winter scenario is dominated by the much lower water temperatures hence a much-enlarged plume with the model indicating a size of 1,864 acres during the normal-late summer, and 2,914 acres during normal mid-winter.

Cleaning and maintenance procedures at the intake and discharge structures at SCR are primarily in association with cleaning the travelling water screens. No dredging has occurred, is planned, or is anticipated for CPNPP.

3.7.4 Places and Entities of Special Ecological Interest

This section documents the occurrence, location and description of communities and habitats of special ecological interest within the plant vicinity. Areas of scientific interest, public interest, or areas that may be ecologically sensitive are recorded below.

3.7.4.1 Dinosaur Valley State Park

Dinosaur Valley State Park is an approximately 1,587-acre national natural landmark that opened in 1972 to display historic dinosaur tracks. It sits along the Paluxy River in Somervell County approximately 3.5 miles from CPNPP. While many people travel to see the dinosaur tracks, the park is situated at the intersection of several ecoregions, which makes it a prime location to spot a variety of unique plants and animals. Visitors can participate in a variety of recreational activities including camping, picnicking, hiking, mountain biking, swimming, fishing, and horseback riding. (TPWD 2021c)

Around 113 million years ago, the park area was thought to be at the edge of an advancing and retreating sea. Calcium carbonate deposits from the shells of sea crustaceans formed a limey mud that created the perfect consistency to preserve the tracks. Herbivorous dinosaurs came to browse the large tropical palm and conifer trees that grew inland from the shore. Carnivorous dinosaurs came to prey on the herbivores. Occasionally, dinosaurs would cross the tidal flats, leaving tracks in the mud. (TPWD 2021c)

In 1909, George Adams discovered the tracks in the limestone bed of the river. The tracks remained unprotected until 1937, when R.T. Bird was collecting fossils for the American Museum of Natural History and travelled to Glen Rose to see the tracks. While exploring, he found multiple tracks including those of both sauropods (believed to be the *Acrocanthosaurus*, a smaller relative of the *Tyrannosaurus rex*) and theropods (believed to be the *Sauroposeidon proteles*). These tracks would be the first distinct sauropod tracks ever discovered. (TPWD 2021c)

Today, the park and surrounding areas host a variety of wildlife species. Mammals seen in the park include white-tailed deer, coyotes, bobcats, raccoons, beavers, skunks, opossums, armadillos, fox squirrels, rabbits, and small rodents. Several kinds of lizards and snakes are also found within the park. The Paluxy River hosts yellow and channel catfish, striped and largemouth bass, alligator gar, freshwater drum, and bluegill. Birds of the park consist of a variety of resident and migrant species including wild turkeys, golden-cheeked warblers, and black-capped vireos. (TPWD 2021c)

3.7.4.2 Squaw Creek Park

SCP serves as the public entrance to utilize SCR. It is located at CPNPP and provides recreation such as boat fishing, bank fishing, and hiking (Luminant 2021b). Details for SCR, including species stocked for sportfishing, are discussed in Section 3.7.1.1.

3.7.4.3 Wheeler Branch Park

Wheeler Branch Park is located on Wheeler Branch Reservoir, two miles north-northwest of the City of Glen Rose in Somervell County. The reservoir is a 180-acre impoundment operated by the SCWD. The reservoir began filling in 2007 and has a maximum dept of 85 feet. The primary purpose of the reservoir is to provide drinking water to Somervell County residents. Water level is maintained by pumping water from the Paluxy River during periods of high flow. Wheeler Branch Reservoir is an oligotrophic reservoir, with water transparencies typically ranging from 10 to 15 feet. Habitat features consist of flooded cedars around the periphery, flooded standing timber in deeper water, brush piles, rock piles and ledges. Details for Wheeler Branch Reservoir including species composition are discussed in Section 3.7.1.2. (Tibbs and Baird 2018)

3.7.5 Invasive Species

This section contains the occurrences of aquatic and terrestrial invasive species in the CPNPP vicinity, and management activities undertaken by the plant to control such species. The TPWD maintains an inventory of invasive species known to have significant economic impacts on agricultural systems, public infrastructure, or natural resources, or are recognized by ecologists to degrade natural ecosystems, negatively affect native species, or have the potential to have deleterious effects on human health (TPWD 2020d). Vistra OpCo maintains guidance documents with policies and procedures for invasive species management of threadfin and gizzard shad, tilapia, and Harris mud crabs in both SCR and the SSI. In addition, CPNPP completes a tri-annual aquatic life study to monitor for the aforementioned species as well as fish species composition, Asian clams, zebra mussels, and golden algae.

3.7.5.1 Aquatic Plants

3.7.5.1.1 Hydrilla (Hydrilla verticillata)

Hydrilla is an aquatic invasive species that is considered a federal noxious weed and is prohibited without a permit in Texas (TPWD 2020d; USDA 2010). There are two forms, monoecious that likely comes from Korea, and dioecious, which comes from India. The dioecious form was first introduced into Florida when aquarium plants were discarded in public waters. The monoecious form was introduced into Delaware and the Potomac River basin. Although it is on the federal noxious weeds list, it is still sold via the internet for aquariums. It is often spread by fragmented pieces attached to boats when the boats move between waterways. It is an herbaceous perennial that grows submersed underwater and can form dense mats. The plants can grow stems up to 25 feet and form dense mats across the surface of the water. It is rooted in the soil below the water surface, it has whorls of four to eight leaves around the stem and produces white flowers along the stalks. Part of what makes this species so invasive are its ability to reproduce rapidly from fragments, its ability to grow in a variety of habitats, and the ability to grow up to an inch a day. Besides reproducing from fragments, it can reproduce through tubers and buds on shoots. This species typically grows in freshwater locations such as ponds, reservoirs, and canals. It can also grow in a variety of depths from a few inches to up to 20 feet of water. Additionally, it can grow with very little sunlight, which allows it to out-compete other species. (Jacono et al. 2020; UFCAIP 2020)

The quick rate of growth and the ability to grow at low light before other plants allows hydrilla to outcompete native species for resources or cause native species to die off. Additionally, it can interfere with recreational activities, impact fish species, and alter the water chemistry. This species can cause economic harm by slowing the flow of water in irrigation canals or clog water control pumping stations. The cost to remove hydrilla from water systems can cost thousands to millions of dollars. Management can be through biological, chemical, or mechanical means. Although mechanical means can cause the hydrilla to fragment, which can lead to additional growth since it is often how the plant reproduces. (Jacono et al. 2020; UFCAIP 2020) According to the USGS Nonindigenous Aquatic Species Database, hydrilla specimens have been collected from SCR in Somervell County (USGS 2020a). CPNPP does not currently have a documented control or monitoring program for hydrilla. Both TPWD and CPNPP aim to educate park visitors on reducing the spread of invasive species at SCR (Baird and Tibbs 2019; Luminant 2021b) Invasive species observed at CPNPP with the potential to impact operations are documented through the Vistra OpCo tracking system.

3.7.5.2 Aquatic Animals

3.7.5.2.1 Zebra Mussel (Dreissena polymorpha)

Zebra mussels were first introduced into the United States from the Black Sea to the Great Lakes. They are native to seas and rivers between eastern Europe and western Asia. Zebra mussels are small bivalves that are no larger than 50 mm long and named for the pattern on their shells; however, colors of the shell can vary, having only light or dark shells with no markings. Reproduction usually occurs during the spring or summer. Females produce approximately 40,000 eggs which are released into the water column and fertilized by males. Up to one million eggs can be produced per female during the spawning season. Larvae emerge after three to five days and remain free floating in the water currents until they develop enough to settle to the bottom and begin searching for a substrate to attach to. Adults are sexually mature when they reach 8–9 mm in length. Individuals typically live between three and nine years. Zebra mussels prefer habitat conditions with optimal temperatures between 68–77°F, although they can tolerate a range of conditions and have shown growth in temperatures as low as 43°F. They feed on algae by efficiently filtering as much as 1 liter of water per day per individual. (Benson et al. 2020a)

Zebra mussels have spread to many waterways due to their free-floating larval form. Larval mussels then mature and attach to boats by threads and are easily transported to other waterways. They cause significant damage and problems because of their biofouling capabilities. They colonize rapidly and have been known to attach to surfaces in high densities, such as in pipes, reducing water flow and intake capabilities in many nuclear and hydroelectric plants. They also disrupt the natural ecosystems they invade. They reduce the amount of food available and therefore outcompete many native mussel species, which also reverberates up the food chain as it removes food sources from other species including fish. Zebra mussels also affect native mussel species by directly attaching to them and restricting their ability to survive. (Benson et al. 2020a) Zebra mussels are an aquatic invasive species that is prohibited in Texas without a permit (TPWD 2020d). Zebra mussels have become a concern at SCR and the SSI because of their spread to the Brazos River basin. However, zebra mussels are intolerant of warm water and would not likely survive in SCR or the SSI. Zebra mussels have not been documented in the SSI within SCR as of 2018. However, CPNPP maintains procedures as well as implements tri-annual aquatic studies to monitor and control for zebra mussels in the SSI Further TPWD has focused management efforts at SCR to educate park visitors on the threats of zebra mussels and how to prevent their spread (Baird and Tibbs 2019).

3.7.5.2.2 Asian Clam (Corbicula fluminea)

Asian clams were first introduced to the United States in 1938 via the Columbia River in Washington State (Foster et al. 2020). Asian clams are small, lightly yellow-green to light-brown bivalves that average 25 mm in length but can be as large as 65 mm long. Its ability to reproduce rapidly, coupled with low tolerance of cold temperatures (2-30°C), can produce wild swings in population sizes from year to year in northern water bodies. Asian clams are asexual and are capable of reproducing by self-fertilization. The average life span of individual clams is between two and four years, but they can live up to seven years. Asian clams can be found in various water sources such as lakes and streams but prefer habitats with high levels of dissolved oxygen and substrate consisting of sand or clay where they can be found on or buried just below the sediment. (USFWS 2015)

The main threat to CPNPP from Asian clams stems from damage to pipes from clogging, where clams accumulate to such an extent that discharge from or intake into pipes is blocked. Asian clams can easily outcompete native species for food resources and habitat, as well as alter substrate. (Foster et al. 2020; USFWS 2015) According to the USGS Nonindigenous Aquatic Species Database, Asian clam specimens have been collected from SCR in Hood County (USGS 2020b). In addition, shells have been found onshore near the CPNPP; however, no documented live Asian clams were observed during studies in 2015 and 2016 nor during fish studies in 2018 in the SSI. Prior to 2008, CPNPP implemented biannual treatment with Bulab to control Asian clams. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for Asian clams is completed as part of the tri-annual aquatic life study.

3.7.5.2.3 Tilapia (Oreochromis spp.)

Tilapia are considered an aquatic invasive species and are prohibited without a permit in Texas (TPWD 2020d). Tilapia were introduced into SCR and the SSI sometime after 2010 as surveys prior to this time found no indication of the fish in the reservoirs. Over the past several years, tilapia biomass has rapidly increased. Tilapia is a non-native species from the Middle East and Africa, likely introduced to the United States via aquaculture operations and the aquarium trade. Several species occur in Texas, including (but not limited to) blue tilapia (*Oreochromis aureus*), Mozambique tilapia (*Oreochromis mossambicus*), and red tilapia (*Oreochromis niloticus*). Identification to species is difficult and hybridization is common. The exact taxonomy of tilapia in SCR is unknown, but likely involves hybrids of two or more species.

Tilapias are omnivorous and opportunistic feeders, and therefore will adapt their diet to what is available. Juveniles primarily feed on zooplankton, while adults consume certain types of planktonic and filamentous green algae, plants, macroinvertebrates, and occasionally other fish. They compete for the same food with threadfin shad and when food is limiting, can feed on small shad. They are commonly stocked in private impoundments to control certain green algae and vascular plant species. However, there are certain algal species that tilapia and/or other fish will not eat for various reasons. Tilapias are intolerant to cold temperatures and sensitive to golden algal toxins. Rapid temperature decreases can stress tilapia and mortality generally occurs when water temperature reaches the low 50s (°F). While cold temperatures are typically not an issue in the SSI or SCR, an outage during cold weather or a golden algae bloom under the right conditions could result in a die off. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for tilapia is completed as part of the tri-annual aquatic life study. As largemouth bass populations increase, predation may help control tilapia numbers.

3.7.5.2.4 Common Carp (Cyprinus carpio)

The common carp is native to Eurasia and was first introduced in the United States in the 1800s. Adult fish can be as long as 25 inches and weigh between 20–60 pounds. Age of sexual maturity of the individuals depends on water temperature, with most fish becoming mature between two and five years of age. Common carp spawn from April through August, commencing when water temperatures reach 62°F. Females release eggs into shallow areas which are then fertilized by males. The eggs stick to underwater surfaces such as logs or plants and then hatch within 3 to 16 days. Common carp have a wide range of habitat tolerances and can live in waters that have a range of oxygen, salinity, and turbidity level, but preferred habitats include shallow water with lots of vegetation and little current. When carp inhabit lakes, they will use warmer, shallower water with plenty of vegetation near the edges of the lake. However, during the winter can inhabit deeper areas. Common carp are omnivorous and feed on a variety of items including invertebrates, plankton, detritus, and vegetation. (Hammerson 2020; Nico et al. 2020)

Common carp can negatively affect the habitat where they exist by destroying vegetation and increasing the turbidity of the water. This reduces spawning habitat and water clarity, thereby reducing habitat for species that require clean water and aquatic vegetation. They have also been known to feed on the eggs of other fish, reducing populations of native species. (Nico et al. 2020) Common carp have been collected from the SSI. CPNPP does not currently have a documented control or monitoring program for common carp. Both TPWD and CPNPP aim to educate park visitors on reducing the spread of invasive species at SCR (Baird and Tibbs 2019; Luminant 2021b) Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system as well as documents occurrences through the Vistra OpCo tracking system.

3.7.5.2.5 Harris Mud Crab (Rhithropanopeus harrisii)

The Harris mud crab is native to the northwest Atlantic. It can be found from the Gulf of Saint Lawrence through the Gulf of Mexico in brackish waters along the coast. It has been introduced to California and Oregon as well as to other countries. The introductions to California and Oregon were likely through shipping ballasts where the larval stage was transported. It is believed that the introduction to Texas freshwater reservoirs is due to accidental release from boats or as bait. This species generally prefers brackish waters with mild salinity but has established populations in freshwater habitats. (Fofonoff et al. 2018)

Harris mud crabs are brown to olive, usually darker above and paler below. Males are typically 0.17-0.57 inches and females are 0.17-83 inches wide. Their walking legs are thin and can be somewhat hairy. They can typically produce 1,000 to 4,000 eggs, up to 7,500 eggs per clutch. Females are able to release fertilized egg clutches up to four separate times following a single mating. Multiple spawnings may also assure continued reproduction under stressful or hazardous conditions when mating activity may be reduced. (Harriet et al. 2021) After hatching, the larval stage remains in the water column until it goes through several molts and is able to settle along the bottom of the water body 15–32 days after hatching. Once established, the crabs are often associated with some form of shelter such as vegetation or decaying debris in freshwater or reefs in estuarine waters. Food sources include algae, carrion, mollusks, and amphipods. The primary predators of Harris mud crabs are fish, although little is known about the species that prey on the crabs in fresh water. (Fofonoff et al. 2018; Perry 2020)

Because little is known about the crab in places where it has invaded, impacts to ecosystems are difficult to discern. They likely have an impact on the food web, altering the trophic structure, particularly in freshwater ecosystems. This species is a known carrier of white spot baculovirus, which is detrimental to penaeid shrimp. They have also been known to cause biofouling issues with intake pipes, particularly in Texas. (Fofonoff et al. 2018; Perry 2020) Harris mud crabs have been documented in SCR. In 2009, a mesocosm study of chemical control alternatives for Harris mud crabs was completed in SCR. The study showed that Bulab (previously used for Asian clam control in the SSI) is most effective in reducing Harris mud crab populations. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for the Harris mud crab is completed as needed, as part of the tri-annual aquatic life study, as well as routinely done during the cleaning of the travelling intake screens.

3.7.5.3 Phytoplankton and Zooplankton

3.7.5.3.1 Golden Algae (Prymnesium parvum)

Golden algae was first documented in inland waters of the Middle East. It was documented for the first time in the United States in 1985 from a fish kill on the Pecos River in Texas. Four additional Texas river systems have since been affected by golden algae, including the Brazos, Canadian, Colorado, and Red rivers. Golden algae are single-celled phytoplankton which contain chlorophyll and can make their own food. Under certain conditions, they are able to prey on other organisms. Phytoplankton provide the base of the food chain in aquatic systems. These algae are microscopic, ranging in size from 8 to 11μm in length and 4 to 6μm in width. They are oval shaped and have two flagella used for locomotion and an additional organelle called a haptonema which allows them to attach to other organisms. Because of their microscopic nature and because they are light sensitive, samples for golden algae need to be collected from below the surface of the water and 400 to 1,000 magnification is needed to view the algae. This species can form cysts and remain dormant when conditions are not ideal, re-emerging when conditions become more favorable. (NMSU 2018; TPWD 2007; TPWD 2020e)

Golden algae can exist in aquatic systems without causing problems, but when they do cause problems, it can be devastating to the ecosystem. When conditions are favorable, the algae can create toxins. Chemical compounds are released from the algae which combine with minerals in the water to form toxins called prymnesins, which causes icthyotoxicity, therefore affecting gill-breathing species. This includes all fish, crayfish, bivalves, amphibians, and some plankton. Releasing toxins provides benefits to golden algae, such as causing other bacteria and algae to slow and making them easier prey to catch, repel zooplankton that prey on golden algae, and inhibit the growth of other algae species, thus outcompeting other alga species. The release of the prymnesins leading to toxic algal blooms occurs most often during the winter and spring when water temperatures are lower than 86°F, nutrients in the water are limited, and the pH is greater than 7.0, often resulting in fish kills. The toxins attach to exposed cells on the gills of fish and other gill-breathing species. The toxins continue to work inwards from the outer gill cells, damaging the cells through hemorrhaging and allowing water and chemicals into the cells and the circulatory system, eventually harming internal organs. When fish become infected, they can exhibit bleeding from the gills or become covered in mucous. Additionally, the mouth, eyes, and fins may become red. The toxicity can cause behavioral changes, such as causing lethargy, crowding near fresher water, leaping out of the water to avoid the toxins, or swimming slowly. When bivalves die, the soft bodies may be seen floating in the water. Large fish kills are common in water sources when golden algae blooms last for a long period of time. The water often becomes yellow, gold, or rust-colored, and will form foam where it is agitated, such as along shorelines. (NMSU 2018; TPWD 2007; TPWD 2020e)

There are very few treatments available for large water bodies to remove harmful golden algae. Ultraviolet light treatment has been successful in small areas, while copper-based algaecides can also be helpful. However, the algaecides can cause unwanted side effects for beneficial and native species. To reduce the risk of spreading golden algae, any boats and equipment should be cleaned thoroughly with hot water and allowed to dry for several days to prevent contamination of other water bodies. (TPWD 2007) Golden algae has been documented in the SSI in the SCR and has contributed to documented fish kills at CPNPP. The SSI historically has grown filamentous green algae from spring through the fall, causing screen and strainer clogging issues. As a result, dye has been added to the reservoir to reduce light penetration and control algal growth. Algal growth in the SSI appears to have declined over the past few years. While many factors play a role in filamentous green algae growth, the increasing tilapia densities may be suppressing growth.

Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Results from the 2018 SSI aquatic life studies indicated that CPNPP can discontinue monitoring for golden algae due to lack of recent documentation, but if a large-scale fish die-off occurs in the SSI or drought conditions exist during seasonal time frame when golden algae could exist then, the environmental team will sample for golden algae on a case-by-case basis.

3.7.5.3.2 Water Flea (Daphnia lumholtzi)

The water flea is native to tropical and subtropical climates. Its native range includes freshwater lakes in east Africa, east Australia, and Asia. The first documented observation of water fleas in Texas was in 1990. It continues to be found throughout the south and midwestern region of the United States. Although it is not known how they were introduced, it was likely though contaminated shipments of fish. It appears that the continued spread of this water flea species is reliant on human dispersal, as it is unlikely to spread between unconnected water bodies without human help. It likely spreads between unconnected water bodies through contaminated surfaces such as boats or other equipment. (USFWS 2018)

The water flea is easily distinguishable from native daphnia species. The helmet is larger than any native species and its tail is longer than the length of the body. The underside of the upper part of the exoskeleton has 10 spines along either side. The folds on the back of the head are formed into sharp points. Males of this species often do not have the helmet on the head and the tail is shorter than that of the females. This species is capable of reproducing without fertilization. They can develop from eggs that are in the females' brood pouch. The eggs can be found in the females' pouch in as little as 5 days after birth. After a female gives birth and the eggs hatch, she will undergo a molt and be ready to develop more eggs. The rapid growth rate of individuals and the rapid rate at which reproduction can occur gives this species an advantage, as the population can grow extremely quickly. (USFWS 2018)

Water fleas are filter feeders that feed on phytoplankton drifting in the water column. This species of water flea has become invasive for several reasons. Among the reasons are rapid reproduction, quick growth, adaptability to warm climates and higher temperatures, spines to protect itself, and its ability to produce eggs that can remain dormant in the sediment of water bodies until favorable conditions are present. Water fleas can cause problems in water bodies because they outcompete native daphnia species. This can impact the base layers of the food web, thus affecting species dependent on it further up the food chain. The presence of the spiny tail gives it an advantage in that many native fish species are unable to eat water fleas, thus putting additional stress on native daphnia. Water fleas have been documented in the SSI in the SCR. (Benson et al. 2020b; USFWS 2018)

CPNPP does not currently have a documented control or monitoring program for the water flea. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system as well as documents occurrences through the Vistra OpCo tracking system.

3.7.5.4 Terrestrial Plants

3.7.5.4.1 Giant Reed (Arundo donax)

One of the largest species of grasses, the giant reed is native to east Asia. It was originally introduced into the United States via California during the early 1800s. It continued to spread to other states, as it was often planted as an ornamental or used to control erosion. This species is often found in riparian areas, near or on wetlands, or along lake or reservoir shores. It can also be found where the water table is near the ground surface. Giant reeds are perennial graminoids. They can grow to a height of between 6 and 30 feet. Each individual stem can grow to a diameter between 0.4 and 1.6 inches. Flowers grow at the top of each stem and look like large plumes. Seeds are easily dispersed by wind, but this species reproduces most often by rhizomes (horizontal stems that grow underground, sending out roots and shoots), or through fragments that can establish and grow new plants. The first characteristic that makes this species invasive is that the rhizomes and plant grow rapidly. The rhizomes can grow up to 2.5 inches a day within the first 40 days, and up to an inch a day up to 150 days. The plant can grow from 1.5 to 4 inches daily. The second characteristic that makes this species invasive is its tolerance of a wide range of conditions, including drought, high levels of precipitation, frequent flooding, salinity, and a variety of soil types with pH levels varying from 5 to 8.7. Finally, it can tolerate high levels of disturbance. Once giant reed becomes established in an area, it can form monocultures and create dense stands of nothing but giant reed. This inhibits growth of native species and provides poor wildlife habitat. (McWilliams 2004) Giant reed has not been documented near SCR. CPNPP does not currently have a documented control or monitoring program for giant reed.

3.7.5.4.2 Cattail (Typha spp.)

Cattails are large (1–5 feet tall) plants with brown cylindrical seed heads which mature from August to September at the top of round stalks. They have long, narrow, green leaves with parallel veins that fan out from a central core. There are two different species of cattail in Texas: broadleaf cattail (*Typha latifolia*), considered native to the contiguous U.S., and narrowleaf cattail (*Typha angustifolia*), which is not. They hybridize readily (into *Typha* x *glauca*) and many of the plants with characteristics of broadleaf cattail have been found to have a large percentage of genetic material matching narrowleaf cattail. Both species have the dense, brown cylindrical seed heads at the top of strong stalks in the fall. These species spread readily by rhizomes and grow in groups. (Landis and Fiedler n.d.)

These species do not tolerate dense shade and become more common in areas cleared of shrubs. The hybrid and narrowleaf cattails are likely to become a dominant plant and push out native species if not managed using herbicide. (Landis and Fiedler n.d.)

The genus *Typha* (cattail family) have been documented near SCR; however, the exact species is not known (BWI 2008). CPNPP does not currently have a documented control or monitoring program for cattails.

3.7.5.5 Terrestrial Animals

3.7.5.5.1 Wild Boar (Sus scrofa)

Wild boars (also known as feral hogs) are native to Eurasia and have been introduced into every continent and many islands, except Antarctica. They were brought to the southeastern United States as early as the 1539 by Spanish explorers on the Gulf Coast and/or settlers. Feral hogs can grow quite large, ranging in size from 100–300 pounds in fully grown adults. Males of this species are larger than females, but both species are covered in dark brown/black coarse hair, although the color can vary significantly. Their canine teeth are large and are often visible. While growth of feral hogs can continue through the first 5 years of life, they reach sexual maturity at a relatively young age, with males become mature between 5 and 7 months and females between 10 and 12 months. Once females become pregnant, they usually have litters of five to six piglets, which remain with the mother until 2 to 3 months. The juveniles' coats are brown with yellowish stripes. They lose this coloring at around 4 months of age. (AISC 2020; McLure et al. 2018)

The diet of feral hogs is omnivorous; they have been known to consume vegetation, roots, nuts, insects, small birds, amphibians, reptiles, small mammals, and eggs. When feeding, hogs are social. Foraging can occur over large areas and usually occurs early in the morning or late in the day. Feral hogs are successful invaders due to their generalist diet, their ability to tolerate a wide range of habitats, and the ability to reproduce often and at a young age. Feral hogs can cause significant biological and economic damage. They root in the soil and can damage crops and irrigation systems. Management and damage control cost Texans millions of dollars each year. Ecologically, they alter soil systems, remove plant cover, destroy the habitats of other species, especially threatened, endangered, and species of conservation concern. Feral hogs are also known carriers of parasites and zoonotic diseases. (AISC 2020; McLure et al. 2018; SI 2007) Feral hogs have been documented in the vicinity of CPNPP. CPNPP does not currently have a documented control or monitoring program for feral hogs.

3.7.6 Procedures and Protocols

Vistra OpCo relies on administrative controls and other regulatory programs to ensure that habitats and wildlife are protected as a result of a change in plant operations (i.e., water withdrawal increase, new TPDES discharge point, wastewater discharge increase, air emissions increase), or prior to ground-disturbing activities. The administrative controls, as presented in Section 9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, or acquiring new permits as needed to minimize impacts. Existing regulatory programs that the site is subject to, as discussed in Chapter 9, also ensure that habitats and wildlife are protected. These are related to programs such as stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

3.7.7 Studies and Monitoring

3.7.7.1 Entrainment and Impingement Monitoring

In accordance with the statutory guidelines set forth in the TPDES permit issued to Vistra OpCo for CPNPP, and to maintain compliance under Section 316(b) of the Clean Water Act (CWA), periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that CPNPP is using the best technology available (BTA) to reduce entrainment and impingement.

The intake structure at CPNPP is located in an excavated recess of the SCR shoreline and consists of eight circulating water system (CWS) pumps and 12 travelling screens. The intake is located approximately 50 feet below the surface of SCR. Noncontact cooling water is discharged from a common outfall located across the peninsula from the intake.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd). Under normal conditions, four pumps operate per unit; however, with lower winter lake temperatures, three pumps operate per unit. The plant can operate at reduced loads operating two or three pumps per unit.

CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps are located downstream of the traveling water screens to transport the screened flow to the condensers.

A historical entrainment and impingement study was conducted at CPNPP. For impingement, sampling was conducted weekly from October 18, 1993, through March 1994, semi-monthly from April 1994 through August 1994, and weekly from September through October of 1994. For entrainment, sampling was conducted weekly from April 6 through August 24, 1994 (spawning season in most Texas reservoirs), using a half-meter, 500-micron mesh net towed from a boat in the vicinity of the intake. The results indicated that there was no significant adverse environmental impact to the SCR as a result of CPNPP operations and that the plant was operating using the BTA.

In 2018, a biological information report was written utilizing the 2014 TPWD fisheries survey to describe the potential impacts of impingement and entrainment on species known to occur in SCR. It was determined that the species most susceptible to impingement and entrainment in SCR include threadfin shad, gizzard shad, and sunfish. These species have life histories that may intersect with the operation of the cooling water intake structure (CWIS).

Specific details regarding historical impingement and entrainment studies, as well as BTA and monitoring are discussed below.

3.7.7.1.1 Impingement Monitoring

Impingement sampling was conducted from October 1993 through October 1994. The sampling involved utilizing a basket inserted into the debris sump to collect fish off of the travelling screens. Approximately 262,498 fish, comprising 13 species, were impinged by the CWS during this timeframe. Ninety-six percent of those impinged were threadfin shad. Gamefish including largemouth bass, white bass, channel catfish, and white crappie accounted for less than one percent combined of the total impingement. These results were consistent with those of plants in similar design and location, that forage species are most likely to dominate impingement losses due to their abundance, their pelagic habit, tendency to move in schools, and reduced physiological condition at high temperatures. Given the low number in game fish impinged on an annual basis and the high reproductive capacity of threadfin shad, it was determined that the total impingement numbers were not significant or creating an unacceptable impact on the game fish community at SCR.

Additional sampling was completed from February 2006 through February 2007 by collecting samples impinged from the facilities intake screens. A total of 58,121 aquatic organisms, including 12 fish species, were collected in impingement samples at CPNPP. Threadfin shad accounted for 92 percent of the total impingement, followed by bluegill (4 percent), mud crab (*Rhithropanopeus harrisii*) (2 percent), inland silverside (*Menidia beryllina*) (1 percent), and largemouth bass (1 percent). However, this total included a threadfin shad die-off that occurred in the reservoir on August 22 and 23, 2006. The number (39,071) of threadfin shad collected during this single event made up 69 percent of the total number of fish collected during the study.

Impingement rates (number of fish/million gallons) for each sample event were used to estimate total impingement for the study year. The estimate of the total number of fish impinged during the sample year was approximately 295,000. The estimates included approximately 253,000 threadfin shad and 28,844 bluegills. Approximately 83 percent of threadfin shad and 96 percent of bluegill were believed to be less than 1 year of age. Impingement rates were compared to various facility and environmental variables to identify possible relationships. Again, the increased temperatures are believed to account for the high number of threadfin shad deaths, as this species experiences high impingement rates during periods of increased water temperature.

CPNPP is identified in the 2013 GEIS in Table 3.1-2 as having a once-through cooling system within the context of license renewal. However, in 2015, SCR was designated as a closed-cycle recirculating system (CCRS) by the TCEQ consistent with the definition in 40 CFR 125.92(c)(2). Plants that recirculate cooling water through the condensers after the waste heat is removed by dissipation to the atmosphere are considered closed cycle cooling. The CCRS designation is specific to 316(b) and how CPNPP operates the cooling system. According to the EPA, CCRSs are highly effective in reducing impingement and entrainment by reducing intake flow. These reductions in flow and the concurrent reductions in impingement and entrainment impacts are among the highest reductions in adverse environmental impact possible at an intake structure. The use of SCR as a CCRS is considered the BTA for impingement as determined by the TCEQ.

The 2019 TPDES permit identifies the existing cooling water system as a CCRS as defined as 40 CFR §125.92(c); thus, it is the BTA. Additional impingement studies were not required. (Attachment B) Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize impacts caused by impingement.

3.7.7.1.2 Entrainment Monitoring

Entrainment sampling of ichthyoplankton was conducted from April through August 1994. Boat-mounted nets were towed in front of the trash racks weekly. The entrainment estimate utilized data on all species and life stages captured in the net. Two juveniles, *Dorosoma* and *Lepomis* were captured and likely represent an overestimate of impact to their populations. Eggs and larvae were also sent to the lab and identified down to the genus. Daily, weekly, monthly, annually, and seasonal estimates were calculated for entrainment characterization based on the actual and maximum operating conditions of the CWS. Taxa identified include sunfish, shad, white bass, inland silverside, crappies, and drums. Assuming 100 percent mortality, 30 million eggs/larvae were estimated to have been entrained in 1994. The results indicated that drums, sunfish, threadfin, and gizzard shad likely accounted for most of the losses (from egg to juvenile), while game fish losses were likely minimal.

In 2018, two fine mesh intake technologies were evaluated to make a BTA determination on entrainment, fine-mesh traveling water screens with fish friendly features, and narrow-slot cylindrical wedgewire screens. Further, an alternative water source and a mechanical draft CCRS was considered to reach a BTA determination. It was later determined that the CWIS is BTA, and the social costs of the alternatives are not justified by the social benefit. No additional control requirements are necessary beyond what Vistra OpCo is already doing.

The 2019 TPDES permit identifies the existing cooling water system as a CCRS as defined as 40 CFR §125.92(c); thus, it is the BTA (Attachment B). Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize impacts caused by entrainment.

3.7.7.2 Avian Monitoring

CPNPP does not have natural draft cooling towers and the tallest plant structures are the reactor containment structures and the metrological tower, which is located away from other structures. The aboveground in-scope transmission lines are those from the turbine buildings to the switchyard adjacent to the power block. Given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures pose a minimal bird collision hazard.

CPNPP does not have an avian protection plan. Site condition reports and the corrective action system are used to identify and correct any site conditions including those involving wildlife. CPNPP implements deterrents such as anti-nesting measures and routine housekeeping to keep birds away from some operational areas. Studies and monitoring at CPNPP occur as needed to comply with federal, state, and local regulatory requirements as directed by the agencies and generally prior to new projects. TPWD is aware of the known rookery at the northwest end of SCR. (TPWD 2020c)

3.7.7.3 As-Needed Monitoring

Studies and monitoring at CPNPP occur as needed to comply with federal, state, and local regulatory requirements, as directed by the agencies, generally prior to new projects. Any onsite monitoring is consistent with agency policies and procedures and is performed under the guidance of the agency under which coordination is occurring.

3.7.8 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

The USFWS Southwest Region Ecological Services Office maintains current lists of threatened or endangered species on its website. The USFWS federal endangered and threatened species listings and the TPWD state threatened, and endangered species listings were reviewed (TPWD 2022a; TPWD 2022b; USFWS 2022a). Further, the TXNDD maintains information on over 700 natural resource "Elements" including threatened and endangered species. The record of these elements is known as an elemental occurrence (EO). An EO has a practical conservation value, is based off of one or more (potentially hundreds) observation and can be a native plant community or an animal aggregation, such as a colonial waterbird rookery or a bat roost. Data were extracted to determine those elemental occurrences within a 6-mile radius of CPNPP. EOs identified include the Comanche peak prairie clover (*Dalea reverchonii*), Brazos water snake, glen rose yucca (*Yucca necopina*), Texas milk vetch (*Astragalus reflexus*), slender glass lizard (*Ophisaurus attenuates*), black-capped vireo (Vireo atricapilla), golden-cheeked warbler (*Setophaga chrysoparia*), Woodhouse's toad (*Anaxyrus woodhousii*), glass mountains coral-root (*Hexalectris nitida*), Strecker's chorus frog (*Pseudacris streckeri*), Cedar-elm sugarberry series, and the ash-juniper-oak series. In addition, a bird rookery was identified on the northern tip of SCR. The species assemblage was not listed. (TPWD 2020c)

Species located onsite or potentially occurring near the CPNPP site, or within either county occurring within a 6-mile radius of the site, that are listed as threatened or endangered by these agencies are described below. Consultation letters with state and federal agencies are provided in Attachment C.

3.7.8.1 Federally Listed Species

A total of five species are federally protected under the Endangered Species Act (ESA) with a probability of occurring within the 6-mile radius (Table 3.7-4) (USFWS 2021a). Golden-cheeked warblers (*Setophaga chrysoparia*), piping plovers, rufa red knots, whooping cranes, and Texas fawnsfoot are known to occur in both Hood and Somervell counties and are listed as endangered, threatened, or candidate species (USFWS 2022a; USFWS 2021b). The ecological requirements for these species are summarized below. No federally listed species are known to exist at the CPNPP site or along the transmission line ROWs.

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to any special status or protected species.

3.7.8.1.1 Golden-Cheeked Warbler (Setophaga chrysoparia)

Golden-cheeked warblers are federally and state-listed as endangered. Golden-cheeked warblers nest only in central Texas in juniper-oak woodlands. They require old growth forest with a dense tree canopy where they forage for a variety of insects, including caterpillars. In early March, golden-cheeked warblers begin arriving in central Texas from their wintering grounds in Mexico, Honduras, Nicaragua, and Guatemala. Their stay in Texas lasts until about the end of July, when they begin departing to take advantage of more abundant winter food supplies south of the border. The males arrive first and can be seen and heard at the tops of the tallest oak and juniper trees. When the females arrive a few days to a week later, they choose males that sing the loudest and defend their territories most vigorously. Normally, pairs remain together throughout the nesting season. If one partner dies, the remaining partner may attempt to find a new mate. There is evidence from banding experiments that some birds return to the same territories year after year and may even choose the same mate. (USFWS 2021a)

Golden-cheeked warblers lay three to four creamy white eggs. For approximately 12 days, the female warbler incubates the eggs. The male is for the most part inattentive at this time, joining the female only when she forages for insects away from the nest. Hatching occurs rapidly, including instances of all the eggs hatching on the same day. To avoid attracting the attention of predators, eggshells and fecal sacs of the young are either carried away or eaten by the adults. The nestlings fledge at nine days, but remain near the adults for approximately four weeks, begging for food. By the third week, the young birds are foraging for themselves and can fly as well as the adults. By mid-July they are ready for the journey south. (USFWS 2021a)

Habitat loss or degradation is the main reason the golden-cheeked warbler is endangered. The clearing of old juniper woodlands for livestock grazing and urban expansion has decreased the area available for nesting. Habitat for the golden-cheeked warbler exists near SCR and individuals have been documented within six miles of CPNPP (eBird 2021; TPWD 2020c). However, informal surveys of the CPNPP site for the golden-cheeked warbler and the black-capped vireo were conducted during April 2007 at various times of day over the course of three days. Recordings of the songs and calls of both species were studied prior to field survey, and survey methods consisted of walking transects on an east/west axis spaced approximately 100 m apart. Neither species was audibly nor visually identified during that survey. (Luminant 2013b)

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.2 Piping Plover (Charadrius melodus)

Piping plovers are federally, and state listed as threatened. Piping plovers are small shorebirds that are approximately 7 inches long. During the breeding season, adult birds are sandy gray above with a white collar and underparts. They have a black band that stretches across the forehead between the eyes and a black band also develops around the neck. Legs are orange and the bill is orange with a black tip. During the non-breeding season, the feathers on the back are paler and the black bands on the forehead and neck are not present. The bill becomes all black. Piping plovers breed from the northern Great Plains through North and South Dakota and southward along major rivers to northern Kansas. They can be found breeding on the beaches of Lake Superior, Lake Michigan, and Lake Huron in Michigan and Wisconsin. The Atlantic population breeds along the coast of New England from Novia Scotia through the mid-Atlantic coast down to North Carolina. Little is known about their overwintering territory. The population of piping plovers that breeds in the Great Plains region spends the winter along the Gulf Coast, while the population that breeds along the Atlantic coast, spends the winters further down the Atlantic coast near Florida. They are also thought to overwinter in Mexico, the Bahamas, and Cuba. Fall migration peaks between August and September but can occur from July through November. Spring migration peaks by mid-April and most birds have left overwintering sites by mid-May. (Elliott-Smith and Haig 2004)

Nests are constructed in sand, shells, or gravel covered ground near patches of grass, away from water, and near a large object such as a log. Nests are simply scrapes 1 to 2 centimeters deep scratched into the ground; they may or may not be lined with pebbles or shells. Females typically lay four eggs, which are incubated for approximately 20–30 days by both the males and females. Both parents also brood the young birds after hatching. Chicks forage near their parents and remain with family groups through fledging, which can occur between 21–35 days after hatching. Piping plovers prefer wide and sparsely vegetated beaches and have been documented breeding on alkali lakes, barrier islands, reservoirs, rivers, and on sand bars. Similar habitat on beaches, mudflats, and sandflats along the Gulf of Mexico and Atlantic coasts are preferred during the winter months. Threats to this species include habitat degradation and loss, particularly from development and beach stabilization projects (Elliott-Smith and Haig 2004).

Piping plovers are only federally considered for wind projects but are also state listed as threatened for both Hood and Somervell counties (TPWD 2022a; TPWD 2022b; USFWS 2021a). Potential habitat for the piping plover likely exists along the Brazos River, which is within the 6-mile vicinity of CPNPP; however, review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c).

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.3 Rufa Red Knot (Calidris canutus rufa)

The rufa red knot is federally listed as threatened. It is a robin-sized shorebird and a master of long-distance aviation. Some rufa red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom. The rufa red knot's unique and impressive life history depends on suitable habitat, food, and weather conditions throughout a network of far-flung sites across the western hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. (USFWS 2021b)

The rufa red knot spends most of the year in flocks, sometimes with other species. As they head north to breed in the tundra of the central Canadian Arctic, their plumage becomes rusty red. The birds return to gray as they head south to wintering grounds at the southern tip of South America (Tierra del Fuego), in northern Brazil, throughout the Caribbean, and along the southeastern and Gulf coasts of the U.S. into Mexico. Rufa red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab (Limulus polyphemus) eggs. On the breeding grounds knots mainly eat insects. (USFWS 2021b)

Large flocks of rufa red knots arrive at stopover areas each spring, with many of the birds flying directly from northern Brazil. Spring migration is timed to coincide with the spawning season for the horseshoe crab, whose eggs provide a rich, easily digestible food source. Because it provides abundant horseshoe crab eggs, Delaware Bay is the single most important spring stopover habitat, supporting an estimated 50 to 80 percent of all migrating rufa red knots each year. Mussel beds and small clams on the Atlantic coast are also important food sources for migrating knots, in both spring and fall. Some rufa red knots that winter on the Gulf coast take an overland migration route, stopping along the rivers of the Mississippi drainage and at saline lakes in the northern U.S. and southern Canadian plains. (USFWS 2021b)

Rufa red knots are only federally considered for protection for wind projects; however, potential habitat for the rufa red knot likely exists along the Brazos River, which is within the 6-mile radius of CPNPP (USFWS 2021a). A review of the TXNDD yielded no observations of this species within six miles of the CPNPP site (TPWD 2020c). eBird data was not available for the rufa red knot.

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Should rufa red knots be observed on or near CPNPP, adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.4 Whooping Crane (Grus americana)

The whooping crane is federally, and state listed as endangered. Once fairly widespread on the northern prairies, it was brought to the brink of extinction in the 1940s, but strict protection has brought the wild population back to well over one hundred. The flock that winters on the central Texas coast flies 2,400 miles north to nest in Wood Buffalo National Park in central Canada; this remote breeding area was not discovered until 1954. (Audubon 2021a)

The tallest bird in North America, the whooping crane breeds in the wetlands of Wood Buffalo National Park in northern Canada and spends the winter on the Texas coast at Aransas National Wildlife Refuge near Rockport. Whooping cranes begin their fall migration south to Texas in mid-September and begin the spring migration north to Canada in late March or early April. Whooping cranes migrate more than 2,400 miles a year. As many as 1,400 whooping cranes migrated across North America in the mid-1800s. By the late 1930s, the Aransas population was down to just 18 birds. Because of well-coordinated efforts to protect habitat and the birds themselves, the population is slowly increasing. In 1993, the population stood at 112. In the spring of 2002, it is estimated that there were 173 whooping cranes—a small, but important, increase. Today, three populations exist: one in the Kissimmee Prairie of Florida, the only migratory population at Aransas National Wildlife Refuge, and a very small captive-bred population in Wisconsin. (TPWD 2021d)

Whooping cranes mate for life but will accept a new mate if one dies. These long-lived cranes can live up to 24 years in the wild. The mated pair shares brooding duties: either the male or the female is always on the nest. Generally, one chick survives. It can leave the nest while quite young but is still protected and fed by its parents. Chicks are rust-colored when they hatch; at about 4 months, chicks' feathers begin turning white. By the end of their first migration, they are brown and white, and as they enter their first spring, their plumage is white with black wing tips. (TPWD 2021d)

The hatchlings will stay with their parents throughout their first winter, and separate when the spring migration begins. The sub-adults form groups and travel together. Cranes live in family groups made up of the parents and one or two offspring. In the spring, whooping cranes perform courtship displays (loud calling, wing flapping, leaps in the air) as they get ready to migrate to their breeding grounds. Their diet consists of blue crabs, clams, frogs, minnows, rodents, small birds, and berries. Whooping cranes migrate throughout the central portion of the state from the eastern panhandle to the DFW area and south through the Austin area to the central coast during October-November and again in April. Their preferred stopover habitat includes areas along rivers, in grain fields, and in shallow wetlands. (TPWD 2021d)

Suitable stopover habitat exists within the 6-mile radius. A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Should whooping cranes be observed on or near CPNPP, adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.5 Texas Fawnsfoot (Truncilla macrodon)

The Texas fawnsfoot is federally listed as proposed threatened and state listed as threatened. Historically, they are known to be located in the Brazos and Colorado River drainages of central Texas. In the Brazos River basin, historic records of the Texas fawnsfoot have primarily come from the mainstem of the Brazos River, though several observations have been reported from its large tributaries. (TAMU 2017)

Currently, little is known about the life history or reproductive requirements of Texas fawnsfoot. Like other freshwater mussel species, it is likely an obligate ectoparasite on one or more host-fish species, and its congeners appear to be long-term brooders that are host specialists of freshwater drum. Based on recent observations from field surveys throughout Texas fawnsfoot's range, adults appear to occur most often in bank habitats and occasionally in backwater, riffle, and point bar habitats with low to moderate water velocities and fine or coarse sediments. These mesohabitat types appear to serve as flow refuges, where near-bed shear stress remains low during high flow events. (TAMU 2017)

Specimen of Texas fawnsfoot have been documented within 6 miles of CPNPP in the Brazos River (TPWD 2020c). However, it is considered intolerant of reservoirs and therefore is not likely to be found in SCR (TPWD 2022a).

3.7.8.2 State Listed Species

A total of nine state-listed species are listed as potentially occurring in Hood and Somervell counties: black rail, golden-cheeked warbler, interior least tern, piping plover, white-faced ibis, whooping crane, THL, Brazos River water snake (*Nerodia harteri*), and Texas fawnsfoot (TPWD 2022a; TPWD 2022b). Golden-cheeked warblers, piping plovers, whooping cranes, and Texas fawnsfoot are also federally protected and described in Section 3.7.8.1. Ecological descriptions and requirements for the remaining species are summarized below. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.1 Black Rail (Laterallus jamaicensi)

The black rail is a tiny marsh bird, generally no bigger than a sparrow. They are extremely secretive and walks or runs through the marsh making them rarely seen in flight. In very dense cover, black rails may get around by using the runways made by mice. The distinctive short song of this bird is given mostly late at night, so the bird may go unnoticed in some areas. They are fairly common at a few coastal points, however, its status inland in the east is rather mysterious. (Audubon 2021b)

Black rails prefer tidal marshes on the coast and inhabit grassy marshes inland (Audubon 2021b). They favor very shallow water, or damp soil with scattered puddles. They prefer dense stands of spartina and other grasses, salicornia, rushes, sedges. Black rails build nests a couple of inches above ground in shallow water in a clump of vegetation, often at a spot slightly higher than surrounding marsh. Their nests are well-constructed cups of marsh plant material, usually with a domed top woven over it. A ramp of dead vegetation leads from nest entrance down to ground. Adults may continue to add to the nest, building it up to higher level, in areas where nest might be threatened by high tides. Black rails can have between 3–13 eggs, but usually have 6–8. The eggs are white to pale buff and dotted with brown spots. Incubation is completed by both sexes and lasts from 17–20 days. The young are downy and leave nest within a day after hatching. They feed on wide variety of insects, including aquatic beetles, and also eat spiders, snails, small crustaceans, and seeds of bulrush and other marsh plants, especially in winter. (Eddleman 1994)

A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c).

3.7.8.2.2 Interior Least Tern (Sternula antillarum athalassos)

Interior least terns are the smallest North American terns. Adults average 8 to 10 inches in length, with a 20-inch wingspan. Their narrow, pointed wings make them streamlined flyers. Males and females are similar in appearance. Breeding adults are gray above and white below, with a black cap, black nape and eye stripe, white forehead, yellow bill with a black or brown tip, and yellow to orange legs. Hatchlings are about the size of ping-pong balls and are yellow and buff with brown mottling. Fledglings are grayish brown and buff colored, with white heads, dark bills and eye stripes, and stubby tails. Young terns acquire adult plumage after their first molt at about one year, but do not breed until they are two to three years old. The interior least tern's call has been described as a high pitched "kit," "zeep," or "zreep." (TPWD 2021e)

Interior least terns arrive at breeding areas from early April to early June and spend three to five months on the breeding grounds. Upon arrival, adult terns usually spend two to three weeks in noisy courtship. This includes finding a mate, selecting a nest site, and strengthening the pair bond. Courtship often includes the "fish flight," an aerial display involving aerobatics and pursuit, ending in a fish transfer on the ground between two displaying birds. Courtship behaviors also include nest preparation and a variety of postures and vocalizations. (TPWD 2021e)

Interior least terns nest in colonies, where nests can be as close as 10 feet but are often 30 feet or more apart. The nest is a shallow depression in an open, sandy area, gravelly patch, or exposed flat. Small twigs, pieces of wood, small stones or other debris usually occur near the nest. Egg-laying begins in late May, with the female laying two to three eggs over a period of three to five days. The eggs are pale to olive buff and speckled or streaked with dark purplish brown, chocolate, or blue-gray markings. Both parents incubate the eggs, with incubation lasting about 20–22 days. The chicks hatch within one day of each other and remain in the nest for about a week. As they mature, they begin to wander from the nest, seeking shade and shelter in clumped vegetation and debris. Chicks are capable of flight within three weeks, but the parents continue to feed them until fall migration. Interior least terns will renest until late July if clutches or broods are lost. (TPWD 2021e)

The breeding season is usually complete by late August. Prior to migration, the terns gather at staging areas with high fish concentrations. They gather to rest and eat prior to the long flight to southern wintering grounds. Low, wet sand or gravel bars at the mouths of tributary streams and floodplain wetlands are important staging areas. Interior least terns often return to the same breeding site, or one nearby, year after year. (TPWD 2021e)

Nesting habitat of the interior least tern includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. The birds prefer open habitat and tend to avoid thick vegetation and narrow beaches. Sand and gravel bars within a wide unobstructed river channel, or open flats along shorelines of lakes and reservoirs, provide favorable nesting habitat. Nesting locations are often at the higher elevations away from the water's edge, since nesting usually starts when river levels are high and relatively small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars and beaches. Highly adapted to nesting in disturbed sites, terns may move colony sites annually, depending on landscape disturbance and vegetation growth at established colonies. For feeding, interior least terns need shallow water with an abundance of small fish. Shallow water areas of lakes, ponds, and rivers located close to nesting areas are preferred. As natural nesting sites have become scarce, the birds have used sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites. (TPWD 2021e)

Habitat may exist along SCR for the interior least tern. A review of the TXNDD data yielded no observations of this species within six miles of the CPNPP site (TPWD 2020c). eBird data was not available for the interior least tern. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.3 White-Faced Ibis (Plegadis chihi)

The white-faced ibis is state listed at threatened. The white-faced ibis is a dark, chestnut colored-bird with green or purple on its head and upper parts, and a long, down-curved bill. It is very similar in appearance to the glossy ibis except during the breeding season when the white-faced ibis has a narrow border of white feathers all around its bare facial skin at the base of the bill. This ibis has reddish legs and feet and red bare skin on the face around the eyes. (TPWD 2021f)

The white-faced ibis seems to prefer freshwater marshes, where it can find insects, newts, leeches, earthworms, snails and especially crayfish, frogs, and fish. They roost on low platforms of dead reed stems or on mud banks. During the nesting season, they are colonial and will construct a deep cup of dead reeds among beds of bulrushes, on floating mats of dead plants or they may nest in trees. The areas where these nests are built usually are where water is less than three feet deep. The nests are lined with grasses in preparation for the ibis nestlings. In Texas, between April and June, three to four greenish-blue eggs will hatch after an incubation period of approximately 21–22 days. The male and female both share in the parenting responsibilities of incubation and brooding of the nestlings. Nestlings initially are covered with a dull, blackish down and are noted to be uncommonly timid. (TPWD 2021f)

The white-faced ibis nests in isolated colonies from Oregon to Kansas, but its center of greatest abundance seems to be in Utah, Texas, and Louisiana. In Texas, they breed and winter along the Gulf Coast and may occur as migrants in the panhandle and west Texas. (TPWD 2021f)

Habitat exists for the white-faced ibis along the Brazos River and portions surrounding SCR. A review of the TXNDD and eBird species observation data yielded multiple observations of this species along SCR and the Brazos River (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.4 Texas Horned Lizard (Phrynosoma cornutum)

The THL is state listed as threatened. The THL is a flat-bodied and fierce-looking lizard. The head has numerous horns, all of which are prominent, with two central head spines being much longer than any of the others. This lizard is brownish with two rows of fringed scales along each side of the body. On most THLs, a light line can be seen extending from its head down the middle of its back. It is the only species of horned lizard to have dark brown stripes that radiate downward from the eyes and across the top of the head. (TPWD 2021g)

They can be found in arid and semiarid habitats in open areas with sparse plant cover. Because horned lizards dig for hibernation, nesting, and insulation purposes, they commonly are found in loose sand or loamy soils. THLs range from the south-central United States to northern Mexico, throughout much of Texas, Oklahoma, Kansas, and New Mexico. (TPWD 2021g)

A review of the TXNDD species observation data yielded no observations of this species within 6 miles of the CPNPP site (TPWD 2020c). During the site visits for the CPNPP Unit 3 and 4 COLA, harvester ant colonies were found onsite. Harvester ants are the THL's primary source of food and can be indicative of the presence of individuals onsite. Following this observation, the site was surveyed for individuals, and none were found onsite. (Luminant 2013b) There have been no recorded observations of the THL at the CPNPP site since the 2007 survey. The greatest threat to the THL would be during ground disturbing activities, none of which are currently planned in areas the THL would inhabit. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.5 Brazos Water Snake (Nerodia harteri)

The Brazos water snake is also known as Harter's water snake. This snake has one of the most restricted ranges of any Texas snake, found only along the upper portions of the Brazos River drainage. The snake is a mix of brown and gray or a green and brown combination. They can be identified by the four rows of dark dorsal spots that run the length of its body, giving it a checkerboard appearance. The snake has a pink or orange-colored belly, and its neck is often a yellow or cream color. (BRA 2021)

The Brazos water snake enjoys residing in water that is fast-flowing, rocky, and free of dense vegetation. This snake takes cover under rocks in water or in vegetation along shore. Juveniles use medium to large flat rocks on unshaded shores for hiding and rocky shallows for feeding, while adults inhabit rocky riffles as well as a wider range of habitats in pools and lakes. A daytime hunter, the Brazos water snake requires rocks within its habitat to provide cover and security. They typically eat small fish but have been recorded eating a variety of salamanders, frogs, and crayfish. (BRA 2021; McBride 2009)

The Brazos water snake has been documented within 6 miles of CPNPP in the Brazos River (TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Of importance, CPNPP does not have any current plan or program in place to manage or alter the site's land outside the plant area including tree or habitat removal. Therefore, threatened, and endangered species identified within the 6-mile radius are unlikely to be affected by the continued operation of CPNPP.

3.7.8.2.6 Brazos heelsplitter (Potamilus streckersoni)

The Brazos heelsplitter is state listed as threatened. It is a rare freshwater mussel with a thin, smooth, elliptical shell and a straight hinge line. The beaks are slightly elevated above the hinge line. External shell color is tan to dark brown or black that fades to a lighter color on the beaks. Some specimens have low, poorly developed wing-like structures that extend above the hinge line; however, these are usually absent or lacking. The interior shell surface (nacre) is shiny and purple throughout or white to bluish white, with a pink or purple tint along the hinge line. (USFWS 2022b)

The species is reported to occur in streams, large rivers, and some reservoirs. In riverine systems, the Texas heelsplitter occurs most often in nearshore habitats such as banks and backwater pools but occasionally in main channel habitats such as riffles. They are typically found in standing to slow-flowing water in soft substrates consisting of silt, mud, or sand but occasionally in moderate flows with gravel and cobble substrates (TPWD 2022a). The species historical range included Louisiana and Texas. However, the current known range for the species does not occur within 6 miles of the CPNPP site. (USFWS 2022b)

3.7.8.3 Species Protected Under the Bald and Golden Eagle Protection Act

Bald and Golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA was originally enacted in 1940 (16 U.S.C. 668-668c) and it prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald or golden eagles, including their parts, nests, eggs, or feathers. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export, or import, at any time or any manner, any bald eagle … [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." (USFWS 2020b)

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment. (USFWS 2020b)

Bald eagles are large birds distinguished by a white head and white tail feathers. Bald eagles do not get their characteristic white head and tail until about 5 years of age, remaining mostly brown until then. This can cause identification confusion with golden eagles. However, golden eagles have feathers on the legs all the way down, while bald eagles only have feathers on the tops of the legs. Both males and females are large birds with females weighing up to 14 pounds with an 8-foot wingspan, while males are slightly smaller, averaging 10 pounds with a 6-foot wingspan. Eagles mate for life. (USFWS 2019)

Several compounding factors led to the bald eagle's decline. Decline started in the late 1800s with the demise of many waterfowl and shorebird species that were overhunted for their plumage, leading to a loss of prey. Eagles often succumbed to lead poisoning after consuming carrion that had been killed with lead shot. The biggest threat that led to the most significant decline was the pesticide commonly known as DDT (dichlorodiphenyltrichloroethane) that became popular as a means to kill insects after World War II. DDT residues ended up in waterways, where it was ingested by aquatic organisms and fish. Through a process of biomagnification, eagles were ingesting fish that had high levels of the pesticide in their bodies. DDT caused eggshells to be thin, with most either cracking during incubation or never hatching. By 1963, only 487 nesting pairs of eagles remained. DDT was eventually outlawed, and the bald eagle was placed on the endangered species list. Recovery efforts included protecting nest sites, captive breeding programs, reintroduction efforts, and placing the eagles on the endangered species list. In July of 2007, the bald eagle was removed from the endangered species list, with the ruling becoming effective in August of 2007. (USFWS 2019)

The staple food of bald eagles is fish, but they will feed on waterfowl and small mammals such as rabbits. Eagles are found near rivers, lakes, marshes, estuaries, and seacoasts. They can be found in tall trees that they use for perching, roosting, and nesting. Nests are built in the tops of trees and eagles will re-use and add to the same nest year after year. Nests can be up to 10 feet across and weigh up to a half ton. If trees are NA, eagles will nest on cliffs or on the ground. Eagles typically breed once a year and lay 1 to 3 eggs that hatch after an incubation period of approximately 35 days. Young eagles can fly three months after hatching and will leave the nest about a month after that. Causes of eaglet death include human interference, disease, and lack of food. Research indicates that eaglet mortality can be as high as 50 percent in the first year of life (USFWS 2019).

Golden eagles (*Aquila chrysaetos canadensis*) can be found in a variety of habitats from the tundra, through grasslands, forested habitat and woodland-brushlands, and south to arid deserts including Death Valley, California. They are aerial predators and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer fawns and coyote pups. They also are known to scavenge and utilize carrion. Golden eagles build nests on cliffs or in the largest trees of forested stands that often afford an unobstructed view of the surrounding habitat. Sticks and soft material are added to existing nests, or new nests are constructed to create strong, flat, or bowl-shaped platforms. They avoid nesting near urban habitat and do not generally nest in densely forested habitat. Individuals will occasionally nest near semi-urban areas where housing density is low and in farmland habitat; however, they have been noted to be sensitive to human presence. Golden eagles migrate from the Canadian provinces and northern tier and northeastern states to milder areas with less snow cover in the winter. During winter, golden eagles are found throughout the continental United States. (USFWS 2011)

Activities on the CPNPP site are evaluated to ensure compliance under the BGEPA and MBTA. Potential habitat for the bald eagle is located on and within the vicinity of the CPNPP site. No bald eagles have been documented at the operational facilities however, they have been observed at SCR (eBird 2021). Eagles observed at SCR have been seen flying, foraging, and resting (eBird 2021). Potential habitat for the golden eagle also exists within 6 miles of CPNPP, however, no golden eagles have been observed at the operational facilities nor near SCR. One golden eagle was observed along the Brazos River in 1979, but none have been observed since (eBird 2021). In addition, no bald or golden eagle nests have been documented onsite. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. There are currently no MBTA permitting requirements associated with the CPNPP site operations or in-scope transmission lines that are under the scope of the CPNPP LRA. A review of the TXNDD data and eBird species observation data yielded several observations of both bald and golden eagles within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to bald eagles.

3.7.8.4 Species Protected Under the Migratory Bird Treaty Act

In addition to species protected under federal and state endangered species acts (ESAs), there are numerous bird species protected under the Migratory Bird Treaty Act (MBTA) that may visit CPNPP. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations (USFWS 2020b). Birds of conservation concern in particular conservation regions in the continental United States that may occur in Hood and Somervell counties include the following species: Harris's sparrow (*Zonotrichia querula*), lesser yellowlegs (*Tringa flavipes*), red-headed woodpecker (*Melanerpes erythrocephalus*), and semipalmated sandpiper (*Calidris pusilla*).

The Harris's sparrow breeds exclusively in northern Canada in areas of open tundra mixed with white pine, black spruce, larch, alder, and willow. In winter they use hedgerows, agricultural fields, shrubby pastures, backyards, and shrubby areas near streams of the southern Great Plains. Like other sparrows, Harris's sparrows hop along the ground scratching at the surface or jump to pick food off a low branch. Although they spend a lot of time foraging on the ground, they hop into small shrubs and trees to rest or to sing. If they feel threatened, they also tend to fly into a tree or shrub rather than run along the ground to seek cover. (AAB 2021a)

No Harris's sparrows have been documented within the operational facilities of CPNPP, however, there are many documented occurrences within 6-miles of the site (eBird 2021). Exact site usage is not fully documented; however, photos from some observations show the Harris's sparrow foraging on the ground (eBird 2021).

The lesser yellowlegs prefers shallow, weedy wetlands, and flooded fields across North America during migration. It's smaller with a shorter, more needlelike bill than the greater yellowlegs, but otherwise looks very similar. It breeds in the meadows and open woodlands of boreal Canada. Lesser yellowlegs walk in a deliberate, high-stepping manner, occasionally darting forward in pursuit of prey. They often travel in loose flocks of half a dozen or more, and sometimes numbering into the thousands at migratory stopover sites. They are fairly tolerant of other shorebird species during migration and in the winter, but birds on breeding territories are aggressive defenders of the nest site, flying at intruders and persistently attempting to chase them from the area. During migration and throughout the winter, Lesser yellowlegs use a wide variety of fresh and brackish wetlands, including mudflats, marshes, lake and pond edges, wet meadows, sewage ponds, and flooded agricultural fields such as rice paddies. They tend to be found in vegetated wetlands rather than in bare habitats, contributing to their "marshpiper" nickname. (AAB 2021b)

No lesser yellowlegs have been documented within the operational facilities of CPNPP, however, there are many documented occurrences within six miles of the site (eBird 2021). Exact site usage is not fully documented, however, photos from some observations show the lesser yellowlegs resting in wetland areas (eBird 2021).

The semipalmated sandpiper is a small sandpiper with a short neck and a moderately long bill that may droop slightly at tip. They have moderately long legs and have a black center of rump and tail. Their legs are black, and their back is gray-brown. They breed on open tundra, generally near water, and winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows. (AAB 2021c)

No semipalmated sandpipers have been documented within the operational facilities of CPNPP; however, there are two documented occurrences within six miles of the site along SCR (eBird 2021). Exact site usage is not fully documented, and no photos were available from observation areas (eBird 2021).

Red-headed woodpeckers are medium-sized woodpeckers with fairly large, rounded heads, short, stiff tails, and powerful, spike-like bills. They inhabit scattered open woodlots in agricultural areas, dead timber in swamps, or pine savannas. Red-headed woodpeckers breed in deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, burned areas, recent clearings, beaver swamps, orchards, parks, farmland, grasslands with scattered trees, forest edges, and roadsides. In the northern part of their winter range, they live in mature stands of forest, especially oak, oak-hickory, maple, ash, and beech. In the southern part, they live in pine and pine-oak. They are somewhat nomadic; in a given location, they can be common one year and absent the next. Red-headed woodpeckers are known to breed and overwinter in Texas. (AAB 2021d)

No red-headed woodpeckers have been documented within the operational facilities of CPNPP; however, there are several documented occurrences within six miles of the site (eBird 2021). Exact site usage is not fully documented in the observations, but photos attached to observations near the site showed them feeding and nesting (eBird 2021).

No planned refurbishment activities, construction activities outside of previously disturbed areas, or land alterations are planned. Further, CPNPP does not have natural draft cooling towers and the tallest plant structures are the reactor containment structures and the metrological tower which is located away from structures. The aboveground in-scope transmission lines are those from the turbine buildings to the switchyard adjacent to the power block. Given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures would not pose a bird collision hazard beyond that considered in the 2013 GEIS.

3.7.8.5 Essential Fish Habitat

A review of the NOAA Essential Fish Habitat (EFH) was conducted to determine the location of EFH within 6 miles of CPNPP. NOAA only provides EFH for federally managed fish and invertebrates. EFH does not apply to enclosed freshwater habitats; subsequently, no EFH is located within the vicinity of CPNPP, nor were any EFH areas protected from fishing. As habitat areas of particular concern (HAPC) are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of CPNPP (NOAA 2020).

Table 3.7-1 Phytoplankton and Zooplankton Taxa in the Vicinity of CPNPP

Phytoplankton	Zooplankton
Prymnesium parvum	*Cyclopoida* spp.
Leptosira terrestris	*Calanoida* spp.
	Nauplii spp.
	Rotifera spp.
	Bosminidae spp.
	Daphniidae spp.
	Conchostraca spp.

(BWI 2008)

Table 3.7-2 Common Fish Species in the Vicinity of CPNPP

Common Name	Scientific Name
Black bullhead	*Ameiurus melas*
Bluegill sunfish	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Flathead catfish	*Pylodictis olivaris*
Freshwater drum	*Aplodinotus grunniens*
Gambusia	*Gambusia spp.*
Gizzard shad	*Dorosoma cepedianum*
Green sunfish	*Lepomis cyanellus*
Inland silverside	*Menidia beryllina*
Largemouth bass	*Micropterus salmoides*
Longear sunfish	*Lepomis megalotis*
Palmetto bass	*Morone chrysops x M. saxatilis*
Redear sunfish	*Lepomis microlophus*
Threadfin shad	*Dorosoma petenense*
Tilapia	*Oreochromis spp.*
Warmouth	*Lepomis gulosus*
Western mosquitofish	*Gambusia affinis*
Yellow bullhead	*Ameiurus natalis*

(BWI 2008)

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 1 of 9)

Common Name	Scientific Name
Amphibians	
Blanchard's cricket frog	*Acris blanchardi*
Cope's gray tree frog	*Dryophytes chrysoscelis*
Gulf coast toad	*Incilius nebulifer*
Plains leopard frog	*Gastrophryne olivacea*
Strecker's chorus frog	*Pseudacris streckeri*
Western narrow-mouthed toad	*Gastrophryne olivacea*
Woodhouse's toad	*Anaxyrus woodhousii*
Birds	
American barn owl	*Tyto furcata*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American robin	*Turdus migratorius*
Bald eagle	*Haliaeetus leucocephalus*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Megaceryle alcyon*
Bewick's wren	*Thryomanes bewickii*
Black-and-white warbler	*Mniotilta varia*
Black-chinned hummingbird	*Archilochus alexandri*
Black-crested titmouse	*Baeolophus atricristatus*
Black-throated green warbler	*Setophaga virens*
Black vulture	*Coragyps atratus*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue grosbeak	*Passerina caerulea*
Blue-headed vireo	*Vireo solitarius*
Blue jay	*Cyanocitta cristata*
Blue-winged teal	*Anas discors*
Brewer's blackbird	*Euphagus cyanocephalus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 2 of 9)

Common Name	Scientific Name
Broad-winged hawk	*Buteo platypterus*
Brown creeper	*Certhia americana*
Brown-headed cowbird	*Molothrus ater*
Brown thrasher	*Toxostoma rufum*
Bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Canyon wren	*Catherpes mexicanus*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thryothorus ludovicianus*
Cassin's sparrow	*Peucaea cassinii*
Cattle egret	*Bubulcus ibis*
Cave swallow	*Petrochelidon fulva*
Cedar waxwing	*Bombycilla cedrorum*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*
Chuck-Wills-widow	*Antrostomus carolinensis*
Clay-colored sparrow	*Spizella pallida*
Cliff swallow	*Petrochelidon pyrrhonota*
Common grackle	*Quiscalus quiscula*
Common nighthawk	*Chordeiles minor*
Common poorwill	*Phalaenoptilus nuttallii*
Common yellowthroat	*Geothlypis trichas*
Crested caracara	*Caracara cheriway*
Dark-eyed junco	*Junco hyemalis*
Dickcissel	*Spiza americana*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Picoides pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 3 of 9)

Common Name	Scientific Name
Eastern screech owl	*Megascops asio*
Eastern towhee	*Pipilo erythrophthalmus*
Eastern wood-pewee	*Contopus virens*
Eurasian collared dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Field sparrow	*Spizella pusilla*
Fox sparrow	*Passerella iliaca*
Franklin's gull	*Leucophaeus pipixcan*
Gadwall	*Anas strepera*
Golden-cheeked warbler	*Setophaga chrysoparia*
Golden-crowned kinglet	*Regulus satrapa*
Grasshopper sparrow	*Ammodramus savannarum*
Gray catbird	*Dumetella carolinensis*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Great-tailed grackle	*Quiscalus mexicanus*
Greater roadrunner	*Geococcyx californianus*
Greater white-fronted goose	*Anser albifrons*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Harris's sparrow	*Zonotrichia querula*
Hermit thrush	*Catharus guttatus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Inca dove	*Columbina inca*
Indigo bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Lark sparrow	*Chondestes grammacus*
Least flycatcher	*Empidonax minimus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 4 of 9)

Common Name	Scientific Name
Le Conte's sparrow	*mmodramus leconteii*
Lesser goldfinch	*Spinus psaltria*
Lesser scaup	*Aythya affinis*
Lincoln's sparrow	*Melospiza lincolnii*
Little blue heron	*Egretta caerulea*
Loggerhead shrike	*Lanius ludovicianus*
Louisiana waterthrush	*Parkesia motacilla*
Magnolia warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Mississippi kite	*Ictinia mississippiensis*
Mourning dove	*Zenaida macroura*
Nashville warbler	*Leiothlypis ruficapilla*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Olive-sided flycatcher	*Contopus cooperi*
Orange-crowned warbler	*Leiothlypis celata*
Orchard oriole	*Icterus spurius*
Painted bunting	*Passerina ciris*
Peregrine falcon	*Falco peregrinus*
Pied-billed grebe	*Podilymbus podiceps*
Pine siskin	*Spinus pinus*
Pine warbler	*Setophaga pinus*
Prairie falcon	*Falco mexicanus*
Purple finch	*Haemorhous purpureus*
Purple martin	*Progne subis*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-breasted merganser	*Mergus serrator*
Red-breasted nuthatch	*Sitta canadensis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 5 of 9)

Common Name	Scientific Name
Red-eyed vireo	*Vireo olivaceus*
Redhead	*Aythya americana*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Rock pigeon	*Columba livia*
Ruby-crowned kinglet	*Regulus calendula*
Ruby-throated hummingbird	*Archilochus colubris*
Ruddy duck	*Oxyura jamaicensis*
Rufous-crowned sparrow	*Aimophila ruficeps*
Sandhill crane	*Grus canadensis*
Savannah sparrow	*Passerculus sandwichensis*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Sharp-shinned hawk	*Accipiter striatus*
Snow goose	*Chen caerulescens*
Snowy egret	*Egretta thula*
Solitary sandpiper	*Tringa solitaria*
Song sparrow	*Melospiza melodia*
Spotted sandpiper	*Actitis macularius*
Spotted towhee	*Pipilo maculatus*
Summer tanager	*Piranga rubra*
Swainson's hawk	*Buteo swainsoni*
Swainson's thrush	*Catharus ustulatus*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
White-crowned sparrow	*Zonotrichia leucophrys*
White-eyed vireo	*Vireo griseus*
White-throated sparrow	*Zonotrichia albicollis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 6 of 9)

Common Name	Scientific Name
White-winged dove	*Zenaida asiatica*
Wild turkey	*Meleagris gallopavo*
Willet	*Tringa semipalmata*
Willow flycatcher	*Empidonax traillii*
Wilson's warbler	*Cardellina pusilla*
Wood duck	*Aix sponsa*
Upland sandpiper	*Bartramia Lesson*
Vesper sparrow	*Pooecetes gramineus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-breasted chat	*Icteria virens*
Yellow-rumped warbler	*Setophaga coronata*
Yellow warbler	*Setophaga petechia*
Crustaceans	
Harris mud crab	*Rhithropanopeus harrisii*
Invertebrates	
American painted lady	*Vanessa virginiensis*
Arogos skipper	*Atrytone arogos*
Black swallowtail	*Papilio polyxenes*
Black witch	*Ascalapha odorata*
Bordered patch	*Chlosyne lacinia*
Checkered white	*Pontia protodice*
Common buckeye	*Junonia coenia*
Common checkered skipper	*Pyrgus communis*
Common streaky-skipper	*Celotes nessus*
Dainty sulphur	*Nathalis iole*
Dun skipper	*Euphyes vestris*
Dusky-blue groundstreak	*Calycopis isobeon*
Goatweed leafwing	*Anaea andria*
Gray hairstreak	*Strymon melinus*
Great purple hairstreak	*Atlides halesus*
Hackberry emperor	*Asterocampa celtis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 7 of 9)

Common Name	Scientific Name
Juniper hairstreak	*Callophrys gryneus*
Juvenal's duskywing	*Erynnis juvenalis*
Monarch	*Danaus plexippus*
Northern cloudywing	*Thorybes pylades*
Orange sulphur	*Colias eurytheme*
Painted lady	*Vanessa cardui*
Pearl crescent	*Phyciodes tharos*
Phaon crescent	*Phyciodes phaon*
Queen	*Danaus gilippus*
Question mark	*Polygonia interrogationis*
Reakirt's blue	*Echinargus isola*
Red admiral	*Vanessa atalanta*
Rustic sphinx	*Manduca rustica*
Sleepy orange	*Abaeis nicippe*
Southern broken-dash	*Wallengrenia otho*
Southern dogface	*Zerene cesonia*
Southern skipperling	*Copaeodes minima*
Variegated fritillary	*Euptoieta claudia*
Mammals	
American beaver	*Castor canadensis*
Black-tailed jackrabbit	*Lepus californicus*
Coyote	*Canis latrans*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Fox squirrel	*Sciurus niger*
Gray fox	*Urocyon cinereoargenteus*
Mexican free-tailed bat	*Tadarida brasiliensis*
Nine-banded armadillo	*Dasypus novemcinctus*
Northern raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
White tailed deer	*Odocoileus virginianus*
Wild boar	*Sus scrofa*
Virginia opossum	*Didelphis virginiana*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 8 of 9)

Common Name	Scientific Name
Reptiles	
American alligator	*Alligator mississippiensis*
Brazos river water snake	*Nerodia harteri*
Broad-banded copperhead	*Agkistrodon contortrix laticinctus*
Coachwhip	*Coluber flagellum*
Common slider	*Trachemys scripta*
Dekay's brown snake	*Storeria dekayi*
Diamondback water snake	*Nerodia rhombifer*
Eastern hognose snake	*Heterodon platirhinos*
Eastern patch-nosed snake	*Salvadora grahamiae*
Eastern racer	*Coluber constrictor*
Gopher snake	*Pituophis catenifer*
Great plains rat snake	*Pantherophis emoryi*
Greater earless lizard	*Cophosaurus texanus*
Green anole	*Anolis carolinensis*
Lined snake	*Tropidoclonion lineatum*
Little brown skink	*Scincella lateralis*
Mediterranean house gecko	*Hemidactylus turcicus*
Ornate box turtle	*Terrapene ornata*
Plain-bellied water snake	*Nerodia erythrogaster*
Ring-necked snake	*Diadophis punctatus*
Rough earth snake	*Haldea striatula*
Rough green snake	*Opheodrys aestivus*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Slender glass lizard	*Ophisaurus attenuatus*
Smooth softshell turtle	*Apalone mutica*
Snapping turtle	*Chelydra serpentina*
Speckled kingsnake	*Lampropeltis holbrooki*
Spiny softshell turtle	*Apalone spinifera*
Texas blind snake	*Rena dulcis*
Texas cooter	*Pseudemys texana*
Texas spiny lizard	*Sceloporus olivaceus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 9 of 9)

Common Name	Scientific Name
Texas spotted whiptail	*Cnemidophorus gularis*
Western diamondback rattlesnake	*Crotalus atrox*
Western rat snake	*Pantherophis obsoletus*
Western ribbon snake	*Thamnophis proximus*

(BMNA 2020; eBird 2021; Haynie 2017; iNaturalist 2020a; iNaturalist 2020b; iNaturalist 2020c)

Table 3.7-4 Federal and State Listed Threatened and Endangered Species Occurring in Hood and Somervell Counties[(a)]

Common Name	Scientific Name	Federal Status	State Status	Habitat Present within 6 miles of CPNPP
Birds				
Black rail	*Laterallus jamaicensis*	—	T	Y
Golden-cheeked warbler	*Setophaga chrysoparia*	E	E	Y
Piping plover	*Charadrius melodus*	T[(b)]	T	Y
Rufa red knot	*Calidris canutus rufa*	T[(b)]	—	Y
White-faced ibis	*Plegadis chihi*	—	T	Y
Whooping crane	*Grus americana*	E	E	Y
Mollusks				
Texas fawnsfoot	*Truncilla macrodon*	C	T	Y
Brazos heelsplitter	*Potamilus streckersoni*	—	T	N
Reptiles				
Brazos water snake	*Nerodia harteri*	—	T	Y
THL	*Phrynosoma cornutum*	—	T	Y

(TPWD 2022a; TPWD 2022b; USFWS 2022a)

a. All species are listed for both counties.

b. Only federally considered for wind projects.

T = Threatened;E = Endangered; DL = Delisted; PT = Proposed Threatened; C = Candidate; — = Not listed

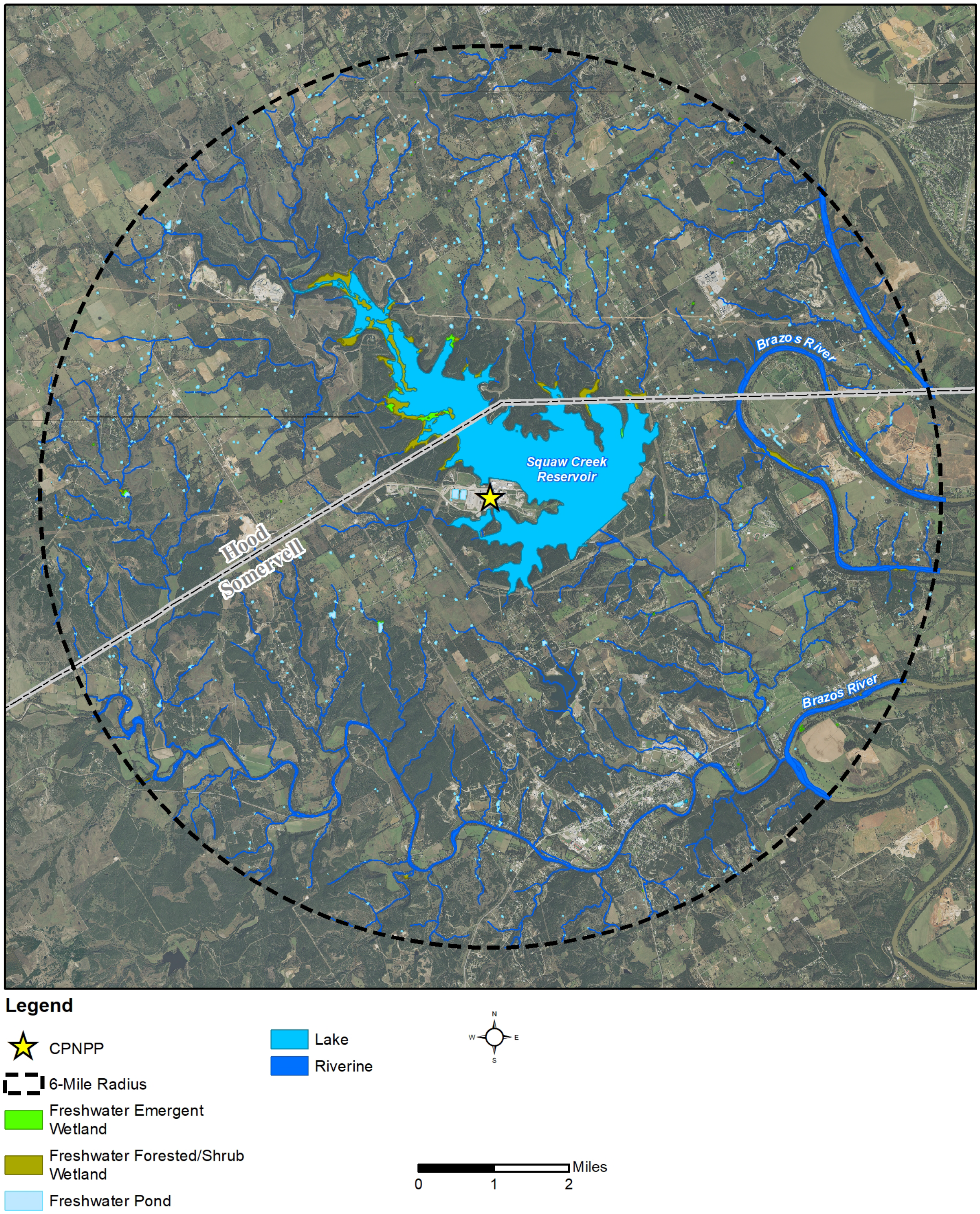


Figure 3.7-1 NWI Wetlands within a 6-mile Radius of CPNPP

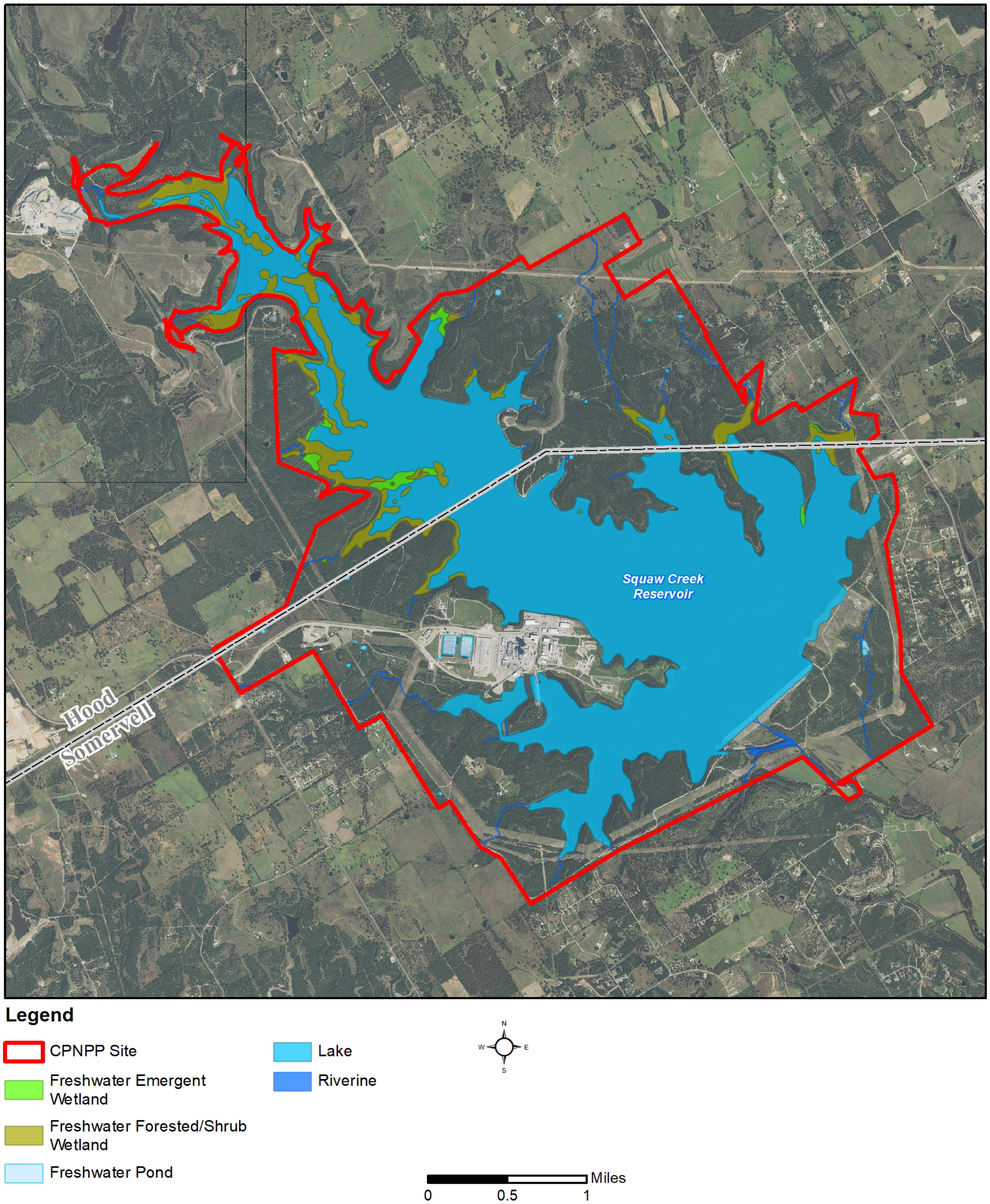


Figure 3.7-2 NWI Wetlands on the CPNPP Site

3.8 Historic and Cultural Resources

Cultural resources include prehistoric era and historical era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-675].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early consultation for the Section 106 process, Vistra OpCo contacted the Texas Historical Commission (THC) for informal consultation concerning the CPNPP LRA and potential effects on cultural resources within the approximately 7,700-acre site and on historic properties within a 6-mile radius of CPNPP. Native American groups recognized as potential stakeholders were also contacted by Vistra OpCo and provided the opportunity for comment. Vistra OpCo correspondence is included in Attachment D.

This ER identifies all known archaeological sites and properties listed on the NRHP within a 6-mile radius of CPNPP. For the purpose of the LRA, the aboveground area of potential effect (APE) is defined as the entire CPNPP property and everything within a 6-mile radius of CPNPP. The aboveground APE considers the visual integrity of historical properties in relation to continued CPNPP operation. The archaeological APE is considered bounded by the approximately 7,700 acres, where ground disturbance, though unanticipated during the proposed license renewal term, might compromise the physical integrity of archaeological data.

No ground disturbance associated with CPNPP is considered within the scope of the 10 CFR Part 51 evaluation. As such, the LRA consists of an administrative action relative to historic and cultural resources. Although construction of the existing CPNPP facility and SCR would have impacted any archaeological resources that may have been located within their respective footprints, much of the surrounding area remains largely undisturbed. There have been five previous cultural resources surveys within the 7,700-acre CPNPP property and extending out from the property (Table 3.8-1).

The literature review of previously recorded cultural sites included the area within a 6-mile radius of CPNPP. A record review was conducted at the THC online Texas Archaeological Sites

Atlas. The purpose of the literature review was to develop an understanding of the local context by conducting an inventory of all previously and newly recorded archaeological sites on the 7,700-acre CPNPP property and within a 6-mile radius of CPNPP, regardless of NRHP status.

The results of the literature review showed that there are 141 cultural resources previously recorded within 6 miles of CPNPP (THC 2021). Of these, 15 are cemeteries or individual burials protected by state burial law, four are NRHP-listed, and five have been determined eligible for the NRHP. There are an additional seven resources with undetermined NRHP status within the 6-mile radius, the remaining 110 cultural resources are unevaluated, or do not have a defined NRHP evaluation listed (Tables 3.8-1 and 3.8-2).

3.8.1 Land Use History

The land use history for CPNPP and the surrounding region was developed as part of a Phase 2A literature review and archaeological sensitivity assessment of the CPNPP property and is summarized here. The approximately 7,700-acre CPNPP property consists of 11 categories of land use/cover as defined in Section 3.2.1. In the order of descending acreage totals, the primary land use/cover consists of the open water of SCR at 41.9 percent, evergreen forest at 26.7 percent, grassland/herbaceous cover at 17.8 percent, developed areas at 8.2 percent, deciduous forest at 4 percent, and woody wetlands at 1 percent, with seven much smaller categories making up less than 1 percent each (Table 3.2-1). Section 3.8.2 provides a more detailed discussion of historical land use as part of the cultural history. Early maps provide information on how the area was used in the past. The USGS Granbury 1889 map shows the project APE with a road connecting the communities of Granbury and Glen Rose passing through the east portion of the APE (Figure 3.8-1). The composite USGS Hill City and Nemo 1961 quad maps show a mosaic of grasslands with some upland and riparian woodlands, crossed by a pipeline, with only a few scattered houses, barns, a windmill, and a gravel pit. There are more unpaved jeep trails than paved roads (Figure 3.8-2). A composite 2016 USGS edition depicts the property with SCR filled. The jeep trails are gone, and numerous paved roads and the railway spur to the CPNPP site are depicted (Figure 3.8-3). Figure 3.8-4 shows the 2 NRHP properties, 2 NRHP districts, and the 15 recorded cemeteries within the 6-mile radius along with the modern infrastructure of the vicinity in 2020.

Photographs taken prior to, during, and after the construction of the CPNPP facility are useful in showing the environmental context during that time period. As shown in the earlier USGS maps discussed above, at the time of construction, the CPNPP facility and reservoir area consisted of undeveloped forest and rangeland, remnants of small communities, and agricultural fields. At the construction site, the trees and brush were removed, and the area was mechanically leveled (Figures 3.8-5 and 3.8-6). Construction included excavation for the CPNPP facility components (Figures 3.8-5, 3.8-6, and 3.8-7). Final construction of the CPNPP facility included multiple buildings, structures, and parking lots on a peninsula surrounded primarily by SCR and forest (Figures 3.8-8, 3.8-9, and 3.8-10).

The CPNPP property and the surrounding region hold evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the CPNPP property and the surrounding area were potentially occupied by Native American populations during the Paleoindian Period (prior to 8,800 before present (BP)), the Archaic Period (circa (ca.) 8,800 to 1,200 to 1,300 BP), the Late Prehistoric Period (ca. 1,300 to 450 BP), and the Historic Period (ca. 1670 AD to present).

3.8.2 Cultural History

3.8.2.1 Paleoindian Period (Prior to 8,800 BP)

The Paleoindian period is the earliest substantiated cultural adaptation in the Americas and Texas. Paleoindian peoples have been defined as nomadic big game hunters who lived in small bands which traveled seasonally within set territories for food sources that included hunting megafauna. However, this definition is not adequate in light of the diverse material culture, projectile point styles, and subsistence practices which have been documented in the last 50 years. Paleoindian sites are primarily located in positions where large streams enter major rivers. Clovis (11,200 to 10,900 BP) is the earliest documented cultural horizon in Texas and is widespread throughout the state in many different environmental settings. The Clovis lifeway seems to have been that of generalized hunter-gatherers with the technology to hunt big game but not the need to rely exclusively on it. The following Folsom culture appears to be oriented towards a subsistence based on bison hunting and is identified by a tool complex including Folsom points, endscapers, and large thin bifaces. The Folsom sites or single artifacts are most often found in grassland settings. The Dalton and San Patrice tool complexes are associated with the transition to latter part of the Early Paleoindian Period and represent hunter gatherer Archaic-like subsistence. The Wilson, St. Mary's Hall and Golondrina-Barber point styles represent the Late Paleoindian Period (10,000 to 8,000 BP) in central Texas. These later Archaic-like manifestations include rock ovens and other typical Archaic features but are smaller in scale than the later Archaic features. Researchers believe this represents the transition from the Late Paleoindian to the Archaic Period. (Collins 1998)

3.8.2.2 Archaic (8,800 to 1,200 BP)

The Archaic Period is marked by changes in subsistence and settlement patterns likely associated with changes in climate and the resulting environmental changes. This period is divided into the Early, Middle, and Late Archaic and is characterized by the exploitation of a larger variety of plant and animal resources with an overall greater diversity in material culture. The transition to the Early Archaic Period is inferred to include a less mobile and more localized lifestyle than the preceding Paleoindian Period. Projectile points no longer exemplified the intricate work characteristic of Paleoindian tools. Early Archaic tools such as spear points, knives, drills, scrappers, and gravers were still used, but varied in size and shape and were often fashioned with side or corner notches for hafting. The overall characteristic of the Archaic period is the large quantity of heated rock which is found as hearths, middens, ovens, scatters, and other features. (Collins 1998)

The early Archaic (8,800 to 6,000 BP) evidence in central Texas indicates a pattern of resource exploitation which favored the live oak savanna of the Edwards Plateau and the nut mast, fruits, berries, and geophites of the region, along with a greater diversity of animals for subsistence. Typical projectile points associated with this period include Angostura, early split stem, and Martindale-Uvalde styles. By the Middle Archaic (6,000 to 4,000 BP) the more mesic climate shifted to a more xeric one. The Bell-Andice-Calf Creek points seem to reflect a concentration on bison hunting in the more mesic interval, while the Taylor and later Nolan-Travis point style are associated with the later more arid climate and the appearance of burned rock middens. The Late Archaic Period (4,000 to 1,200 BP) subsistence practice continues with the Middle Archaic technology with an increase in burned rock middens and increase bison hunting again. The "tool kit" includes six prominent point styles of notched and stemmed points as well as mortars and pestles for food processing. (Collins 1998)

3.8.2.3 Late Prehistoric (800 to 1670 AD)

The Late Prehistoric is often referred to as the Neo-Indian Period in Texas and is characterized by a shift to bow and arrow technology from the preceding atlatl and dart point technology and the period has both early and late subperiods typified by the earlier Austin and later Toyah material culture manifestations. The early Late Prehistoric Period subsistence is a continuation of the preceding Late Archaic Woodland hunting and gathering practices with burned rock middens. By the later Late Prehistoric Toyah interval, pottery is added to the material culture typified by Toyah and Perdiz points, end scrapers, long thin bifacial knives, and prismatic blades. (Collins 1998)

3.8.2.4 Historic Period (1670 AD to present)

The Historic Period begins with arrival of Europeans in late 1600s. The indigenous populations of Texas were impacted by the Spanish and French contact in the region. The primary early Historic Period impact was from diseases introduced by the Europeans, for which the indigenous populations had no immunity. The introduction of the horse to the region and the incursions of mounted Apaches from the north added to regional conflict and the shifting of material culture and subsistence practices of the central Texas population. (Collins 1998) The middle Historic Period (1730 to 1800 AD) began with an increase in the Spanish mission system followed by the subsequent failure of that Spanish effort. The Wichita and Comanche occupied the fortified villages on the Red River in modern Oklahoma and northern Texas. The conflict between these Red River groups and the Apache caused the latter to seek protection from the Spanish resulting in formation of two Spanish missions near Menard, Texas. (NRC 2013d) A group of allied Wichita, Comanche, and Tawakonis attacked the mission in 1758, specifically targeting the Apache, which only resulted in retaliation by the Spanish for the attack (NRC 2019) The later Historic Period began about 1800. At this time other northern groups entered the Southern Plains. The Kiowa were present in the Southern Plains around 1800 and the Cheyenne and Arapaho were present in the early 1840s. (NRC 2013d) The first permanent Anglo settlers in the valleys of the Paluxy River and Squaw Creek arrived prior to 1855. At this time, the Brazos River was the general boundary of settlement by Anglo populations who feared raids and predation from the Comanche and other Plains indigenous groups. (NRC 2013d)

3.8.2.5 Hood County

Hood County embraces 425 square miles of the north-central plains of Texas. Granbury, the county seat, is 41 miles southwest of Fort Worth. Before settlers from the east ventured onto the plains, the area was the home of the Comanche and, to a lesser extent, the Lipan Apaches and Kiowas. In the 19th century, a band of Comanches known as the Penatekas, or Honeyeaters, roamed the area west of the cross timbers, generally between the headwaters of the Colorado and Brazos rivers. Comanche Peak, the highest point in Hood County, was a Comanche meeting place. The Lipan Apaches also roamed the area, and the town of Lipan in extreme northwestern Hood County was named after a group that once lived in the Kickapoo Valley. (Callaway 2006)

Settlers from the east began to arrive in the area 10 or 15 years before the Civil War. One of the first, Charles E. Barnard, set up a trading post and Barnard's Mill at a site now in Somervell County. George B. Erath, for whom an adjacent county is named, was one of the first to survey on the Brazos River (1846–1850). Other settlers, mostly ranchers and farmers, began to settle in the Brazos and Paluxy river valleys in 1854. The main concern facing these early settlers was the frequent raids by the Comanches. Native American horse-stealing raids into the Paluxy and Squaw Creek country occurred all during the Civil War and until 1872, when a party of Native Americans stole horses from a section of land close to Cresson in northeast Hood County. (Callaway 2006)

Hood County was formed in November 1866 by an act of the eleventh Texas legislature. The area was within the municipality of San Felipe de Austin as early as 1823 and the municipality of Viesca in 1834. After Texas became a republic, the area now known as Hood County had, at one time or another, been part of Robertson, Navarro, McLennan, Johnson, and Erath counties.

Location of the new county seat was a controversial issue. Residents in the southern section of the county favored the center of the county, as stated in the law. The other choice was a parcel of land donated by influential county leaders Thomas Lambert and J. F. and J. Nutt. The commission established to designate the county seat, citing a poor water supply at the center of the county, voted in favor of the donated land. The controversy surrounding the site of Granbury eventually caused the residents of the southern section of the county to petition for a new county.

As a result, in 1875, Somervell County was established by an act of the Texas legislature. In that same year, a fire destroyed the courthouse in Granbury. In 1870 whites made up 96 percent of the population. The highest total of blacks in Hood County was 241 in 1900, or only 3 percent of the population. The last three decades of the 19th century saw a steady increase in population; in 1910, the total was just over 10,000. Residents were able to send their produce and livestock to market on the Fort Worth and Rio Grande Railway, which was completed in 1887. (Callaway 2006)

By the turn of the century, Hood County had several towns: Granbury, Acton, Tolar, Lipan, and Cresson. After 1910, Hood County's population fell to 8,759 in 1920, to 6,779 in 1930, and to its

20th-century low of 5,287 in 1950. The number of farms fell by almost a third between 1910 and 1920 to 1,234, then dropped more gradually to 830 in 1950. From 1960 to 1980, the population increased from 5,443 to 17,714. Between 1970 and 1980, Hood County ranked sixth among all U.S. counties in the category of highest growth rate. One of the main reasons for the sudden increase was the completion in 1969 of Lake Granbury, which turned the county into a popular recreation and resort center, as well as a retirement community. The influx of people into Hood County between 1970 and 1980 had a tremendous impact on the area, and by 1990 the county's population had grown to 28,981. The census counted 41,100 people living in Hood County in 2000. (Callaway 2006)

3.8.2.6 Somervell County

Somervell County is in north-central Texas and comprises 188 square miles, the second-smallest area among Texas counties. Glen Rose, the principal town, and county seat is 55 miles southwest of Fort Worth. Prior to European settlement of North America, the area was inhabited by Native Americans, particularly members of the Caddo groups and Tonkawas. The southern edge of the Wichita Confederacy of Caddos extended into this area, although the Tonkawas were the major tribal group. Apaches and Comanches came into the area periodically. (Elam 2006)

Most of the early history of Somervell County was as part of either Johnson or Hood counties. Somervell County was established in 1875, when residents in southern Hood and northern Bosque counties petitioned for a new county because of their separation from markets and seats of government. The county, taken completely from Hood County, was named for Alexander Somervell, who led an expedition to Mexico under the Republic of Texas. The first and only county seat is Glen Rose, named in 1872. Other early communities included Wilcox, Rainbow, Nemo, and Glass. The census of 1880 indicated a population of 2,649, with only 132 people in Glen Rose. (Elam 2006)

Glen Rose was the center of activity for the county during the last two decades of the 19th century. Four periodicals were published in Glen Rose during these decades: *The Glen Rose Citizen*, *The Glen Rose Falcon*, and *The Glen Rose Herald* were local newspapers, while T*he Monthly Baptist Standard* had a wider circulation. The county entered the 20th century with a population of 3,498. The population peaked at 3,931 in 1910 and then declined to a low of 2,542 by 1950. (Elam 2006)

Although agricultural production during the Great Depression remained fairly constant, unemployment increased dramatically. New Deal programs provided some assistance. Glen Rose borrowed $80,000 under the Public Works Administration to construct a new water and sewage system. Three low-water dams on the Paluxy River, several local school buildings, and a canning plant were built with Work Projects Administration money. (Elam 2006)

In the years after World War II, the county's proximity to Dallas-Fort Worth led to a rapid increase in industry that transformed it. Dramatic changes came with the construction of a nuclear power plant by the Texas Utilities Electric Company along Squaw Creek north of Glen

Rose. The construction of this plant, begun in the mid-1970s, resulted in some important financial advantages for the county. Between 1960 and 1970, the county grew by 8 percent, but the next census reflected a 49 percent growth rate; half the population of 4,154 lived in Glen Rose. In 1990 the population of the county was 5,360, with Glen Rose (1,949) the most populous community. (Elam 2006)

3.8.3 Onsite Cultural Resources

Onsite cultural resources are those located within the 7,700-acre CPNPP property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE. There are 33 cultural resources listed within the 7,700-acre CPNPP property. These 33 resources were recorded during five cultural resources surveys of the property, or associated ROW for waterline and transmission lines. (NRC 2013d) The cultural resources investigations are listed in Table 3.8-1. Prior to the construction of CPNPP and SCR, an archaeological survey of the vicinity was conducted by Alan Skinner and Gerald Humphreys under the auspices of Southern Methodist University anthropology (SMU) department. The SMU survey resulted in the recording of 25 archaeological sites and the Hopewell Cemetery within the CPNPP property. Of note is that three resources: —41HD55, 41HD56, and 41HD57, — recorded in the text have been subsequently redesignated as sites 41HD64, 41HD65, and 41HD66, respectively. The 1985 Espey, Houston, and Associates survey filled out a site update form for 41SV52 noting that the site had been destroyed but did not record any additional sites within the CPNPP property. In 2007 and 2008, James Briscoe recorded seven sites within the CPNPP property while conducting surveys for water and transmission lines: 41HD87, 41HD88, 41HD89, 41SV160, 41SV161, 41SV169, and 41SV170 (NRC 2013d). Briscoe recommended that six of the sites were not eligible for the NRHP, while 41SV88 is listed as undetermined.

No NRHP-eligible cultural resources have been confirmed within the 7,700-acre CPNPP property (Figure 3.8-5). No structures within the CPNPP property have been documented through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) programs.

3.8.4 Offsite Cultural Resources

Offsite cultural resources are those outside the 7,700-acre CPNPP property boundary. There are 108 offsite resources within 6 miles of CPNPP. Lists of known archaeological sites and historic properties within a 6-mile radius of CPNPP are presented in Tables 3.8-3 and 3.8-4. There are two NRHP-listed properties and two NRHP districts with 6 miles of CPNPP (Table 3.8-4 and Figure 3.8-4). The Somervell County Courthouse and Barnards Mill are dually listed as State Antiquities Landmarks (SAL) and on the NRHP. The Glen Rose Downtown Historic District and Oakdale Park Historic District are listed on the NRHP. Additionally, there are 14 cemeteries within 6 miles of CPNPP which are protected by state burial laws (Figure 3.8-4). There is no planned offsite disturbance during the proposed LR operating term, and as such no offsite impacts to the archaeological resources would be anticipated. The two NRHP properties and two NRHP districts are located in the community of Glen Rose over 4.5 miles from the

CPNPP. Therefore, any visual or noise impacts to these four NRHP properties would be minimal due to distance, topographic variability, and vegetation.

3.8.5 Cultural Resource Surveys

There have been five previous cultural resources surveys within the 7,700-acre CPNPP property (Table 3.8-1). In 1972 a survey of the property and SCR was conducted by SMU prior to the construction of the plant and the reservoir. The survey resulted in the recording of 27 archeological sites and the Hopewell Cemetery. A subsequent survey of CPNPP water lines and a transmission line by SMU in 1974 resulted in the recording of three archaeological sites and a 20th-century structure outside of the CPNPP property within the 6-mile APE. (NRC 2013d) A survey of a transmission line in 1985 by Espey, Houston, and Associates resulted in the updating of site 41SV52 and the recording of an additional two sites outside the CPNPP 6-mile APE. (NRC 2013d) Briscoe Consulting conducted a survey in 2007 and 2008 under the auspices of Enercon Services, Inc., for several water and transmission lines. The two surveys resulted in the re-examination of several site areas and the recording of seven archaeological sites within the CPNPP property and two new sites outside the CPNPP 6-mile APE. (NRC 2013d)

3.8.6 Procedures and Integrated Cultural Resources Management Plan

Cultural resources on the CPNPP site are protected by Vistra OpCo's procedures related to all ground disturbance and excavation at the plant site. The Excavation Permit Pre-Job Brief Card specifies that, "If human remains or cultural resources over 50 years of age are uncovered during excavation, stop work and notify the Site Facility Engineer." The Control of Site Excavation procedure clearly defines all cultural resources. These two procedures serve to make Vistra OpCo personnel and contractors aware of the need to identify, protect, and minimize impact to all cultural resources over 50 years of age at the CPNPP site during the planning, scoping, and implementation of all potential ground disturbing activities.

Table 3.8-1 Previous Cultural Resources Surveys within the CPNPP Property

THC Atlas Abstract Number	Survey Company and Author	Report Date	Description	Findings
8100000119	Southern Methodist University S. Alan Skinner and Gerald Humphreys	1973	The Historic and Prehistoric Archaeological Resources of the SCR	27 archaeological sites (19 prehistoric and 8 historic sites)
8100000161	Southern Methodist University Joseph Gallagher	1974	Results of Small-Scale Survey of Comanche Peak Transmission Lines and Pipeline R-O-Ws.	No sites on property, three prehistoric sites and one historic site within the CPNPP 6-mile APE
8100003639	Espey, Huston and Associates Mindy Bonine	1985	Summary Report: A Cultural Resources Investigation of the Proposed Comanche Peak-Walnut Springs 345 kV Transmission Line, Erath, Hood, and Somervell Counties, Texas	One prehistoric site on property, two sites outside of CPNPP 6-mile APE
8100015956 and 8100015957	Briscoe Consulting James Briscoe and Robert Walker	2008 2009	Archaeological Survey Report on the Luminant Proposed New Water Exchange Line Project Comanche Peak Nuclear Power Plant Hood and Somervell Counties, Texas	No sites reported in abstract, seven sites within CPNPP property on Atlas, four sites outside 6-mile APE

Table 3.8-2 Archaeological Sites and Historic Properties within the CPNPP Property (Sheet 1 of 2)

Site ID#	Quadrangle	Site Type	NRHP Status
41HD57	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41HD64	Hill City	Paleo-Archaic lithic scatter	Not evaluated
41HD65	Hill City	Early 20^{th} century farmstead complex	Not evaluated
41HD66	Hill City	Small, thin unassigned lithic scatter	Not evaluated
41HD87	Hill City	Unassigned prehistoric lithic scatter	Recommended not eligible
41HD88	Hill City	Unassigned prehistoric lithic scatter	Undetermined
41HD89	Hill City	Early 20^{th} century debris scatter/standing water tower, corral	Recommended not eligible
SV-C004 Hopewell Cemetery	Hill City/Nemo	Cemetery	Protected by state burial law
41SV29	Hill City	Early to mid-20^{th} century debris and windmill	Not evaluated
41SV30	Hill City	Multi-component site, with a prehistoric scatter/late 19^{th} to early 20^{th} century Hopewell Community School	Not evaluated
41SV31	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV32	Hill City	Small unassigned prehistoric lithic scatter	Not evaluated
41SV33	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV34	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV35	Hill City	Early 20^{th} century cattle camp or farmstead	Not evaluated
41SV36	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV37	Hill City	Unassigned prehistoric knapping station	Not evaluated

Table 3.8-2 Archaeological Sites and Historic Properties within the CPNPP Property (Sheet 2 of 2)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV38	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV39	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV40	Hill City	Late prehistoric lithic scatter/camp	Not evaluated
41SV41	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV42	Hill City	Early to mid-20th century farmstead	Not evaluated
41SV43	Hill City	Early to mid-20th century farmstead	Not evaluated
41SV44	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
41SV45	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
41SV48	Hill City	Unassigned lithic scatter	Testing recommended
41SV52	Hill City	Unassigned lithic scatter	Destroyed by construction
41SV53	Hill City	Early 20th century concrete wall features	Not evaluated
41SV54	Hill City	Small unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV160	Hill City	A possible Middle Archaic lithic scatter	No further work was recommended
41SV161	Hill City	Early 20th century farmstead remains	No further work was recommended
41SV162	Nemo	An unassigned prehistoric lithic scatter	No further work recommended
41SV169	Hill City	An early to mid-20th century dry laid stone skirt on an earthen dam	No further work recommended
41SV170	Hill City	A late 19th century ford	No further work recommended

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 1 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
HD-C005 Nubbin Ridge-Cedar Grove Cemetery	Nemo	Cemetery	Protected by state burial law
HD-C037 Mitchell Bend Cemetery	Nemo	Cemetery	Protected by state burial law
41HD76	Hill City	Multi-component Early Archaic lithic scatter and 20^{th} century debris scatter	Determined ineligible in ROW
41HD85	Nemo	Unassigned prehistoric lithic scatter	Recommended not eligible
41HD97	Nemo	20^{th} century?? stone field fence	Recommended not eligible in ROW
79003008 Somervell County Courthouse	Glen Rose West	Historic county courthouse	NRHP Listed
82004523 Barnard's Mill	Glen Rose West	Historic mill and hospital complex	NRHP Listed
12000352 Oakdale Park District	Glen Rose East	Historic district with 29 contributing elements and 14 noncontributing elements	NRHP Listed
14000820 Glen Rose Downtown Historic District	Glen Rose West	Historic district with 35 contributing elements and 12 noncontributing elements	NRHP Listed
SV-C001 Post Oak Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C002 Milam Chapel Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C003/41SV64 Unknown Grave(s)	Glen Rose West	Cemetery	Protected by state burial law
SV-C005/41SV2 Cox Bend/Connally Cemetery	Nemo	Cemetery	Protected by state burial law

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 2 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
SV-C007 Squaw Creek Cemetery	Nemo	Cemetery	Protected by state burial law
SV-C008 Herndon Valley (Oldham) Cemetery	Nemo	Cemetery	Protected by state burial law
SV-C010 Kimmel Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C011 Lanham Mill Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C012 Glen Rose Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C024 McCamant Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C026 Unknown Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C029 Booker Cemetery	Glen Rose West	Cemetery	Protected by state burial law
41SV1	Nemo	Reported late Paleo to early ceramic camp	Site reported destroyed by plowing and borrow pit
41SV3	Nemo	Unassigned prehistoric camp	No further work recommended
41SV4	Nemo	Archaic camp	1991 No further work recommended 2004 Ineligible in ROW
41SV5	Nemo	Unassigned prehistoric camp with burned rock	No further work recommended
41SV6	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
41SV7	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
41SV8	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
41SV9	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 3 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV10	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
41SV11	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
41SV12	Glen Rose East	Small unassigned prehistoric midden	No further work recommended
41SV13	Glen Rose East	Two areas of unassigned prehistoric middens	No further work recommended
41SV14	Glen Rose East	Reported site, observed as a thin lithic scatter	No further work recommended
41SV15	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
41SV16	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
41SV18	Glen Rose East	Archaic camp	Not evaluated
41SV19	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
41SV20	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
41SV21	Glen Rose East	Small unassigned lithic scatter with mussel shell	Not evaluated
41SV22	Glen Rose East	Small unassigned lithic scatter with little mussel shell	Not evaluated
41SV25	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
41SV26	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV27	Glen Rose East	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV28	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV46	Hill City	Late 19th to early 20th century farmstead	Not evaluated
41SV47	Nemo	Late Prehistoric Period camp site	Avoid or testing recommended
41SV49	Nemo	Archaic lithic scatter/camp	No further work recommended
41SV50	Nemo	Archaic to Late Prehistoric lithic scatter/camp	No further work recommended
41SV51	Nemo	Petroglyph, a lithic scatter with diagnostic points reported from the Paleo to Late Prehistoric Periods	Protection of petroglyph recommended Determined ineligible in ROW

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 4 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV55	Nemo	Archaic camp with manos and metates	Not Evaluated
41SV56	Hill City	Late Prehistoric camp with hearths	Determined eligible
41SV57	Hill City/Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
41SV58	Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
41SV59	Hill City	Unassigned prehistoric camp	Determined eligible
41SV61	Hill City	A possible hearth eroding from riverbank, no cultural material observed	Not evaluated as cultural material was not observed, monitoring for cultural material recommended
41SV62	Hill City	Unassigned lithic scatter with shell midden	Monitoring recommended
41SV63	Glen Rose West	1930s to 1950s trash midden and concrete slab	Undetermined
41SV65	Glen Rose West	Late 19th to mid-20th century farmstead	Not evaluated
41SV103	Glen Rose East	Unassigned prehistoric camp with PPK fragments, manos, metates and flakes exposed by plowing	Not evaluated
41SV109	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV110	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV112	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Not evaluated
41SV113	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Further survey recommended
41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV114	Glen Rose West	Unassigned prehistoric lithic scatter with mano and metate fragments	Site reported destroyed

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 5 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV115	Hill City	Archaic to Late Prehistoric Period lithic scatter	Site reported destroyed
41SV117	Glen Rose West	1903 to 1943 Lanham Mill School site	Undetermined
41SV118	Not stated	Unassigned prehistoric site No site form	Determined ineligible
41SV119	Hill City	Unassigned prehistoric site No site form	Undetermined
41SV120	Glen Rose West	Unassigned prehistoric site No site form	Undetermined
41SV121	Glen Rose East	Late Prehistoric Period open camp with pottery, arrow points, and faunal fragments	Site reported destroyed?
41SV122	Glen Rose East	Archaic to Late Prehistoric open camp based on PPK	Site reported destroyed?
41SV123	Glen Rose West	Unassigned prehistoric site exposed by bulldozing	Site reported destroyed
41SV127	Nemo	Archaic to Late Prehistoric open camp	Not evaluated
41HD128	Hill City	Small Archaic activity site	No further work recommended
41SV129	Hill City	Unassigned lithic scatter	No further work recommended
41SV130	Hill City	Unassigned lithic scatter with two hearths	Testing recommended
41SV131	Hill City	Early 20th century moonshine still	No further work recommended
41SV132	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter	No further work recommended
41SV133	Hill City	Thin unassigned prehistoric lithic scatter	No further work recommended
41SV134	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter on bedrock	Not eligible
41SV135	Hill City	Thin unassigned prehistoric lithic scatter on exposed bedrock no soils	Not eligible
41SV136	Hill City	Thin unassigned camp with minor burned rock cultural deposit present	Testing for eligibility was recommended
41SV137	Hill City	Early to mid-20th century farmstead	No further work recommended

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 6 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV138	Glen Rose West	Thin unassigned prehistoric lithic scatter	No further work recommended
41SV139	Glen Rose West	Mid-20th century trash dump	No further work recommended
41SV140	Glen Rose West	Thin unassigned prehistoric lithic scatter, no deposits	No further work recommended
41SV141	Glen Rose West	Small thin unassigned prehistoric lithic scatter with burned rock, no deposits	No further work recommended
41SV142	Glen Rose West	Small unassigned prehistoric camp with burned rock, debitage, an unidentified dart point and mussel shell	Preservation recommended
41SV143	Glen Rose West	Small unassigned prehistoric camp with a hearth and charcoal	Unclear recommendation
41SV144	Glen Rose West	Small Archaic camp site, with debitage, burned rock and Granbury point	No further work recommended
41SV145	Glen Rose West	Small unassigned prehistoric lithic scatter with no diagnostics or cultural deposits	No further work recommended
41SV146	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	No further work recommended
41SV147	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	A possible cistern was recommended for further study if destruction of the site was imminent
41SV148	Glen Rose West	Mid-20th century artesian wells utilized by the	No further work recommended
41SV149	Glen Rose West	A single hearth exposed in the riverbank three meters below the surface	Further investigations of the hearth and surrounding soils was recommended
41SV150	Nemo	A probable Archaic camp site.	Unknown as the site form missing/report redacted

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 7 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV151	Nemo	A single buried hearth exposed in backhoe trenching; no additional artifacts were observed	Determined eligible
41SV153	Nemo	An extensive lens of burned rock observed in several backhoe trenches	Ineligible in ROW; undetermined
41SV154	Hill City	An early to mid-20th century house, well and cellar depression in poor condition	Not fully evaluated
41SV155	Hill City	An early to mid-20th century stone barn	Evaluation by architectural historian recommended
41SV156	Glen Rose East	A WPA dam on the Paluxy River that was blown up with dynamite in the mid-20th century	Evaluation by architectural historian recommended
41SV157	Glen Rose West	Burned rock and a few flakes recovered from three backhoe test trenches, no features observed	Determined ineligible
41SV172	Glen Rose East	Buried burned rock, mussel shell and lithic debitage observed in backhoe tests	Undetermined
41SV174	Nemo	Site type not listed on Atlas	Determined ineligible
41SV175	Nemo	Site type not listed on Atlas	Undetermined

(THC 2021a)

Table 3.8-4 NRHP-Listed Sites within a 6-Mile Radius of CPNPP

Resource Name NRHP Listing	County	Quadrangle	NRHP Listed	Distance from CPNPP[a]
Somervell County Courthouse 79003008	Somervell	Glen Rose West	1979	2.18 mi
Barnards Mill 82004523	Somervell	Glen Rose West	1982	4.87 mi
Oakdale Park Historic District 12000352	Somervell	Glen Rose West	2012	4.59 mi
Glen Rose Downtown Historic District 14000820	Somervell	Glen Rose West	2014	4.63 mi

(THC 2021)

a. Distances are approximate and based on the CPNPP center point and NRHP location data.

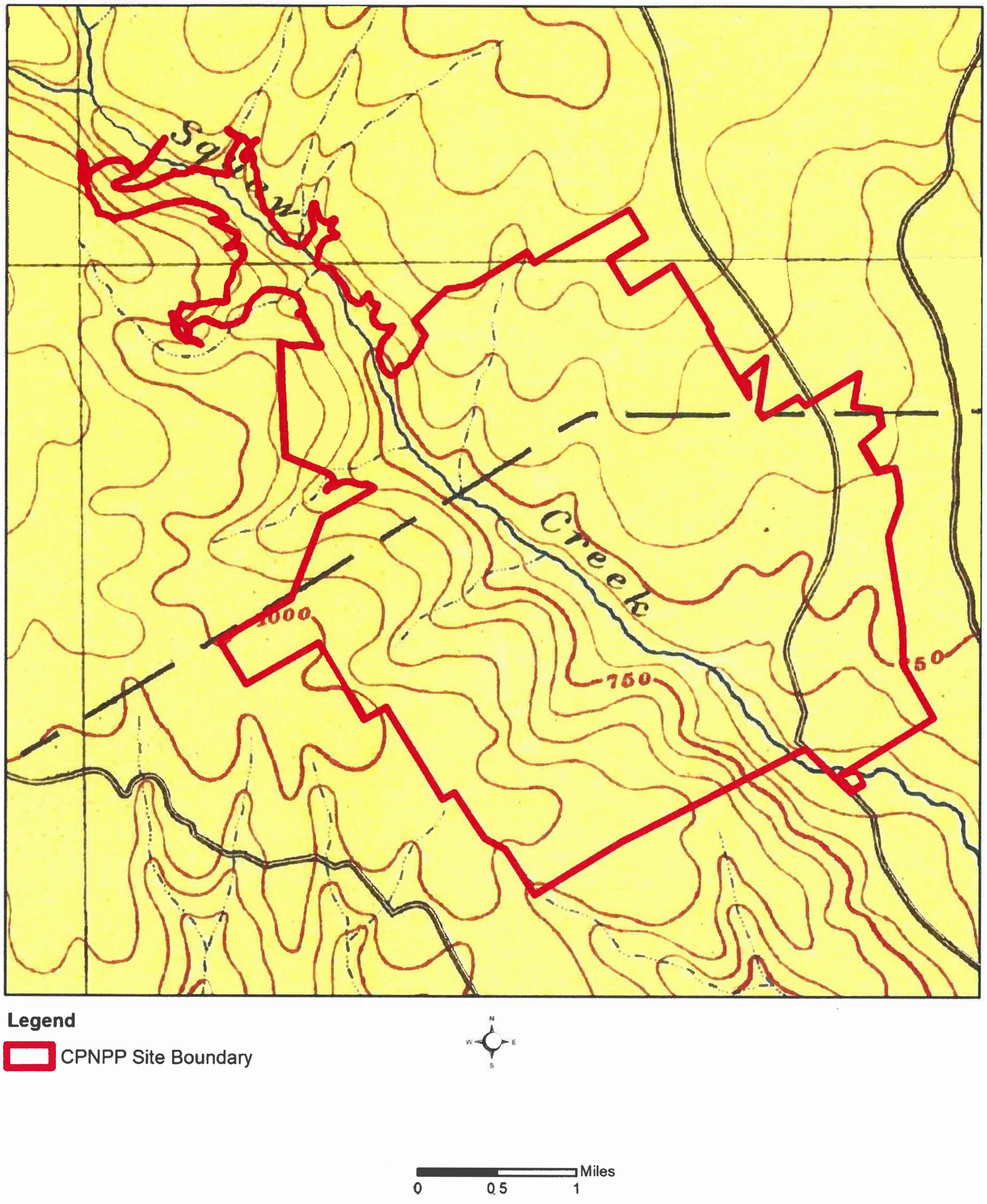


Figure 3.8-1 USGS 1889 Granbury, Texas, Map

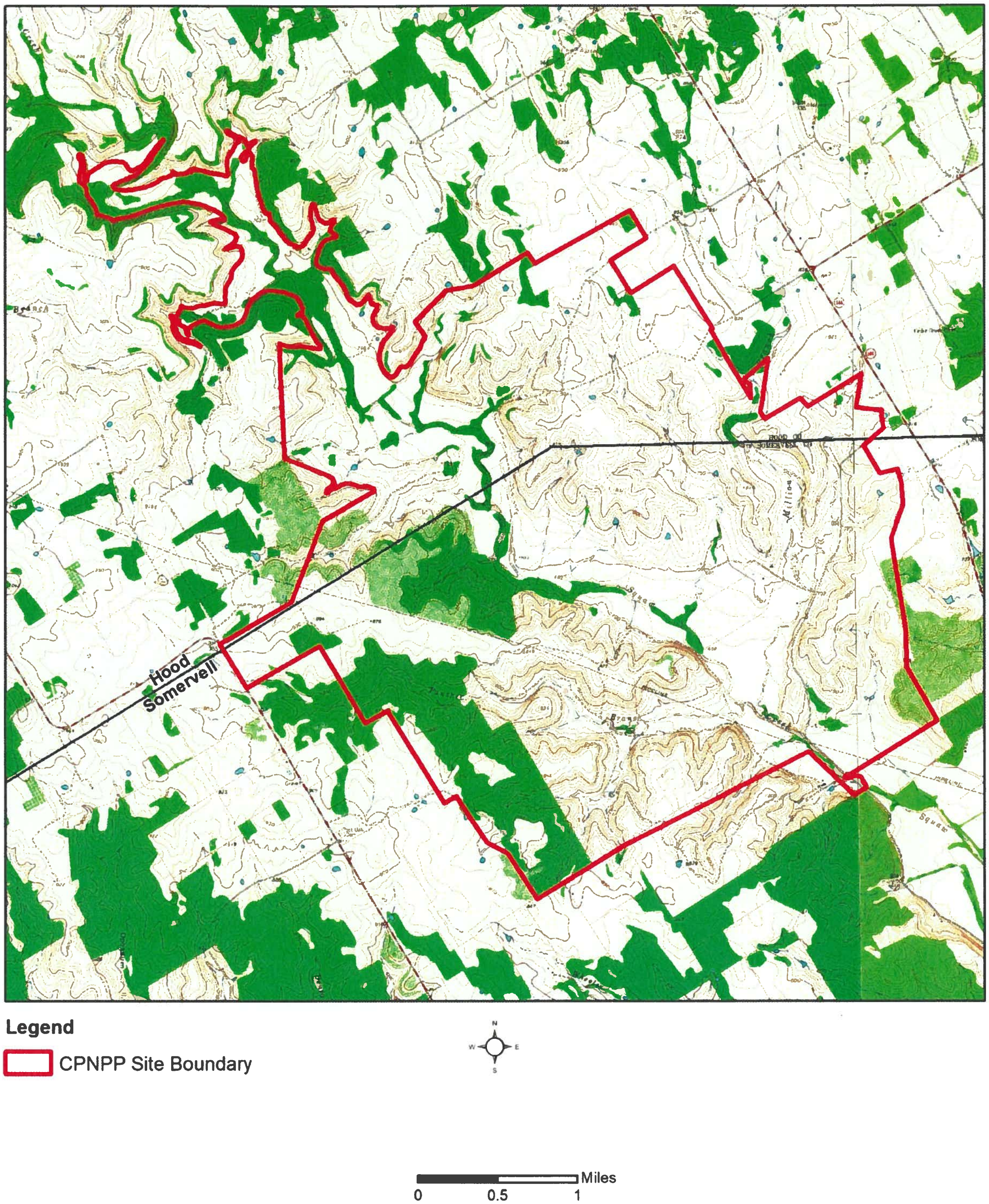


Figure 3.8-2 CPNPP Property, 1961

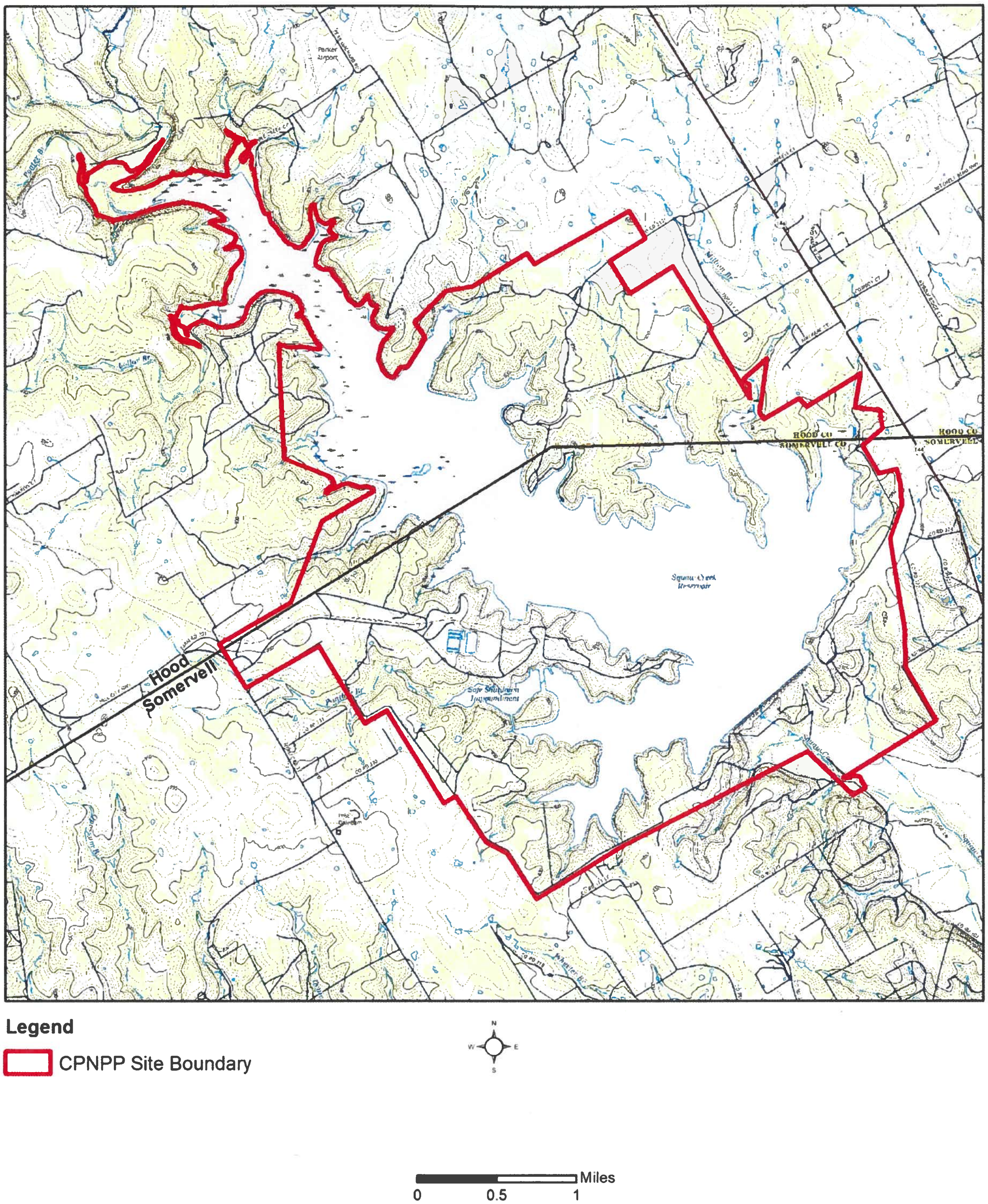


Figure 3.8-3 Vistra OpCo Property, 2016

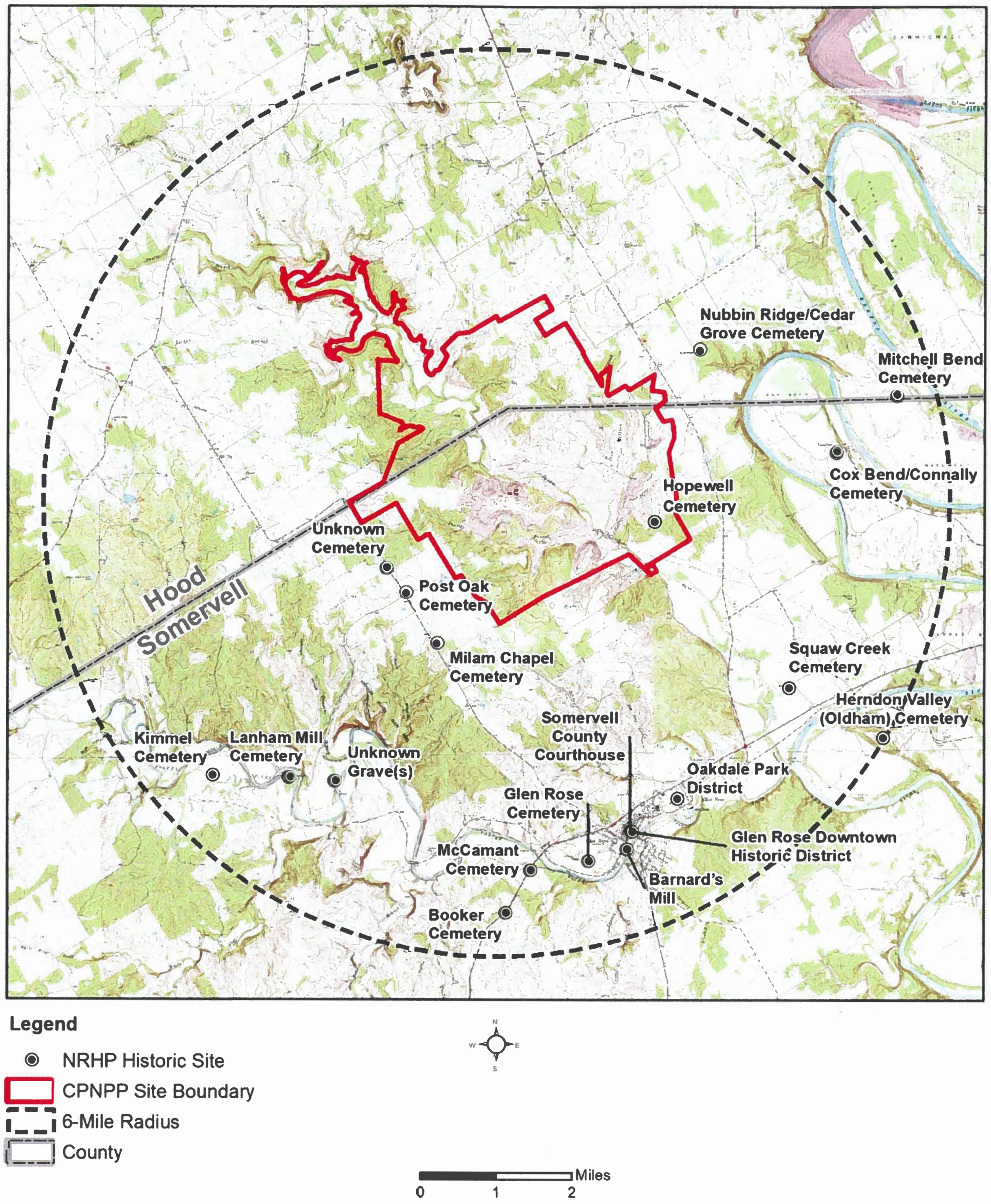
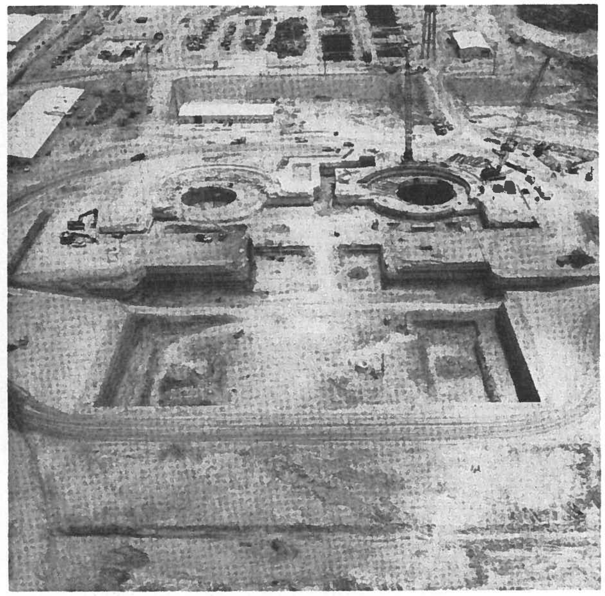


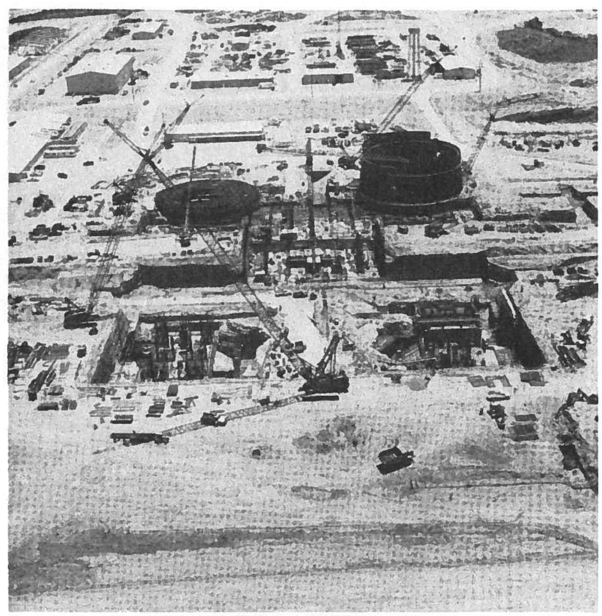
Figure 3.8-4 NRHP-Listed Resources and Cemeteries within 6 Miles of CPNPP

DECEMBER 1974



JUNE 1975

DECEMBER 1975



JUNE 1976

Figure 3.8-5 Construction Photographs of the CPNPP Site Over an 18-Month Period

Figure 3.8-6 Construction Photograph of the CPNPP Site After Tree Removal, Mechanical Leveling, and Initial Excavation

Figure 3.8-7 Construction Photograph of CPNPP Showing Areas Excavated for Structures, Facing South

Figure 3.8-8 Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Facing North

Figure 3.8-9 Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Facing Northeast

Figure 3.8-10 Late-Construction Photograph of CPNPP Showing Structures, Buildings, SCR, Dam and Spillway, Facing West-Northwest

3.9 Socioeconomics

Socioeconomic descriptions focus on Hood, Somervell, and Tarrant counties, because approximately 64 percent of the CPNPP workforce are located in these three Texas counties, while the remaining workforce is dispersed throughout the state of Texas and across the United States (see Table 2.5-1).

As presented in Section 2.5, during refueling outages, which usually last approximately 28 days per unit, there are typically an additional 800 to 1,200 contract employees onsite. Refueling and maintenance outages at CPNPP are on an 18-month staggered cycle. As seen in Figure 3.1-4, within the 50-mile radius of CPNPP there are several nearby Texas cities, including Glen Rose, Granbury, Stephenville, Cleburne, and the Dallas-Fort Worth metroplex. These communities offer numerous motels, campgrounds, and food service conveniences for contract workers who provide temporary staffing support to CPNPP during site outages. Regional transportation corridors such as US 67 and US 377, and local SH 144 provide commuter access to CPNPP.

3.9.1 Employment and Income

The three geographic areas most influenced by CPNPP operations are Hood, Somervell, and Tarrant counties in Texas. Additionally, CPNPP is a CP PowerCo asset with assessed property taxes distributed to various taxing jurisdictions within Somervell County. As presented in Section 3.11.1, the populations of these counties are expected to increase during the LR operating term. Low-income populations and poverty thresholds for the counties are described in Section 3.11.2.

Because of population size and interaction with nearby urban areas, Hood County has been designated the Granbury micropolitan statistical area within the Dallas-Fort Worth-Arlington combined statistical area (CSA) (USCB 2020b). The reported employed population in Hood County in 2020 was 28,849 persons. The leading reported occupational sector was retail trade, with approximately 12.1 percent, or 3,497 persons employed. This was followed by construction with 9.7 percent, or 2,810 persons employed; and health care and social assistance with 9.4 percent, or 2,706 persons employed. The annual personal income in Hood County was approximately $3.5 billion in 2020, and the average wage per job was $44,162. In 2020, per capita personal income was $55,132. (BEA 2022). The annual average unemployment rate in Hood County has dropped steadily over the years from a reported recent high in 2010 (8.6 percent) to 3.4 percent in 2019. In 2020, during the Covid-19 pandemic, the annual average unemployment rate jumped to 6.6 percent. In 2021, the preliminary average unemployment rate for Hood County was 5.4 percent. (BLS 2022) The top employers for Hood County in 2018 include the Granbury Independent School District (ISD), City of Granbury, and Luminant (GCOC 2020).

Because of its smaller population and distance from urban areas, Somervell County is not included with any metropolitan or micropolitan statistical areas (USCB 2020b). The reported employed population in Somervell County in 2020 was 5,270 persons. The leading reported occupational sector was government and government enterprises with 17.0 percent, or 897 persons employed. This was followed by accommodation and food services with 8.1 percent, or 427 persons employed; and construction with 7.6 percent, or 398 persons employed. The annual personal income in Somervell County was $458 million in 2020, and the average wage per job was $66,429. In 2020, per capita personal income was $50,164. (BEA 2022) The annual average unemployment rate in Somervell County has dropped steadily over the years from a reported recent high of 8.1 percent in 2011 to 3.6 percent in 2019. In 2020, during the Covid-19 pandemic, the annual average unemployment rate jumped to 6.5 percent. In 2021, the preliminary average unemployment rate for Somervell County was 5.3 percent. (BLS 2022) A list of Somervell County top employers was not available.

Tarrant County is located in the Dallas-Fort Worth Metropolitan Statistical Areas, and within the Dallas-Fort Worth-Arlington CSA (USCB 2020b). In 2020, Tarrant County reported a total employment of 1,272,899 persons. The leading occupational sector was retail trade with 127,785 persons employed (10.07 percent); followed by health care and social services with 124,267 persons employed (9.8 percent), and government and government enterprises with 115,726 employed (9.1 percent). The annual personal income in Tarrant County was $118 billion in 2020, and the average wage per job was $61,533. In 2020, the per capita personal income was $55,615. (BEA 2022) The annual average unemployment rate in Tarrant County has steadily dropped from 8.2 percent in 2010 to 3.3 percent in 2019. During the Covid-19 pandemic in 2020, the annual average unemployment rate jumped to 7.3 percent. The preliminary average annual unemployment rate in 2021 for Tarrant County was 5.5 percent. The principal employers in Tarrant County are AMR Corp/American Airlines, Texas Health Resources, and Lockheed Martin Aeronautics Company (TC 2021a).

3.9.2 Housing

Between 2010 and 2020, the Texas counties where the majority of CPNPP workforce reside all had an increase in population: Hood County (20.4 percent); Somervell County (8.4 percent); and Tarrant County (16.7 percent) (see Table 3.11-2).

As presented in Table 3.9-1 the availability of vacant housing in the three counties has been consistent since 2000. The 2020 percentage of available housing indicates that with the growth in population in the three counties, there were sufficient vacant homes available to keep up with the population increase. In 2020, availability of housing in Hood County was 12.9 percent, 18.3 percent in Somervell County, and 7.4 percent in Tarrant County. (USCB 2020c; USCB 2021d; USCB 2022c)

Table 3.9-1 also details the rise in median housing values that has taken place over the years. Between 2000 and 2010, the median house value rose by 35.8 percent in Hood County, 58.1 percent in Somervell County, and 49.4 percent in Tarrant County. Between 2010 and 2020, the median housing values in Hood County rose by 37.1 percent; 42.6 percent in Somervell County, and 55.4 percent in Tarrant County. Of the three counties, as of 2020, Tarrant County median house values are the highest ($209,600) and Somervell County median house values are the lowest ($205,800). (USCB 2020c; USCB 2021d; USCB 2022c)

Between 2000 and 2010, median monthly rents increased along with median housing values in the three counties. In Hood County, between 2000 and 2010 median monthly rents rose by 53.8 percent; and rose again by 21.3 percent between 2010 and 2020. Somervell County median monthly rents rose by 44.3 percent between 2000 and 2010 and by 23.3 percent between 2010 and 2020. In Tarrant County, between 2000 and 2010, median monthly rents rose by 36.1 percent and by 37.1percent between 2010 and 2020. Of the three counties, Tarrant County has the highest median monthly rents ($1,142) and Somervell County has the lowest monthly rents ($715). (USCB 2020c; USCB 2021d, USCB 2022c)

3.9.3 Water Supply and Wastewater

The following community water supply and wastewater discussion focuses primarily on Hood and Somervell counties where CPNPP is located. In both Somervell and Hood counties, there are various ways for residents to obtain water and wastewater services. Depending on the geographic location, residents of the two counties can get water from a municipality or from private wells. (NRC 2011)

As of 2013, in Hood County there were 16 individual water service providers for communities and subdivisions and two sanitary wastewater disposal providers. Septic systems are utilized in the majority of Hood County subdivisions for wastewater disposal. (AMUD 2021a)

The largest city in Hood County and one of the larger water service providers is the City of Granbury, where water customers consist of a mixture of residential, commercial, institutional, and wholesale users. At present, Granbury provides water service to approximately 14,000 retail water users through 5,500 retail service connections, and 1,670 wholesale water users through three wholesale metered connections. The City of Granbury holds water rights from the Brazos Water Management Area. (Granbury 2021c)

In 2017, the City of Granbury built a new water treatment plant. The plant expanded the city's surface water treated capacity by more than 500 percent and replaced the old water treatment plant. The new plant allowed the city of Granbury to eliminate purchasing water from the Acton Municipal Utility District (AMUD). The surface water treatment plant can produce up to 2.5 million gallons per day (MGD). This meets the city of Granbury's current daily water requirements (approximately 1.5–2 MGD). On peak demand days (3–3.5 MGD), water supply from Granbury's 34 groundwater wells supplement user demand. Currently, the City of Granbury is in Phase II of adding additional equipment to the water plant that will increase its capacity to 5 MGD, and also has plans for a future Phase III increase in water treatment plant capacity to 7.5 MGD, to be implemented in the next 20–30 years, depending on population growth. (Granbury 2021d)

The City of Granbury wastewater collection system consists of a network of sewer lines, lift stations, and manholes. Sewage flows by gravity, aided, when necessary, by lift stations, through the collection system into the wastewater treatment plant (WWTP). No wholesale customers are served by the city of Granbury sewage collection and treatment system. The current WWTP has a permitted capacity of 2 MGD. All treated wastewater is disposed of via permitted outfall into Lake Granbury. (Granbury 2021c)

Currently 100 percent of the Granbury WWTP capacity is already accounted for by existing and upcoming developments. In 2018, city government approved a master plan to meet short-term needs for increasing wastewater capacity with immediate construction of a new 1 MGD east Granbury WWTP. As part of the initial project, Granbury would also rehabilitate the existing 2-MGD south WWTP and introduce other waste collection improvements. In 2018, as part of the phased wastewater expansion plan, the city also intended to continue to improve on the collection system and in 5-10 years build a north Granbury WWTP, and in 10–20 years add additional lines and a west Granbury WWTP. Currently the Granbury WWTP expansion project has stalled due to ongoing public opposition to construction of the proposed 1 MGD east WWTP. As of 2021, the City of Granbury has established an ongoing 180-day moratorium on new development in the eastern portion of the city, which could eventually envelop the entire municipality if the state does not issue a permit for the east WWTP facility. (Granbury 2021d; HCN 2021)

AMUD is another large water and wastewater provider in Hood County and serves both municipal and wholesale customers. The district is composed of a number of residential subdivisions in the Acton area, scattered individual residences, and undeveloped agricultural lands surrounding the southern portion of Lake Granbury and the portion of the Brazos River which flows from Lake Granbury. The district's current customer base is 8,200 households. AMUD water comes from 24 wells located throughout the district and is supplemented with surface water from Lake Granbury via water treated at the Brazos Regional Public Utility Agency Surface Water and Treatment System plant located in Acton. As of 2014, the AMUD wells had a capacity of 3.1 MGD, and the Brazos Regional Public Utility Agency contract supplies 5.81 MGD to the district via the surface water and treatment system plant. (AMUD 2021b; AMUD 2021c)

Approximately 20 percent of the water distributed to AMUD retail users is returned to the district's two wastewater treatment facilities. No wholesale customers are served by the district's sewage collection and treatment system. The AMUD WWTP No. 1 has a rated treatment capacity of 0.6 MGD, and AMUD WWTP No. 2 is rated for 0.487 MGD. It was announced in 2020 that because of the age of some of the waste treatment components and to accommodate additional population growth in the Acton area, WWTP No. 1 would expand its treatment capacity to over 0.9 MGD. (AMUD 2021b; AMUD 2021c)

The SCWD serves as the main water supplier for Somervell County and has completed facilities for raw water supply, recreational use, water treatment, and transmission facilities. The SCWD operates the only water treatment plant in Somervell County and has a capacity of 2.5 MGD, with build out capacity to 3.75 MGD. (SCWD 2021b) As discussed in Section 3.1.4, the SCWD is continuing to add new waterlines to the county distribution system.

The SCWD provides treated water to the city of Glen Rose on a wholesale basis and serves Somervell County as a retail supplier. Until recent years, the municipal water needs of Somervell County were being met by groundwater, but groundwater levels have been rapidly declining. In 2008, the Wheeler Branch Reservoir was constructed northwest of Glen Rose. The Wheeler Branch storage capacity is 4,118 acre-feet, and the current yield available for municipal use is 2,000 acre-feet per year. The population of Somervell County was a reported 8,490 in 2010, and the amount of water used for municipal purposes was estimated to be 1,541 acre-feet. This is approximately 162 gallons per person per day. Based on a projected 2070 population, the dry year municipal water use in Glen Rose and Somervell County would be approximately 1,819 acre-feet per year, indicating enough SCWD capacity to meet potential population growth. (SCWD 2021b; SCWD 2021a)

The SCWD also provides commercial potable water supplies to CPNPP. The industrial demand by CPNPP is a reported 10,750,000 gallons per year. The SCWD does not provide CPNPP power plant cooling water nor any make-up water (see Section 3.6 discussion). (SCWD 2021b)

The City of Glen Rose owns and operates the only public wastewater treatment facility in Somervell County. Over the past several years, Glen Rose's WWTP has consistently discharged an average of 0.30 MGD. Since the remainder of the county is served by individual septic systems, there is no return wastewater flow in the rural portions of Somervell County. (SCWD 2021b)

3.9.4 Community Services and Education

As of the 2018–2019 school year, Hood County had three public ISDs and one charter school, with 8,656 total students and 16 schools. Within the county, Granbury ISD is the largest district with 10 schools and 7,346 students (grades pre-kindergarten to 12). The Granbury ISD student/teacher ratio was 15.72. Hood County has one private school with 52 total students (2017-2018 school year). (NCES 2021) In Hood County, Weatherford College has opened an education center in the city of Granbury. Along with library collections, smart classroom technology, and academic/career assessments, the center offers credit and workforce continuing education courses. (WC 2021)

For Hood County emergency services, county-wide law enforcement is provided through various agencies including the county sheriff's office, local county constables, the county fire marshal, the Lipan City Marshal office, and the cities of Granbury and Tolar both have police departments (USACOPS 2021). Hood County is served by nine community fire departments, with 22 stations and 498 active volunteer firefighters (USFA 2021). There is one full-service hospital in Hood County. Located in the city of Granbury, the Lake Granbury Medical Center is a 73-bed (acute care) facility. (TDSHS 2021)

For the 2018–2019 school year, Somervell County had one ISD and one charter school, with a reported 2,095 students and five schools. The Glen Rose ISD is the largest district in the county with four schools and 1,857 students serving grades pre-kindergarten to 12. The Glen Rose ISD student/teacher ratio was 13.55. Somervell County has one private school serving 193 students in the 2017–2018 school year. There are no colleges or universities reported to be located in the county. Within the CPNPP 50-mile region, there are 20 two-year and four-year higher educational facilities (both public and private). Approximately 27 miles from Glen Rose, the nearest four-year schools are Tarleton State University in Stephenville, TX, and Southwestern Adventist University in Keene, TX. (NCES 2021)

Somervell County public safety is provided through the County Sheriff's office and the city of Glen Rose police department (GR 2021). The Somervell County Fire Department has one station in the city of Glen Rose. (FireDepartment.net 2021; USFA 2021) There is one full-service hospital in Somervell County. The Glen Rose Medical Center has a 16 bed (acute care) capacity and is located in the city of Glen Rose. (TDHS 2021)

With 41 incorporated cities, towns, and municipalities (TC 2021b), Tarrant County has a large public school student population, and in the 2018–2019 school year reported 27 school districts and 359,281 total students (528 schools). Fort Worth ISD is the largest school district in the county with 84,510 students and 145 schools serving grades pre-kindergarten to 12. The Fort Worth ISD student/teacher ratio was 14.63. There are also 86 private schools in Tarrant County serving a reported 19,772 students (2017–2018 school year). Fourteen of the four-year and two-year higher educational facilities are located within the cities of Fort Worth and Arlington in Tarrant County. (NCES 2021)

There are 38 law enforcement agencies in Tarrant County providing public safety, including the county sheriff's office, community marshals, airport and transit police, and municipal police departments (USACOPS 2021). Tarrant County has 36 fire departments, with 124 stations and over 2,400 firefighters (active and volunteer) providing support (USFA 2021). There are 44 hospitals located in Tarrant County, with 6,221 acute care beds available and 312 psychiatric care beds (TDHS 2021).

3.9.5 Local Government Revenues

For Somervell County, TX, where CPNPP is located, the Somervell County Appraisal District (Somervell CAD) is responsible for annual fair market appraisal of all real and business property within the jurisdiction. The Somervell CAD appraises property according to the Texas property tax code and is a political subdivision of the state of Texas. Using the taxable values for the county as certified by the chief appraiser and following requirements of the truth in taxation laws, tax rates are established for the individual Somervell County taxing jurisdictions. Within Somervell County, the Somervell CAD assesses CPNPP property and collects property tax payments for the following individual taxing jurisdictions: Somervell County, City of Glen Rose, SCWD, Glen Rose Medical (Somervell County Hospital District), and Glen Rose ISD. (SCAD 2020).

Based on annual property appraisals, Table 3.9-2a presents CPNPP's total annual property tax payment to Somervell CAD for 2015 through 2021, along with the Somervell CAD total annual tax revenues. Table 3.9-2b provides a breakdown of CPNPP's annual tax payment as allocated by the Somervell CAD to each of the individual taxing jurisdictions, along with each of the taxing jurisdictions annual tax revenue totals for 2015 through 2021. As presented in Table 3.9-2a, the Somervell CAD total annual revenues attributable to the annual CPNPP tax payment between 2015 and 2021 ranged from 58 percent to 75 percent. In 2021 (latest year of complete financial reporting) the payment attributable to CPNPP represented approximately 68 percent of Somervell CAD revenues. Annually, the Glen Rose ISD is the Somervell CAD taxing jurisdiction that receives the largest percentage of CPNPP's tax payment, representing approximately 69 percent of total school district revenues in 2021 (Table 3.9-2b).

As noted in Table 3.9-2a, CPNPP property taxes for 2015–2017 were challenged by the taxpayer under the Texas tax code. The parties reached a settlement in a confidential settlement agreement that established the values and corresponding tax payments for those three years. At this time, CPNPP does not anticipate any material future changes in tax laws, although it should be noted that the value of CPNPP for Texas property tax purposes moves up and down with power price forecasts, costs incurred to produce electricity at CPNPP, and output, among other valuation variables applicable to an income-producing power plant. In addition to changes in valuation associated with operation of CPNPP in the Electric Reliability Council of Texas (ERCOT) competitive market, the Texas legislature and courts actively consider school finance reforms that could also alter the Texas property tax system in the future.

In appreciation for emergency planning support, CPNPP contributes a total of $220,000 annually to Hood County, Somervell County, Glen Rose ISD, Bosque County, and the city of Benbrook. CP PowerCo also allocates $25,000 each year to support a variety of local community organizations and programs, such as the Somervell County Food Bank, Glen Rose American Legion, Lake Granbury Beautification, and Granbury ISD Science Fair. CP PowerCo actively encourages CPNPP employee participation in charitable fundraising, and annually sponsors a United Way corporate match for staff contributions. With United Way and additional contributions to community special events, approximately $100,000 in total contributions were raised by CP PowerCo and CPNPP staff in 2021.

3.9.6 Transportation

As discussed in Section 3.1, transportation in the CPNPP region includes a rural and urbanized road network, plus rail and air travel (see Figures 3.1-3 and 3.1-4). East of CPNPP, Interstate 35 (I-35) is a major north-south interstate that traverses the 50-mile region, running through the Dallas-Fort Worth metropolitan area. Located north of CPNPP, the I-20 transportation corridor is a major east-west interstate that crosses north Texas. Within Hood and Somervell counties, US 67, US 377, and SH 144 provide commuter access from the communities in the region to CPNPP.

In Hood and Somervell counties, FM 56, located just west of the CPNPP site, is a two-lane, north-south paved highway connecting US 377 at the city of Tolar to US 67 at the city of Glen Rose. FM 56 provides the only direct road access to CPNPP's main plant facilities. For plant workers arriving via Somervell County, FM 56 north from Glen Rose intersects with the plant access road entrance. For CPNPP workers arriving via Hood County north of the plant entrance, FM 56 south from Tolar, and the FM 56 intersection with FM 51 (a two-lane, northeast-southwest highway from the city of Granbury) provide direct commuter access to the CPNPP site. At the FM 56 and CPNPP plant access road intersection, vehicle access to the plant includes dedicated turn lanes and traffic signals. (NRC 2011, Section 2.5.2.3)

The TxDOT average annual daily traffic (AADT) volumes for FM 56 are listed in Table 3.9-3. Over the years, the traffic volume counts on FM 56 have been consistent and reveal little fluctuation of commuter plant access. On FM 56 south of the plant, the most recent 2019 AADT count was 3,308. On FM 56 north of the plant, the 2019 AADT count was 2,988. (TXDOT 2021b)

The U.S. Transportation Research Board developed a commonly used indicator called level of service (LOS) to measure how well a highway accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter during peak hours. LOS categories are listed and defined in Table 3.9-4.

No recent TxDOT traffic studies specific to FM 56 in the area of CPNPP were available. To provide a current evaluation of LOS for FM 56, the known AADT traffic volumes were compared to the estimated capacity of a two-lane highway, as presented in the U.S. Transportation Research Board highway capacity manual. The manual notes that the capacity of a two-lane highway under base conditions is 1,700 passenger cars per hour (pc/h) in one direction, with a limit of 3,200 pc/h for the total of the two directions. Because of the interactions between directional flows, when a capacity of 1,700 pc/h is reached in one direction, the maximum opposing flow would be limited to 1,500 pc/h. Based on 2019 AADT recorded volumes, FM 56 south of the plant access road would have a reported flow rate of 138 pc/h on average. The 2019 AADT recorded volumes would indicate FM 56 north of the plant access road would have a reported flow rate of 125 pc/h on average. Because traffic flow has stayed consistent over the years, and the base condition capacities for a two-lane road are not exceeded by the current average traffic conditions, there should be ample traffic capacity on FM 56 in the road areas associated with plant access. Applying the LOS traffic conditions defined in Table 3.9-4, FM 56 should fall within the LOS “A” to “C” range of conditions.

In both Somervell and Hood counties, the TxDOT transportation improvement program has identified additional potential local road improvement projects for 2021–2024 planning purposes. These potential transportation improvement program projects should have no impact on plant accessibility. (TXDOT 2021c; TXDOT 2021d).

3.9.7 Recreational Facilities

While there are a number of popular regional and local county parks with playgrounds, visitor attractions, private and public overnight accommodations and camping, marina services, and recreational access to local lakes and rivers, no data on present and projected percentage of visitor use were available. See Figure 3.1-5 for locations of attractions that can be found within the vicinity of CPNPP.

As discussed in Section 3.1, the SCP public use area is located approximately 1 mile north of CPNPP on the SCR shoreline. SCR and park visitor access are controlled by CPNPP. SCP public recreational opportunities include SCR access for boat fishing, bank fishing, and shoreline picnicking. Between 2015 and 2019, in peak years as many as approximately 20,000 annual visitors have accessed SCP, with boat and bank fisherman the primary users. The highest visitor park use traditionally takes place during the cooler months of October through March, with fewer visitors the remaining 6 months of the year. While the SCR and SCP are currently closed to the public, recreational use is expected to reopen to visitors on a seasonal basis in the future. (Luminant 2021b)

Table 3.9-1 Housing Statistics, 2000–2020

Name	2000	2010	2000 to 2010 Change (%)	2020 Estimate	2010 to 2020 Change (%)
Hood County					
Total Housing Units	19,105	23,888	25.0	26,651	11.6
Occupied Units	16,176	20,240	25.1	23,215	14.7
Vacancy Units	2,929	3,648	24.5	3,436	5.8
Vacancy (percent)	15.3	15.3	0.0	12.9	2.4
Median House Value ($)	112,100	152,200	35.8	208,700	37.1
Median Rent ($/month)	541	832	53.8	1,009	21.3
Somervell County					
Total Housing Units	2,750	3,502	27.3	3,851	10.0
Occupied Units	2,438	2,923	19.9	3,145	7.6
Vacancy Units	312	579	85.6	706	21.9
Vacancy (percent)	11.3	16.5	5.2	18.3	1.8
Median House Value ($)	91,300	144,300	58.1	205,800	42.6
Median Rent ($/month)	402	580	44.3	715	23.3
Tarrant County					
Total Housing Units	565,830	696,556	23.1	780,381	12.0
Occupied Units	533,864	632,518	18.5	722,446	14.2
Vacancy Units	31,966	64,038	100.3	57,935	-9.5
Vacancy (percent)	5.6	9.2	3.6	7.4	-1.8
Median House Value ($)	90,300	134,900	49.4	209,600	55.4
Median Rent ($/month)	612	833	36.1	1,142	37.1

(USCB 2020c; USCB 2021d; USCB 2022c)

Table 3.9-2a CPNPP Total Property Tax Payments, 2015–2021

Year	Somervell CAD Total Tax District Revenue (USD)	CPNPP Total Property Tax Paid (USD)	% of Total Annual Revenue
2015[a]	39,924,784	29,819,198	75
2016[a]	46,575,615	26,783,926	58
2017[a]	39,653,991	27,726,896	70
2018	40,088,012	27,004,042	67
2019	41,613,724	27,131,834	65
2020	43,988,727	29,866,917	68
2021	42,425,538	28,900,690	68

a. CPNPP property taxes for 2015–2017 were challenged by the taxpayer under the Texas tax code. The parties reached settlement for the three years in a confidential settlement agreement that established the values and payments for those three years.

Table 3.9-2b CPNPP Total Property Tax Payment (USD) by Somervell County Tax Jurisdictions, 2015–2020

Jurisdiction	2015	2016	2017	2018	2019	2020	2021
Somervell County Water District							
Total Tax Jurisdiction Revenue	2,946,663	3,332,094	2,855,614	2,906,962	2,854,875	3,207,275	2,971,801
CPNPP Total Property Tax Paid	2,217,053	1,955,064	2,065,752	1,974,670	1,877,518	2,194,612	2,040,555
% of Total Annual District Revenue	75	59	72	68	66	68	69
Somervell County Hospital District							
Total Tax Jurisdiction Revenue	3,084,468	4,622,068	3,343,788	3,309,278	3,510,609	3,778,504	3,816,128
CPNPP Total Property Tax Paid	2,320,390	2,194,399	2,351,909	2,248,209	2,309,275	2,585,899	2,620,303
% of Total Annual District Revenue	75	47	70	68	66	68	69
Somervell County District							
Total Tax Jurisdiction Revenue	10,278,112	12,384,528	10,510,640	11,023,500	11,894,304	12,420,744	11,752,390
CPNPP Total Property Tax Paid	7,733,193	7,277,726	7,391,710	7,488,928	7,822,992	8,499,203	8,195,128
% of Total Annual District Revenue	75	59	70	68	66	68	70
Glen Rose ISD							
Total Tax Jurisdiction Revenue	22,978,613	25,581,028	22,244,937	22,114,893	22,578,637	23,845,010	23,235,273
CPNPP Total Property Tax Paid	17,548,537	15,356,713	15,917,502	15,292,212	15,122,026	16,587,181	16,044,684
% of Total Annual District Revenue	76	60	72	69	67	70	69
Glen Rose, City							
Total Tax Jurisdiction Revenue	636,928	655,897	699,011	733,380	775,300	737,194	649,947
CPNPP Total Property Tax Paid	25	24	23	23	23	22	21
% of Total Annual District Revenue	0	0	0	0	0	0	0

Table 3.9-3 Total Average Annual Daily Traffic Counts on FM 56

Route	Location	2005	2010	2015	2017	2019
FM 56	South of CPNPP Plant Access Road	2,900	2,300	2,695	2,526	3,308
FM 56	North of CPNPP Plant Access Road	NC	NC	2,539	2,530	2,988

(TXDOT 2021b)

NC = no count

Table 3.9-4 Level of Service Definitions

Level of Service	Conditions
A	Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles.
B	Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver.
C	The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.
F	Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

3.10 Human Health

This section describes site conditions likely to contribute to the occurrence of pathogenic thermophilic microbiological organisms; methodology and procedures designed to meet the regulatory requirements and standards for limiting potential induced current hazards arising from energized in-scope transmission lines; and a description of the plant's radiological health environment and preventative measures necessary to reduce potential exposure levels to plant workers and visitors during plant operations.

3.10.1 Microbiological Hazards

In the GEIS, the NRC considered health impacts from thermophilic microorganisms posed to both the public and plant workers because ideal conditions for thermophilic microorganisms can result from nuclear facility operations and discharges. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*. The public can be exposed to the thermophilic microorganisms *Salmonella, Shigella, P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater. If a nuclear plant's thermal effluent enhances the growth of thermophilic microorganisms in waters open for recreational use, recreational users could experience an elevated risk of exposure when using waters near the plant's discharge. (NRC 2013c; NRC 2020a)

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95 to 113°F, although the bacteria can persist in waters from 68 to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs. As such, human infection is often associated with complex water systems housed within buildings or structures, such as cooling towers. (NRC 2020a)

N. fowleri is ubiquitous in nature and thrives in water bodies at temperatures ranging from 95-106°F or higher and is rarely found in water cooler than 95°F. Infection rarely occurs in water temperatures of 95°F or less (NRC 2013c, Section 3.9.3). Infections occur when *N. fowleri* penetrates the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrates to the brain tissues (CDC 2020). There have been 37 cases of primary amebic meningoencephalitis in Texas through 2020 (CDC 2020).

The other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The pathogens can grow at a range of temperatures, but as human pathogens, have an optimal growth temperature around the human body temperature. The U.S. Centers for Disease Control and Prevention reports three outbreaks of waterborne *Shigella* infection from untreated recreational waters in the Texas 2009–2017 (CDC 2017). There were no reported cases of waterborne infection in

Texas from untreated recreational waters from *Salmonella* spp*., Pseudomonas* spp., *Acanthamoeba*, or *Legionella* ssp. in Texas in 2009–2017 (CDC 2017).

Activities at SCR are seasonal recreational boating and fishing. Access for the public to SCR is at SCR Park located on the northern arm of SCR. Swimming and wading are not allowed in SCR. Fishing is allowed from a boat or the bank. In-water barriers restrict boaters' approach to the discharge point by more than 1,800 feet. (Luminant 2021b; Attachment E)

CPNPP utilizes a cooling system in which cooling water is withdrawn from SCR from its intake on the north side of the plant, increases in temperature as it passes through the plant condensers, and returned to SCR through the discharge point on the southeast side of the plant. The discharge is pumped into a submerged outlet into a deep arm of the SCR. The outlet is a 101.5-foot-long channel that terminates at a lake depth of 35-40 feet (TUGC 1978).

CPNPP's TPDES Permit No. WQ0001854000 included in Attachment B was renewed in October 2019 and governs discharges of cooling water, stormwater, and low-volume wastewater to SCR. The SCR is classified as an industrial cooling reservoir and not subject to ambient water quality temperature limits; however, the permit identifies temperature limits that were proposed and accepted by TCEQ in earlier permit editions. Daily maximum and daily average discharge temperatures based on a flow-weighted average temperature (FWAT) are computed on a daily basis. The daily maximum discharge temperature limit is 116°F for the highest FWAT during the calendar month. The daily average discharge temperature limit is 113°F based on the arithmetic mean of the FWATs for the calendar month. The permit allows discharge of treated domestic wastewater through Outfall 003. Prior to discharge the treated domestic wastewater effluent is routed through a UV light disinfection.

CPNPP's procedures govern chemical additions. Sodium bromide and sodium hypochlorite are added to circulating water to control biological fouling of the system. Anti-scalant is added to circulating water to control scale development in the system. Sodium bromide and sodium hypochlorite are added to station service water to control biological fouling of the system. A corrosion inhibitor and dispersant chemical blend is added to station service water to control corrosion and fouling in the system. Clamicide is added to station service water biannually to control clam growth in the system. Each treatment period lasts several days. Aquashade can be used in the SSI for algae and aquatic plant control as needed.

CPNPP does not have cooling towers which carry a risk of promoting *Legionella*. Condenser tubing also has the potential of promoting *Legionella*. At CPNPP, condenser tubing cleaning is accomplished during outages and staff involved in the cleaning use respiratory protection equipment. The condenser tubes are cleaned during outages by using air to push brushes through the tubes. When the circulating water system (e.g., condenser water boxes) are entered by personnel, to protect against microorganisms (e.g., *Legionella*), safety instructions include ensuring that the circulating water system has been disinfected prior to entry, use of approved air purifying or supplied air respiratory protection equipment and performing personal hygiene practices after exiting the system.

3.10.2 Electric Shock Hazards

The electric field created by high-voltage lines can extend from the energized conductors on the lines to other conducting objects, such as the ground, vegetation, buildings, vehicles, and persons if appropriate clearances are not maintained, posing a shock hazard for the public and workers. To minimize the shock that could be experienced by someone touching an object that is capacitively charged, the clearance between the power lines and the object must limit the induced current to a low enough electrical charge. The National Electrical Safety Code (NESC) contains the basic provisions considered necessary for the safety of workers and the public.

The in-scope transmission lines (Figure 2.2-2) span between the switchyards and the power block. The switchyards are within a fenced, restricted access area and the power block is within the protected area fence. The span between these fenced areas crosses one of the plant's private roads. The entirety of the in-scope transmission lines is within the owner-controlled area (OCA). Thus, risk to the public is minimized due to restricted site access.

The in-scope transmission lines have been evaluated for compliance with NESC clearance standards. The existing switchyard to plant tie lines conductors and clearances were evaluated in 2008 by a licensed engineer as part of the CPNPP uprate project. The clearance study used computer-based modelling of the existing line structures and conductor sag. The evaluation concluded that the clearances at the maximum operating temperature met the 2007 NESC minimum requirements, except for clearance from the Unit 1 main transformers tie line to a light pole. This light pole clearance anomaly was subsequently corrected. Per Section 0.13.B.2 of the current Code, 2017 NESC, existing installations, including maintenance and replacement that currently comply with prior editions of the code, need not be modified to comply with these rules except as may be required for safety reasons by administrative authority. As stated above, the in-scope transmission lines are wholly within areas of restricted access and under the control of Vistra OpCo. Therefore, the in-scope transmission lines comply with current NESC clearance standards.

Compliance with NESC clearance standards is maintained by CPNPP's procedure-driven design review and control process. This process documents evaluations of changes that would potentially affect the electrical shock hazard of the in-scope transmission lines. Maintenance activities are also controlled by procedures. The use of man lifts and cranes near transmission lines is controlled by procedure.

Work on the CPNPP site is governed by a comprehensive industrial safety program with programmatic and tiered specific activity procedures. The program lists as references Occupational Safety and Health Administration (OSHA) regulations at CFR, Title 29, Parts 1904, 1910, and 1926. The program addresses electrical safety, clearance, and safety tagging, use of ladders and portable equipment, etc. Additional instructions are provided for using cranes and man lifts to ensure these are placed and operated safely.

3.10.3 Radiological Hazards

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," Vistra OpCo designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at CPNPP. NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the ALARA criteria in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Through these release limits, the NRC places regulatory limits on the radiation dose that members of the public can receive from a nuclear power plant's radioactive effluent.

CPNPP's ODCM contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents (Luminant 2020b). These methods ensure that radioactive material discharges from CPNPP meet NRC and EPA regulatory dose standards. CPNPP's annual radioactive effluent release reports contain a detailed presentation of the radioactive liquid and gaseous effluents released from CPNPP and the resultant calculated doses.

Radioactive effluent release data from 2013 through 2019 is trended in the 2019 report, showed no trends for increasing effluent radioactivity but show variability from year to year. Variability is a result of several factors including fuel type in the core, core cycles, and if the year was an outage year for either or both units. The 2020 report also showed no trends for increasing effluent radioactivity. Also, there was no unplanned gaseous or liquid radioactive releases in 2019 or 2020. Radiation doses to members of the public were controlled within the NRC's and EPA's radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190. Dose to a member of the public from activities inside the site boundary was evaluated. The highest dose resulted from recreational fishing on SCR. A dose of 2.86E-03 and 2.86E-03 milli roentgen equivalent man/year (mrem/year) was calculated for 2019 and 2020 respectively based on an individual fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all doses are calculated at the point of circulation water discharge into the reservoir. (Luminant 2020b; Luminant 2021a)

CPNPP also monitors radioactivity onsite and in the surrounding area through its REMP to identify any undue accumulation of radioactivity in any sector of the environment. Annual reports on the results are sent to the NRC. There were no values reported during the year 2019 or 2020 that exceeded any NRC reportable limit. Based on the 2019 results and from comparisons with the pre-operational and operational program results from previous years, Vistra OpCo concluded that the impact of CPNPP operations on the environment is minimal. The only REMP result directly attributable to Comanche Peak is the tritium detected in SCR. The tritium in SCR is expected to remain well below the reportable level. Gross beta trend indications concerning

SCR are consistent with previous values and do not indicate any increase due to influence from CPNPP. (Luminant 2020c; Attachment E)

Occupational exposure at nuclear power plants is reported by licensees to NRC and then summarized by the NRC. CPNPP's average annual individual occupational dose was well under the NRC exposure limit and the collective worker dose was also below average. The 3-year (2016 to 2018) average annual occupational dose per individual [total effective dose equivalent (TEDE)] was 0.089 roentgen equivalent man (rem) for CPNPP. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)]. The NRC also trended CPNPP's collective dose for workers. From 2016 to 2018, the collective worker dose per reactor at CPNPP was below the average collective dose for pressurized water reactors. (NRC 2020b) Occupational exposure levels are expected to be similar during the license renewal term as there are no planned changes in plant operation that would materially affect occupational doses.

3.11 Environmental Justice

This section characterizes the population and demographic makeup, including the identification of minority and low-income individuals, within a 50-mile radius of CPNPP.

3.11.1 Regional Population

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC 1996b, Section C.1.4). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC 1996b, Section C.1.4)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC 1996b, Section C.1.4)

The GEIS then uses the following matrix to rank the population in the region of the plant as low, medium, or high.

GEIS Sparseness and Proximity Matrix

		Proximity			
		1	**2**	**3**	**4**
Sparseness	**1**	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	3.4
	4	4.1	4.2	4.3	4.4

Low Population Area | Medium Population Area | High Population Area

(NRC 1996b, Figure C.1)

The 2020 census population and TIGER/Line data from the USCB were used to determine demographic characteristics in the vicinity of the site (USCB 2020b). The data were processed at the state, county, and census block levels using ESRI ArcGIS 10.4 software (USCB 2022a; USCB 2022d). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing. (USCB 2020d)

The 2020 census data indicate that approximately 82,833 people live within a 20-mile radius of the CPNPP site, which equates to a population density of 66 persons per square mile (USCB 2022d). The boundary of the city of Cleburne, TX, falls within the 20-mile radius of the CPNPP site. As listed in Table 3.11-1, Cleburne's 2020 population was estimated to be 31,352.

Based on the GEIS sparseness index, the site is classified as Category 3 with 60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.

The 2020 census data indicate that approximately 2,056,308 people live within a 50-mile radius of the site, which equates to a population density of 262 persons per square mile (USCB 2022d). There are three cities within a 50-mile radius that have a population greater than 100,000 residents (Table 3.11-1). Based on the GEIS proximity index, the site is classified as Category 4, greater than or equal to 190 persons per square mile within 50 miles.

As illustrated in the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 3 and "proximity" Category 4 results in the conclusion that CPNPP is located in a "high" population area.

The latest permanent population projections for Texas were obtained from the Texas Demographic Center (TDC). County-level permanent population values for the counties within a 50-mile radius are shown in Table 3.11-2. Transient data for the state of Texas were obtained from Travel Texas Industry Research (TTIR) and included in projected total population within a 50-mile radius of CPNPP.

The area within a 50-mile radius of the CPNPP site totally or partially includes 19 counties, all within the state of Texas (Table 3.11-2). According to the 2020 census, the permanent population (not including transient populations) of the entire 19 counties was approximately 5,910,067 (Table 3.11-2). By 2053, the end of the proposed CPNPP operating term for Unit 2, the permanent population (not including transient populations) of the entire 19 counties is projected to be approximately 8,767,344. Based on 2010–2053 population projections, an annual growth rate of approximately 1.2 percent is anticipated for the permanent population in the 19 counties wholly or partially within a 50-mile radius (TDC 2021).

As shown in Table 3.11-2, the total population (including transient populations) of the 19 counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 9,465,735 in 2053. The total population (including transient populations) within the 50-mile radius is projected to be 3,317,301 in 2053. (TDC 2021; TTIR 2021; USCB 2022a; USCB 2022d)

CPNPP is located in Somervell County. As shown in Table 3.11-2, the population of Somervell County, TX, as reported in the 2020 census was 9,205. Based on Texas's population projection data, Somervell County's projected permanent population for 2053 is expected to be 10,791. (TDC 2021; USCB 2022a). Estimated projected populations and average annual growth rates for Somervell County are shown in Table 3.11-3.

Cities, towns, villages, and some census designated places (CDPs) with centers falling within a 50-mile radius of CPNPP are listed in Table 3.11-1. As seen in Figure 3.1-3, the city of Glen Rose (Somervell County) falls within the 6-mile vicinity of CPNPP. Glen Rose's 2020 population was reported at 2,659 persons. (USCB 2022b)

As listed in Table 3.11-1, there are three cities with populations greater than 100,000 located in the CPNPP region. The largest of these is the city of Fort Worth (40 miles northeast) with a 2020 population of 918,915. The city of Arlington (50 miles northeast) has a population of 394,266 in 2020. The city of Grand Prairie (55 miles northeast) has an estimated 2020 population of 196,100. Ten additional communities, within a 50-mile radius of CPNPP, have a population greater than 25,000 as of 2020 (Table 3.11-1).

3.11.2 Minority and Low-Income Populations

3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the potential environmental "impact area." LIC-203 Revision 4 (NRC 2020c) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state that encompasses the 50-mile radius individually for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for CPNPP.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2020 low-income and minority census population data and TIGER/line data for Texas were obtained from the USCB and processed using ArcGIS software (USCB 2022e). Census population data were used to identify the minority and low-income populations within a 50-mile radius of CPNPP. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian, or Alaska Native, Asian, Native Hawaiian/other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC 2020c). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1. The minority population in the census block group exceeds 50 percent; or
2. The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for the state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percentage points were added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50 percent, or minority population is more than 20 percentage points greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for Texas and a 50-mile radius, and the corresponding criteria, are shown in Table 3.11-4.

A minority category of "Aggregate of All Races" is created when the populations of all the 2020 USCB minority categories are summed. As shown in Table 3.11-4, the 2020 "Aggregate of All Races" category, when compared to the total population, indicates 49.9 percent of Texas's population are minorities. The 2020 "Aggregate of All Races" category, when compared to the total population, indicates 44.7 percent of the population in a 50-mile radius (region) are minorities. The "Aggregate of All Races and Hispanic" population percentages for Texas and the region are 60.3 and 51.4 percent, respectively. Because 80.3 and 71.4 percent exceeds the 50 percent noted for Condition 1, defined above, the lower criterion (50 percent) would be used for the threshold.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the "Aggregate and Hispanic" category.

The number of census block groups contributing to the minority population count were evaluated using the criteria shown in Table 3.11-4 and summarized in Table 3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures 3.11-1, 3.11-2, 3.11-3, 3.11-4, 3.11-5, 3.11-6, 3.11-7, 3.11-8, 3.11-9, 3.11-10, 3.11-11, 3.11-12, 3.11-13, and 3.11-14) depict the locations of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the "American Indian or Alaskan Native" and "Native Hawaiian/Other Pacific Islander" race categories, no figures illustrating those race categories were produced.

The percentage of census block groups exceeding the "Aggregate of All Races" minority population criterion was 37.8 percent when a 50-mile radius (region) was used and 37.8 percent when the individual state was used as the geographic area (Table 3.11-5). For the "Aggregate and Hispanic" category, 44.9 percent of the census block groups contained a minority population when the region or the individual state was used (Table 3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

The identified minority population closest to the CPNPP center point is located approximately 23 miles east-northeast of the site: Block Group 482511307002. This census block group contained a total of 1,942 people, with 1,005 Aggregate and Hispanic. Using the regional criteria or the individual state criteria, the block group contains an Aggregate and Hispanic population. (USCB 2022a; USCB 2022e)

There are no block groups within a 6-mile radius that meet the criteria for a minority population. All of the identified minority block groups fall within or are immediately adjacent to cities, municipalities, or USCB-defined urban areas. (USCB 2022e; USCB 2020b)

As presented in Section 3.1.3, the state of Texas has three federally recognized American Indian nations and tribal communities. No tribal lands are located within the 50-mile region of CPNPP.

3.11.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC 2020c). As addressed above with minority populations, two alternative geographic areas (state of Texas and CPNPP 50-mile region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50 percent; or
2. The percentage of individual or family below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., individual state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20 percentage points were added to the low-income values for individuals and families and each geographic area. None of the geographic areas described in the first condition exceeded 50 percent.

As shown in Table 3.11-6, when the 2020 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 12.2 percent of the population in the region has an individual income below poverty level. In the state of Texas, the percentages of individuals with an income below poverty level is 14.2 percent.

As shown in Table 3.11-6, the state of Texas has an estimated 1,326,621 families living below poverty level. For the low-income family analysis, the USCB 2020 household category "income in the past 12 months below poverty level" is utilized. In the state of Texas, the percentage of the family population with an income below poverty level is 13.4 percent. In the region, when the 2020 census data family category "income in the past 12 months below poverty level" is compared to the total family count, 11.3 percent of the families had an income below poverty level.

When the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 32.2 percent of the total block group population would be considered a "low-income population." Using this criterion, 97 of the 1,258 census block groups (7.7 percent) were identified as low-income populations within a 50-mile radius of the CPNPP site, as shown in Figure 3.11-15. (USCB 2022e)

When the state of Texas is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 34.2 percent of the total block group, the population would be considered a "low-income population" (individual) (Table 3.11-6). Using the appropriate criteria for the individual state criteria, 80 of the total 1,258 census block groups (6.4 percent) have low-income individual population percentages that meet or exceed the threshold criteria noted in Table 3.11-5. There are no identified low-income populations (individual) within the vicinity of CPNPP. The low-income (individual) census block groups are illustrated in Figure 3.11-15 and Figure 3.11-16.

Similarly, both regional and state geographies along with family census data are used to identify low-income family block groups (Table 3.11-5). Using the family individual state criteria, 62 census block groups were identified as having low-income families. Using the regional criteria, 75 census block groups were identified as having low-income families. These census block groups are illustrated in Figures 3.11-17 and 3.11-18. (USCB 2022e; USCB 2022f) The closest low-income block group that meets the guidance criteria for families is located 4.6 miles southeast of the CPNPP center point (Block Group 484250002002). (USCB 2022e)

3.11.3 Subsistence Populations and Migrant Workers

3.11.3.1 Subsistence Populations

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level are aggregated and not usually structured to identify such uses on or near the site. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population, which is most likely to know of such activity. This may include county officials, community leaders, and landowners in the vicinity who would have knowledge of subsistence activity.

As described in Section 3.1, the CPNPP vicinity falls within rural areas of Hood and Somervell counties. The area consists of farmland and rural residential properties. As illustrated in Figure 3.1-4, within the 50-mile region large metropolitan populated areas (Dallas-Fort Worth-Arlington CSA) are located northeast of CPNPP, while the remainder of the region consists of scattered communities and counties with smaller populations. The NRC staff's scoping and outreach did not identify any special socioeconomic or health circumstances or potential pathways that could lead to disproportionately high and adverse health and environmental impacts. The NRC staff did not identify any unique resource dependencies or practices or other circumstances that could result in disproportionately high and adverse impacts to minority or low-income populations. (NRC 2011)

As discussed in Section 3.11.2, there are no low-income individual populations in the vicinity of the CPNPP and one low-income family population located in Glen Rose. Potential power plant related impacts would be expected to be most significant closer to the plant. The identified regional low-income populations are found within urban areas where subsistence-type dependence on natural resources (e.g., fish, game, agricultural products, and natural water sources) is less likely.

3.11.3.2 Migrant Workers

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the worker from returning to his/her permanent place of residence the same day." In 2017, Hood County reported that 194 out of 1,176 total farms employed farm labor. Somervell County reported that 69 out of 352 total farms employed farm labor. Tarrant County reported 248 out of 1,173 total farms employed farm labor. The 2017 Census of Agriculture reported that six of the Hood County farms hired migrant labor. None of the Somervell County farms employed migrant farm workers. Five farms in Tarrant County reported employing migrant workers. For Hood County, an estimated total of 420 farm laborers were hired, of which 223 were estimated to work fewer than 150 days per year. For Somervell County, an estimated total of 162 farm laborers were hired, of which 123 were estimated to work fewer than 150 days per year. For Tarrant County, an estimated total of 845 farm laborers were hired, of which 474 were estimated to work fewer than 150 days per year. (USDA 2021)

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 1 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Texas						
Abbott	Hill	300	356	352	51	ESE
Aledo	Parker	1,726	2,716	4,858	29	NNE
Alvarado	Johnson	3,288	3,785	4,739	34	ENE
Annetta	Parker	1,108	1,288	3,041	29	NNE
Annetta North	Parker	467	518	554	30	NNE
Annetta South	Parker	555	526	621	26	NNE
Aquilla	Hill	136	109	101	45	SE
Arlington	Tarrant	332,969	365,438	394,266	50	NE
Azle	Tarrant	9,600	10,947	13,369	43	NNE
Benbrook	Tarrant	20,208	21,234	24,520	32	NE
Blue Mound	Tarrant	2,388	2,394	2,393	46	NNE
Blum	Hill	399	444	383	25	ESE
Brazos Bend	Hood	NA	305	NA	12	N
Briaroaks	Johnson	493	492	507	31	ENE
Burleson	Johnson	20,976	36,690	47,641	32	ENE
Canyon Creek	Hood	NA	916	1,249	7	NNE
Carl's Corner	Hill	134	173	201	45	ESE
Cedar Hill	Dallas	32,093	45,028	49,148	52	ENE
Cleburne	Johnson	26,005	29,337	31,352	24	E
Clifton	Bosque	3,542	3,442	3,465	38	SSE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 2 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction[(c)(d)]
Cool	Parker	162	157	211	37	NNW
Covington	Hill	282	269	261	32	ESE
Coyote Flats	Johnson	NA	312	345	29	E
Cranfills Gap	Bosque	335	281	277	36	S
Cresson	Hood	NA	741	1,349	19	NNE
Cross Timber	Johnson	277	268	362	29	ENE
Crowley	Tarrant	7,467	12,838	18,070	31	NE
Dalworthington Gardens	Tarrant	2,186	2,259	2,293	46	NE
De Leon	Comanche	2,433	2,246	2,258	46	WSW
DeCordova	Hood	NA	2,683	3,007	10	NNE
Dublin	Erath	3,754	3,654	3,359	36	WSW
Edgecliff Village	Tarrant	2,550	2,776	3,788	36	NE
Everman	Tarrant	5,836	6,108	6,154	37	NE
Forest Hill	Tarrant	12,949	12,355	13,955	40	NE
Fort Worth	Tarrant	534,694	741,206	918,915	40	NE
Gholson	McLennan	922	1,061	1,250	53	SE
Glen Rose	Somervell	2,122	2,444	2,659	5	SSE
Godley	Johnson	879	1,009	1,450	18	NE
Gordon	Palo Pinto	451	478	470	38	WNW
Granbury	Hood	5,718	7,978	10,958	10	N
Grand Prairie	Dallas	127,427	175,396	196,100	55	NE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 3 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Grandview	Johnson	1,358	1,561	1,879	36	E
Gustine	Comanche	457	476	392	48	SW
Haltom City	Tarrant	39,018	42,409	46,073	46	NE
Hamilton	Hamilton	2,977	3,095	2,895	46	SSW
Hico	Hamilton	1,341	1,379	1,335	26	SSW
Hillsboro	Hill	8,232	8,456	8,221	43	ESE
Hudson Oaks	Parker	1,637	1,662	2,174	32	N
Hurst	Tarrant	36,273	37,337	40,413	51	NE
Iredell	Bosque	360	339	305	22	SSW
Itasca	Hill	1,503	1,644	1,562	38	ESE
Joshua	Johnson	4,528	5,910	7,891	26	ENE
Keene	Johnson	5,003	6,106	6,387	28	ENE
Kennedale	Tarrant	5,850	6,763	8,517	41	NE
Lake Worth	Tarrant	4,618	4,584	4,711	40	NNE
Lakeside	Tarrant	1,040	1,307	1,649	40	NNE
Lipan	Hood	425	430	505	21	NW
Mansfield	Tarrant	28,031	56,368	72,602	42	ENE
Maypearl	Ellis	746	934	939	45	E
Meridian	Bosque	1,491	1,493	1,396	27	SSE
Midlothian	Ellis	7,480	18,037	35,125	48	ENE
Milford	Ellis	685	728	722	51	ESE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 4 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Millsap	Parker	353	403	370	34	NNW
Mineral Wells	Palo Pinto	16,946	16,788	14,820	40	NNW
Mingus	Palo Pinto	246	235	223	41	WNW
Morgan	Bosque	485	490	454	22	SSE
North Richland Hills	Tarrant	55,635	63,343	69,917	49	NE
Pantego	Tarrant	2,318	2,394	2,568	47	NE
Pecan Plantation	Hood	3,544	5,294	6,236	8	NE
Pelican Bay	Tarrant	1,505	1,547	2,049	46	NNE
Reno	Parker	2,441	2,494	2,878	46	NNE
Richland Hills	Tarrant	8,132	7,801	8,621	48	NE
Rio Vista	Johnson	656	873	1,008	24	E
River Oaks	Tarrant	6,985	7,427	7,646	40	NE
Saginaw	Tarrant	12,374	19,806	23,890	46	NNE
Sanctuary	Parker	256	329	337	44	NNE
Sansom Park	Tarrant	4,181	4,686	5,454	41	NNE
Springtown	Parker	2,062	2,658	3,064	46	N
Stephenville	Erath	14,921	17,123	20,897	25	WSW
Strawn	Palo Pinto	739	653	540	45	WNW
Tolar	Hood	504	681	941	10	NW
Valley Mills	Bosque	1,123	1,203	1,229	48	SSE
Venus	Johnson	910	2,960	4,361	41	ENE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 5 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Walnut Springs	Bosque	755	827	795	17	S
Watauga	Tarrant	21,908	23,497	23,650	49	NE
Waxahachie	Ellis	21,426	29,621	41,140	55	E
Weatherford	Parker	19,000	25,250	30,854	32	N
Westover Hills	Tarrant	658	682	641	38	NE
Westworth Village	Tarrant	2,124	2,472	2,585	38	NNE
White Settlement	Tarrant	14,831	16,116	18,269	37	NNE
Whitney	Hill	1,833	2,087	1,992	36	SE
Willow Park	Parker	2,849	3,982	4,936	33	NNE

a. (USCB 2021b)

b. (USCB 2022d)

c. (USDOT 2021)

d. Reported distances and directions were calculated from the CPNPP center point to the city center.

NA = not available

Table 3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of CPNPP

State and County	2000 Population[(a)]	2010 Population[(a)]	2020 Population[(b)]	2053 Projected Permanent Population[(b)(c)]	2053 Projected Total Population[(b)(c)(d)]
Texas (19 Counties)	4,545,522	5,202,787	5,910,067	8,767,344	9,465,735
Bosque	17,204	18,212	18,235	18,235	19,688
Comanche	14,026	13,974	13,594	13,594	14,677
Coryell	74,978	75,388	83,093	88,770	95,841
Dallas	2,218,899	2,368,139	2,613,539	3,975,327	4,291,994
Eastland	18,297	18,583	17,725	17,725	19,137
Ellis	111,360	149,610	192,455	278,843	301,055
Erath	33,001	37,890	42,545	52,773	56,977
Hamilton	8,229	8,517	8,222	8,222	8,877
Hill	32,321	35,089	35,874	35,874	38,732
Hood	41,100	51,182	61,598	83,903	90,587
Jack	8,763	9,044	8,472	8,472	9,147
Johnson	126,811	150,934	179,927	244,228	263,683
McLennan	213,517	234,906	260,579	296,083	319,668
Palo Pinto	27,026	28,111	28,409	28,409	30,672
Parker	88,495	116,927	148,222	202,101	218,200
Somervell	6,809	8,490	9,205	10,791	11,651
Stephens	9,674	9,630	9,101	9,101	9,826
Tarrant	1,446,219	1,809,034	2,110,640	3,315,223	3,579,307
Wise	48,793	59,127	68,632	79,670	86,016

a. (USCB 2021a)
b. (USCB 2022a)
c. (TDC 2021)
d. (TTIR 2021)

Table 3.11-3 County Population Growth, 2010–2053

County	Measure	2010	2020	2025	2030	2035	2040	2045	2053
Hood County	Population	51,182	61,598	62,404	66,206	69,917	73,586	77,646	83,903
	Average Annual Growth %		1.87	0.26	1.19	1.10	1.03	1.08	0.97
Somervell County	Population	8,490	9,205	9,802	10,253	10,468	10,519	10,428	10,791
	Average Annual Growth %		0.81	1.26	0.90	0.42	0.10	-0.17	0.43
Tarrant County	Population	1,809,034	2,110,640	2,322,418	2,507,170	2,689,000	2,862,672	3,030,318	3,315,223
	Average Annual Growth %		1.55	1.93	1.54	1.41	1.26	1.14	1.13

a. County projection data indicate Somervell County's population may begin to decline after 2040. For a more conservative population value a linear trend was applied to the county projection data to derive the 2053 population.

Note: Projected population values are based on the population projection growth trend for the years reported by the Texas Demographic Center (TDC 2021; USCB 2021a, USCB 2022a).

Table 3.11-4 Minority Populations Evaluated Against Criterion

Geographic Area	Texas[a]			50-Mile Radius (Region)[b]		
Total Population	29,145,505			2,147,297		
Census Categories	**State Population by Census Category[a]**	**Percent[c]**	**Criteria**	**Regional Population by Census Category[b]**	**Percent[c]**	**Criteria**
Black or African American	3,552,997	12.2	32.2	309,807	14.4	34.4
American Indian or Alaska Native	278,948	1.0	21.0	19,718	0.9	20.9
Asian	1,585,480	5.4	25.4	89,101	4.1	24.1
Native Hawaiian/Other Pacific Islander	33,611	0.1	20.1	3,256	0.2	20.2
Some Other Race	3,951,366	13.6	33.6	250,183	11.7	31.7
Two or More Races	5,133,738	17.6	37.6	287,963	13.4	33.4
Aggregate of All Races	14,536,140	49.9	50.0	960,028	44.7	50.0
Hispanic or Latino	11,441,717	39.3	50.0	616,263	28.7	48.7
Aggregate and Hispanic[d]	17,560,908	60.3	50.0	1,104,001	51.4	50.0

a. (USCB 2022a)

b. (USCB 2022d)

c. Percent values were calculated by dividing each census category's population by the state or region total population values.

d. Includes everyone except persons who identified themselves as "White," "Not Hispanic," or "Latino" (NRC 2020c).

Table 3.11-5 Minority and Low-Income Census Block Group Counts, 50-Mile Radius of CPNPP

Total Number of Block Groups with Population within 50-mi radius	Individual State Method		50-Mile Radius (Region)	
	1,258		1,258	
Census Categories	**Number of Block Groups**	**Percent of Block Groups within Region**	**Number of Block Groups**	**Percent of Block Groups within Region**
Black or African American	178	14.1	157	12.5
American Indian or Alaska Native	0	0	0	0
Asian	11	0.9	15	1.2
Native Hawaiian/Other Pacific Islander	0	0	0	0
Some Other Race	66	5.2	81	6.4
Two or More Races	2	0.2	6	0.5
Aggregate of All Races	476	37.8	476	37.8
Hispanic or Latino	160	12.7	168	13.4
Aggregate and Hispanic	565	44.9	565	44.9
Low Income Individuals	80	6.4	97	7.7
Low Income Families (Households)	62	4.9	75	6.0

(USCB 2020b; USCB 2022d; USCB 2022e)

Table 3.11-6 Low-Income Population Criteria Using Two Geographic Areas

Geographic Area	Texas[a]			50-Mile Radius (Region)[b]		
(Income) Total Population	28,013,446			2,061,236		
(Income) Total Families	9,906,070			715,993		
Census Category	**State Population**	**Percent[c]**	**Criteria**	**Region Population**	**Percent[c]**	**Criteria**
Low Income – Number of Persons Below Poverty Level (Individuals)	3,984,260	14.2	34.2	251,029	12.2	32.2
Low Income – Number of Families Below Poverty Level (Households)	1,326,621	13.4	33.4	81,034	11.3	31.3

a. (USCB 2022f)

b. (USCB 2022e)

c. Percent values were calculated by dividing each census category's population by the state and regional total population values.

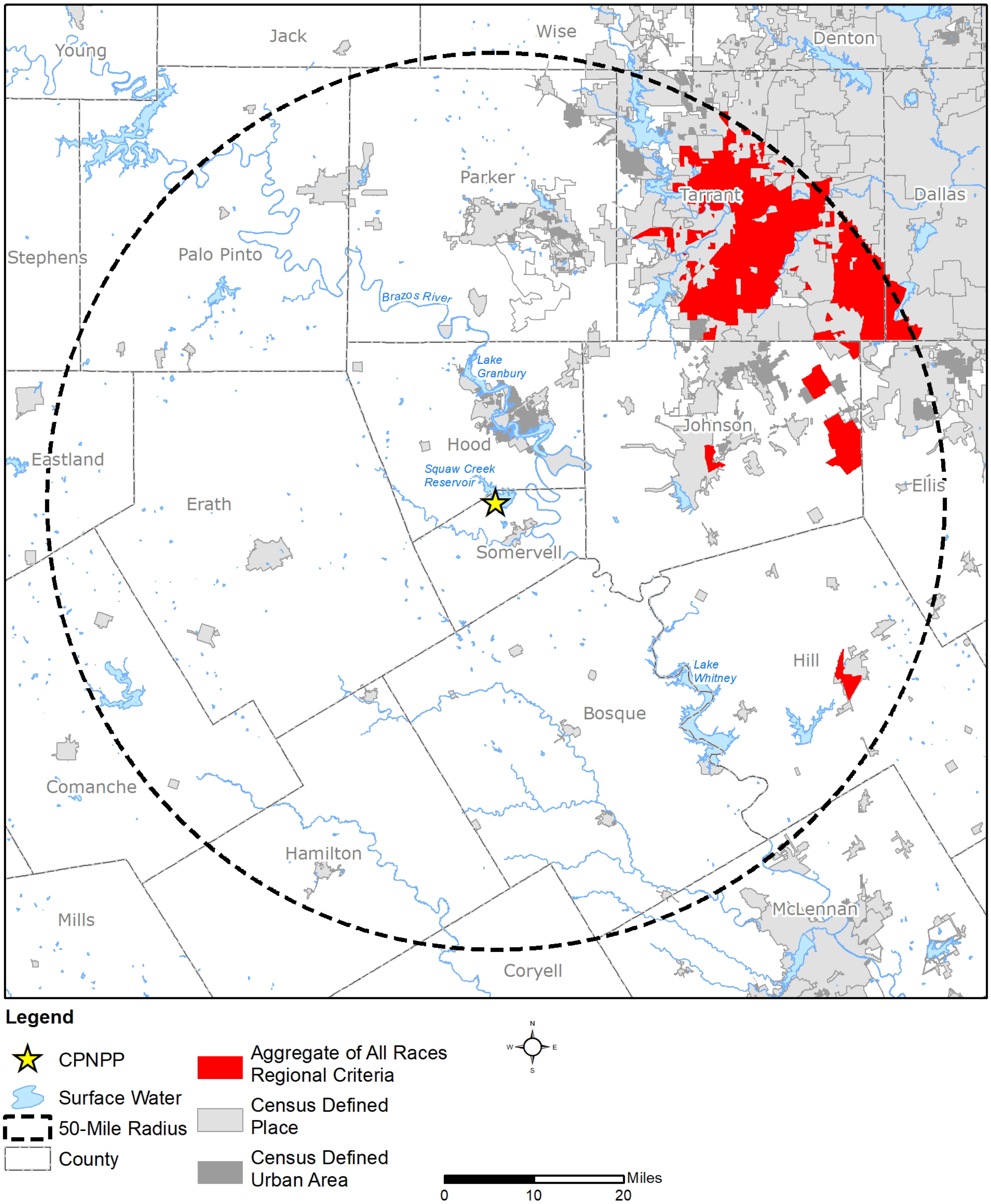


Figure 3.11-1 Aggregate of All Races Populations (Regional)

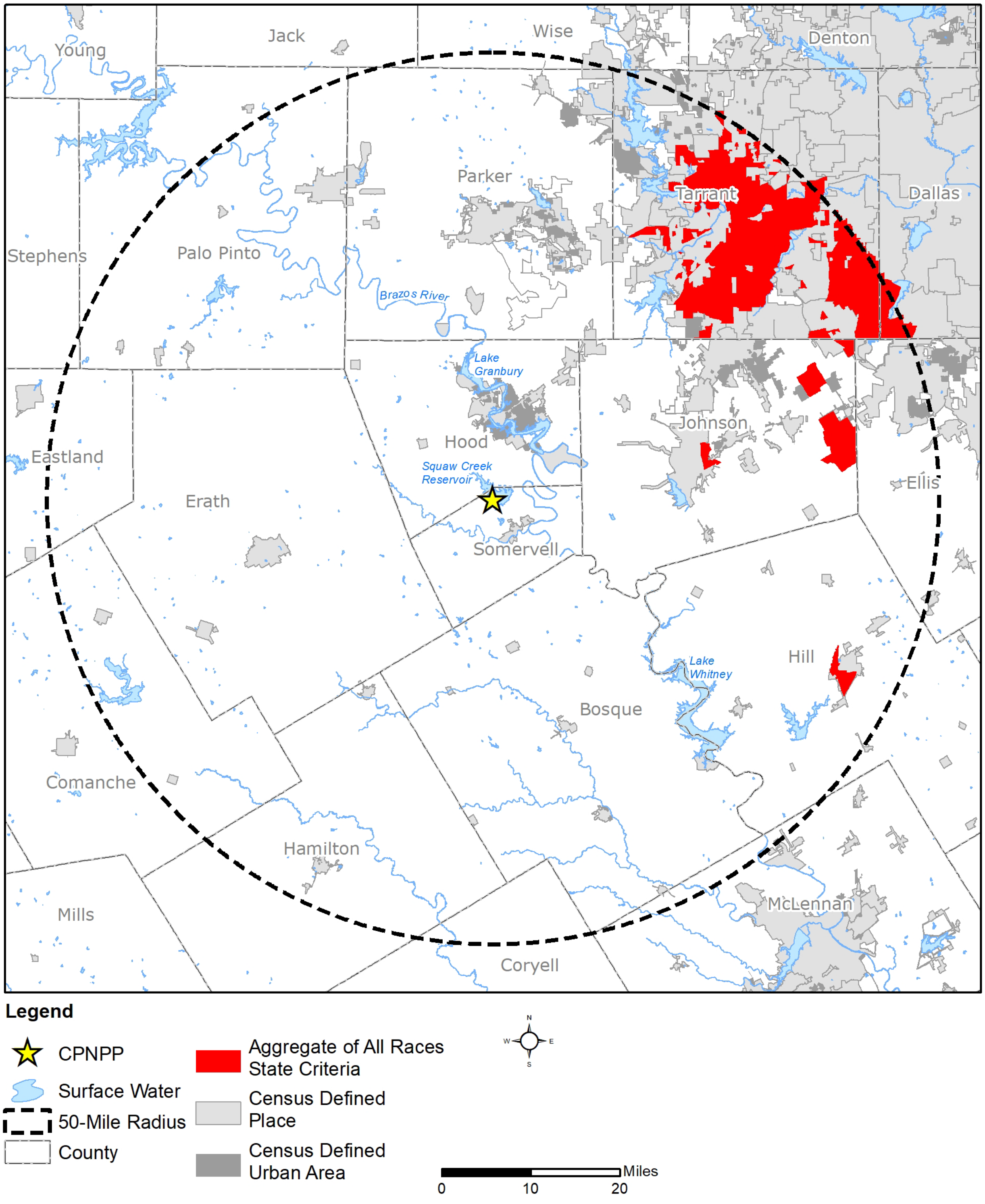


Figure 3.11-2 Aggregate of All Races Populations (Individual State)

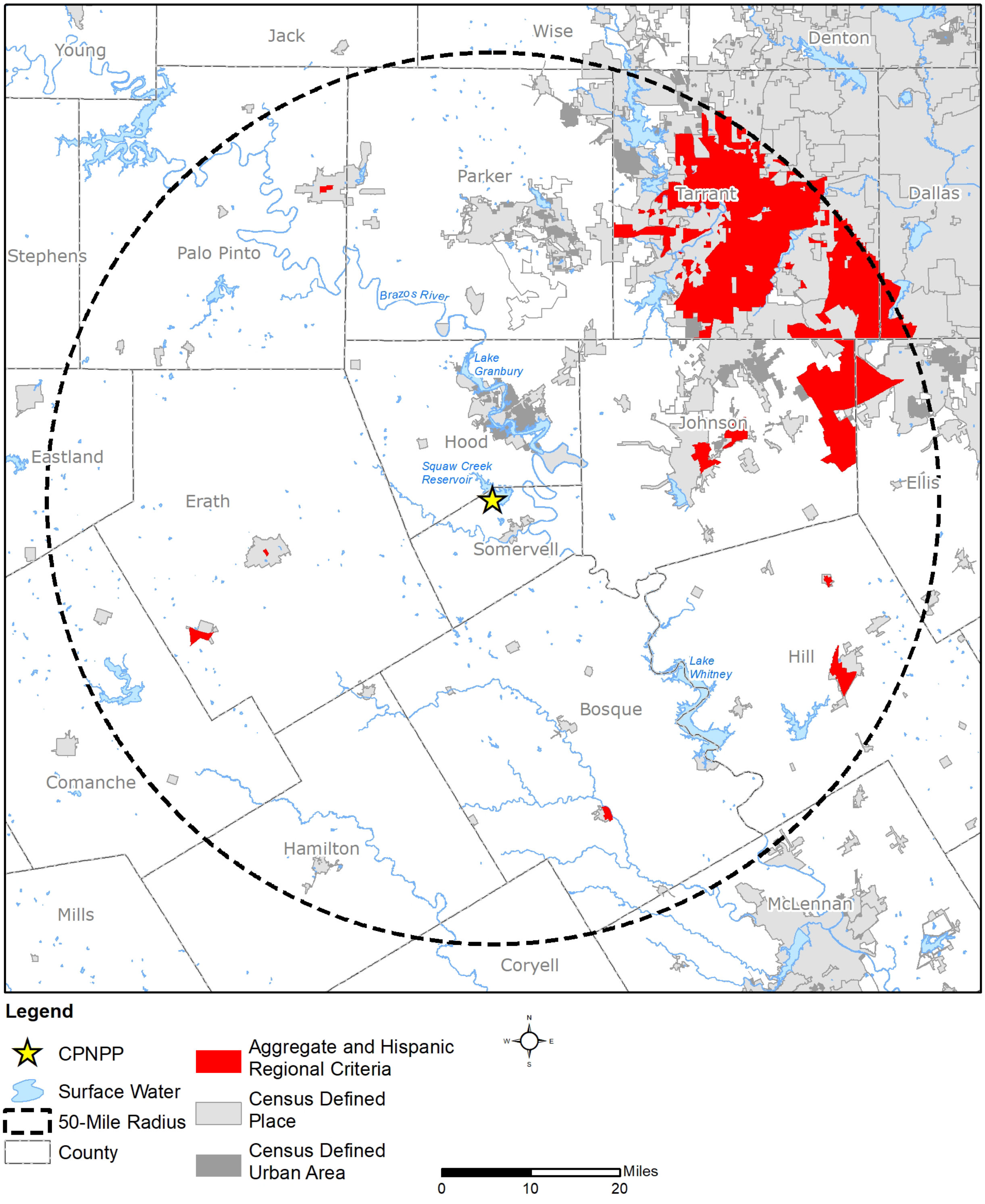


Figure 3.11-3 Aggregate and Hispanic Populations (Regional)

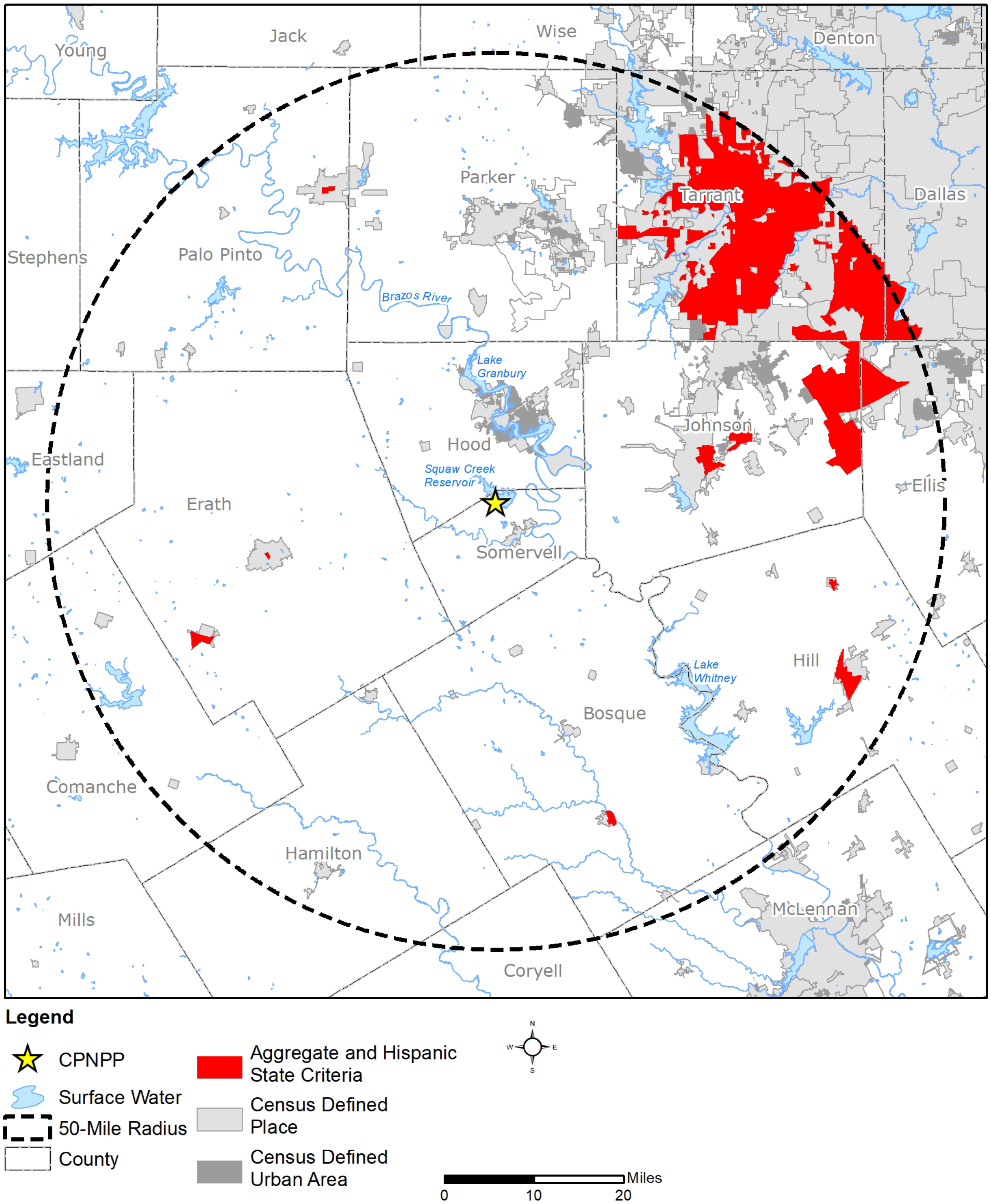


Figure 3.11-4 Aggregate and Hispanic Populations (Individual State)

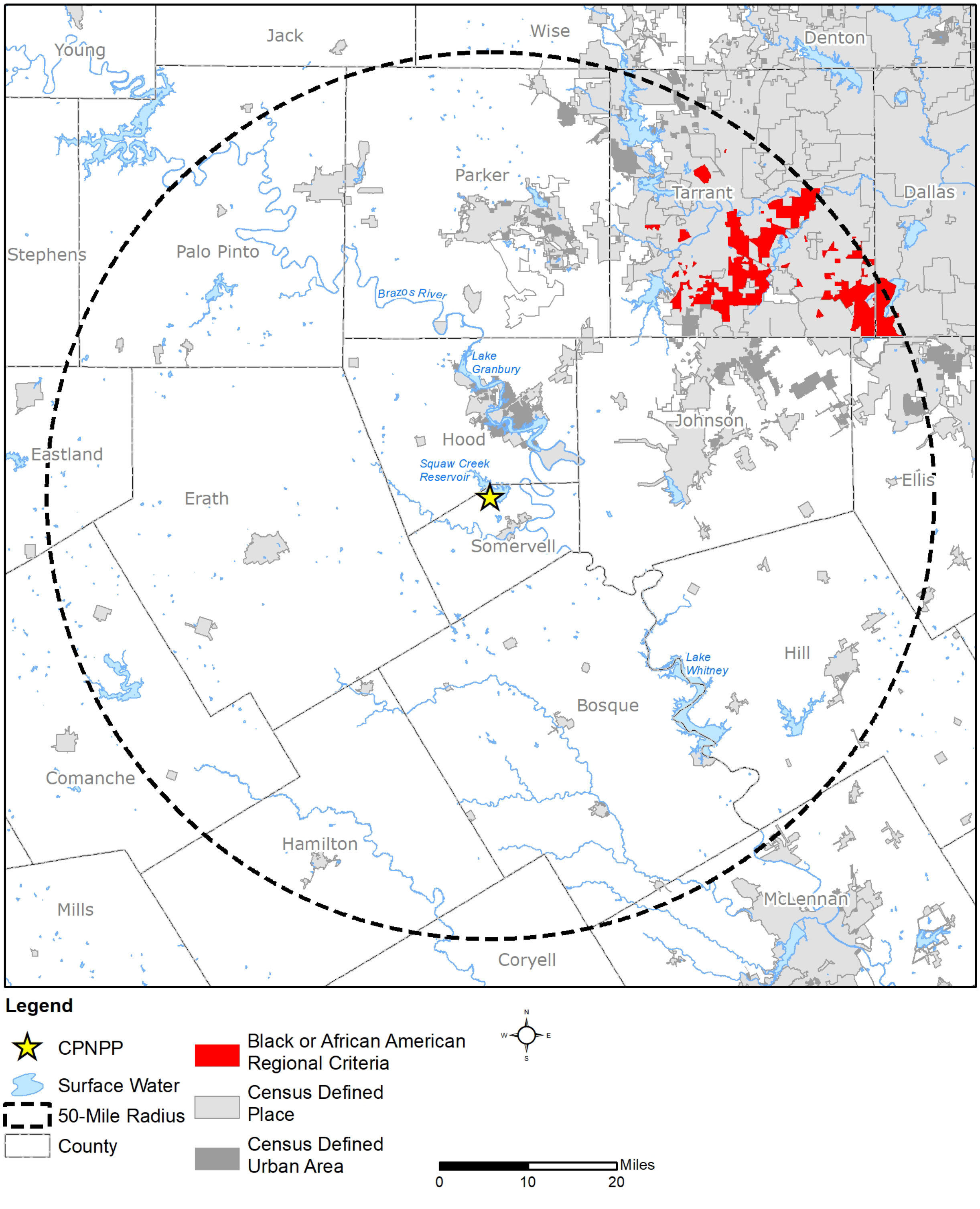


Figure 3.11-5 Black or African American Populations (Regional)

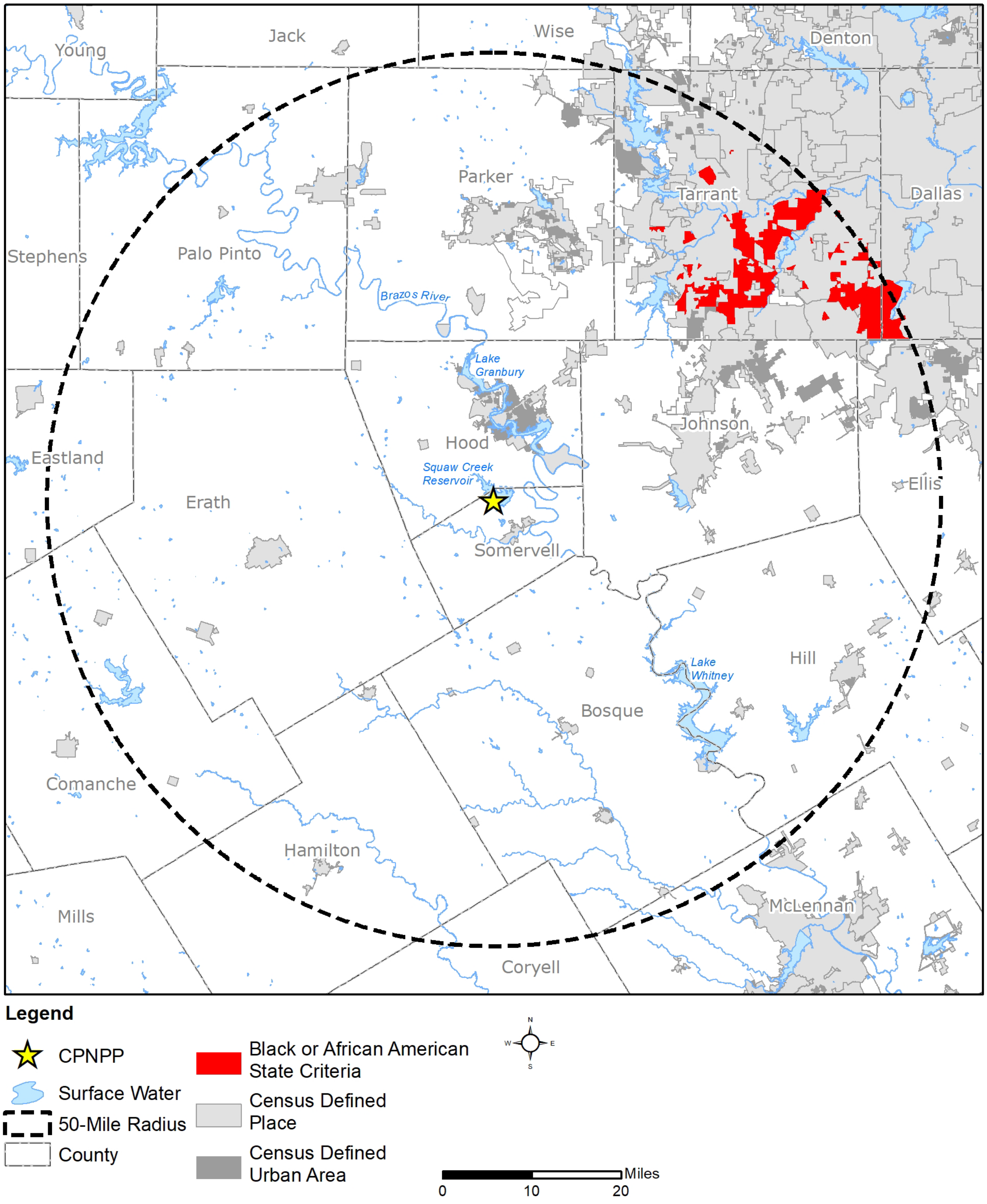


Figure 3.11-6 Black or African American Populations (Individual State)

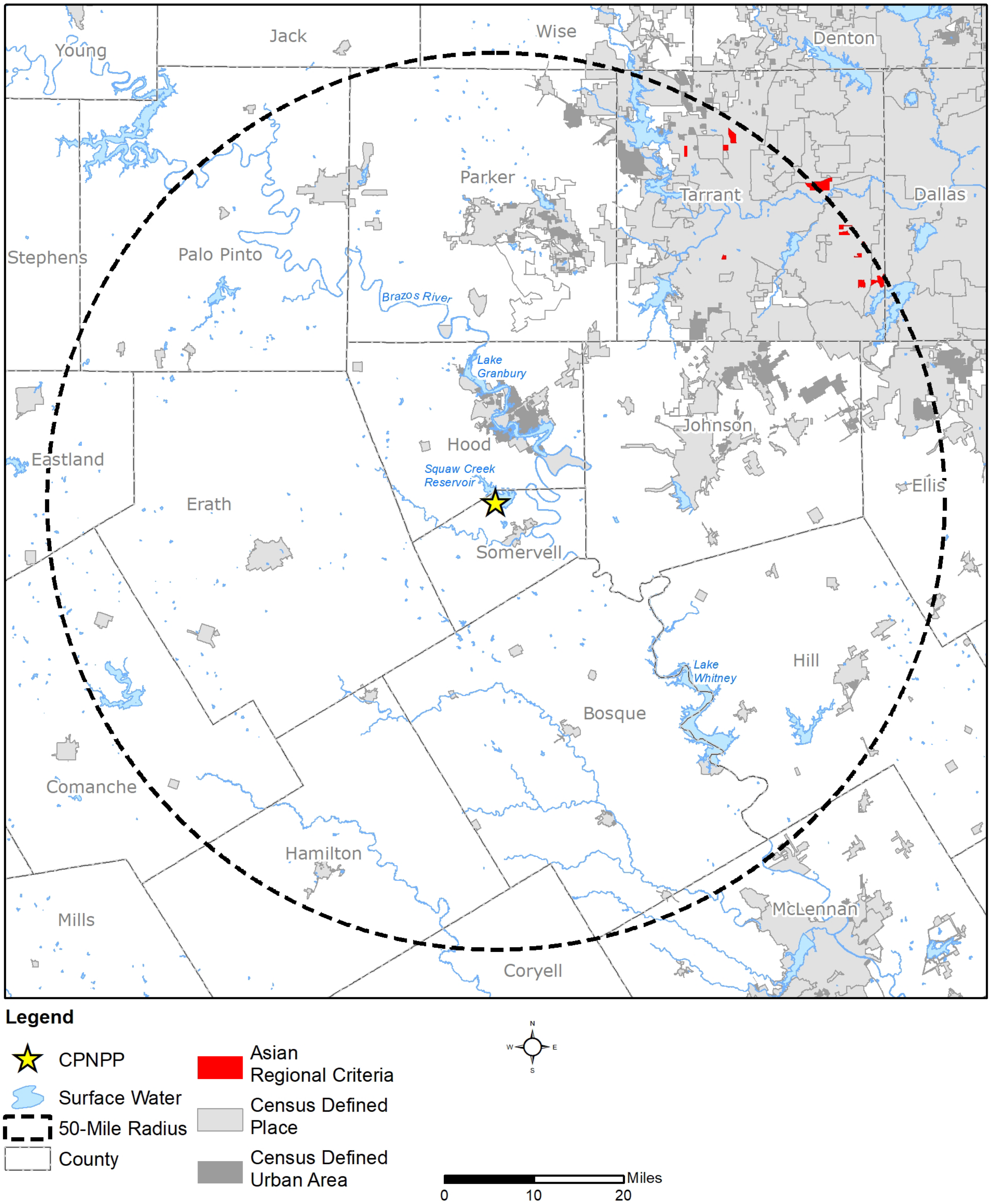


Figure 3.11-7 Asian Populations (Regional)

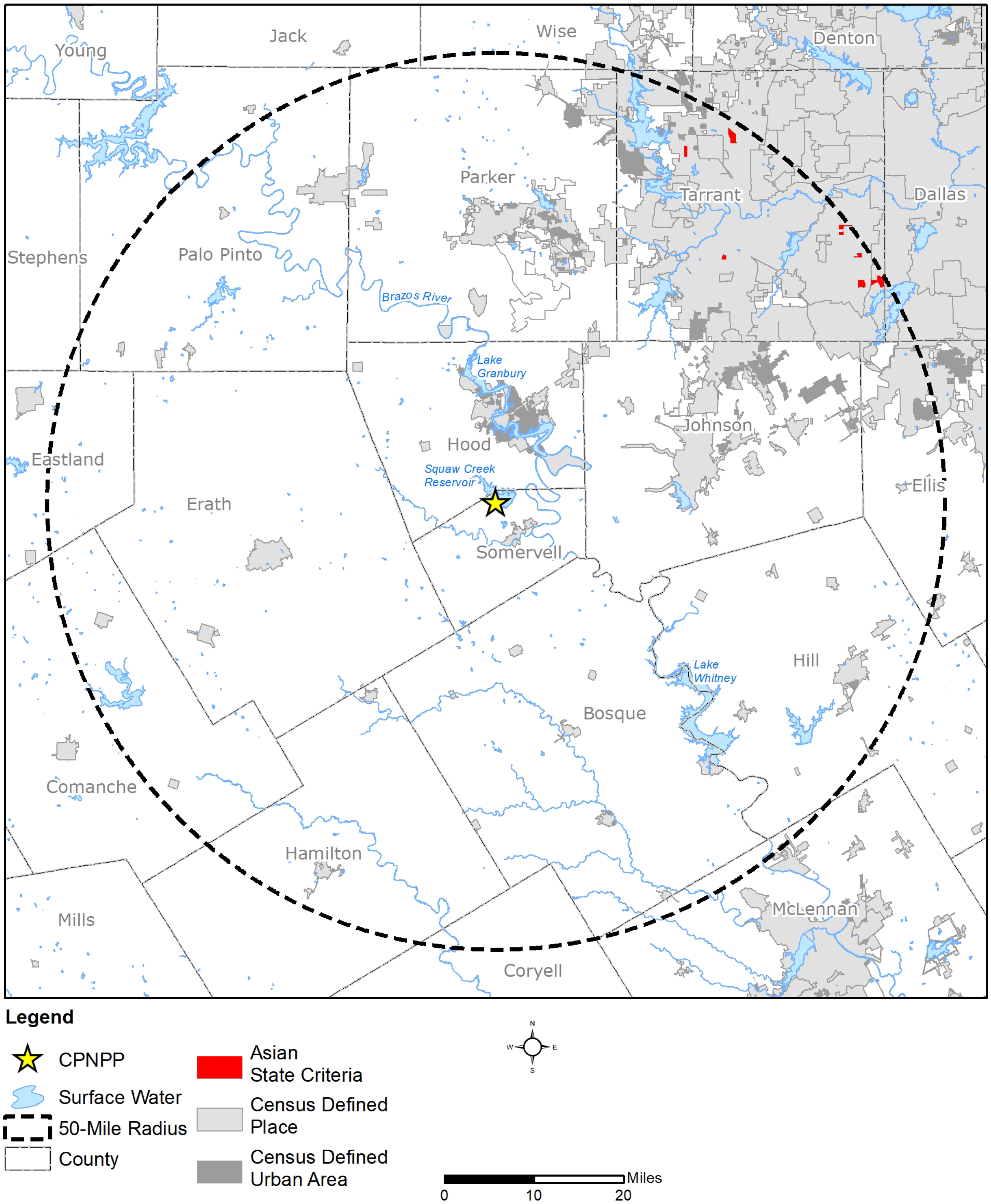


Figure 3.11-8 Asian Populations (Individual State)

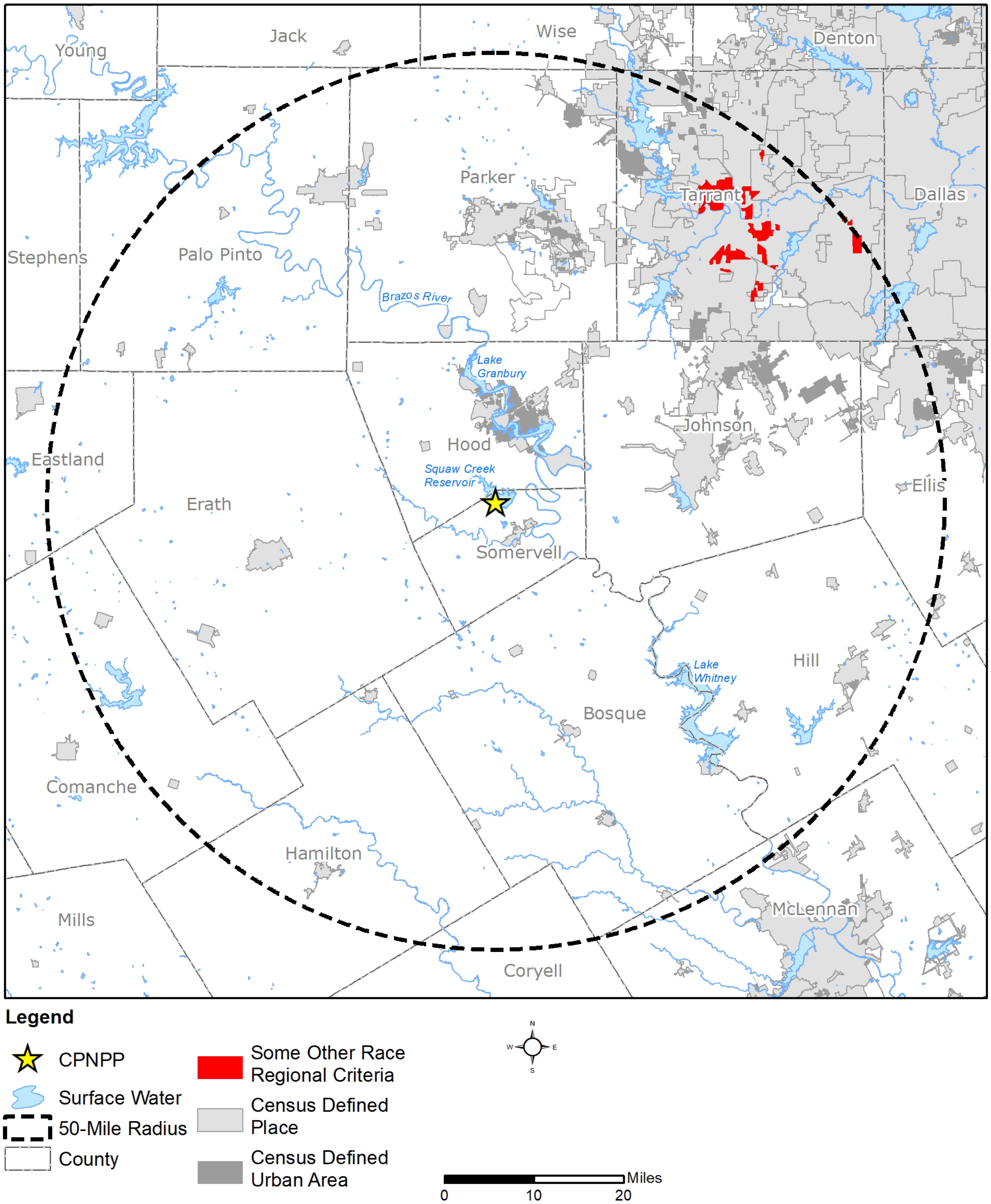


Figure 3.11-9 Some Other Race Populations (Regional)

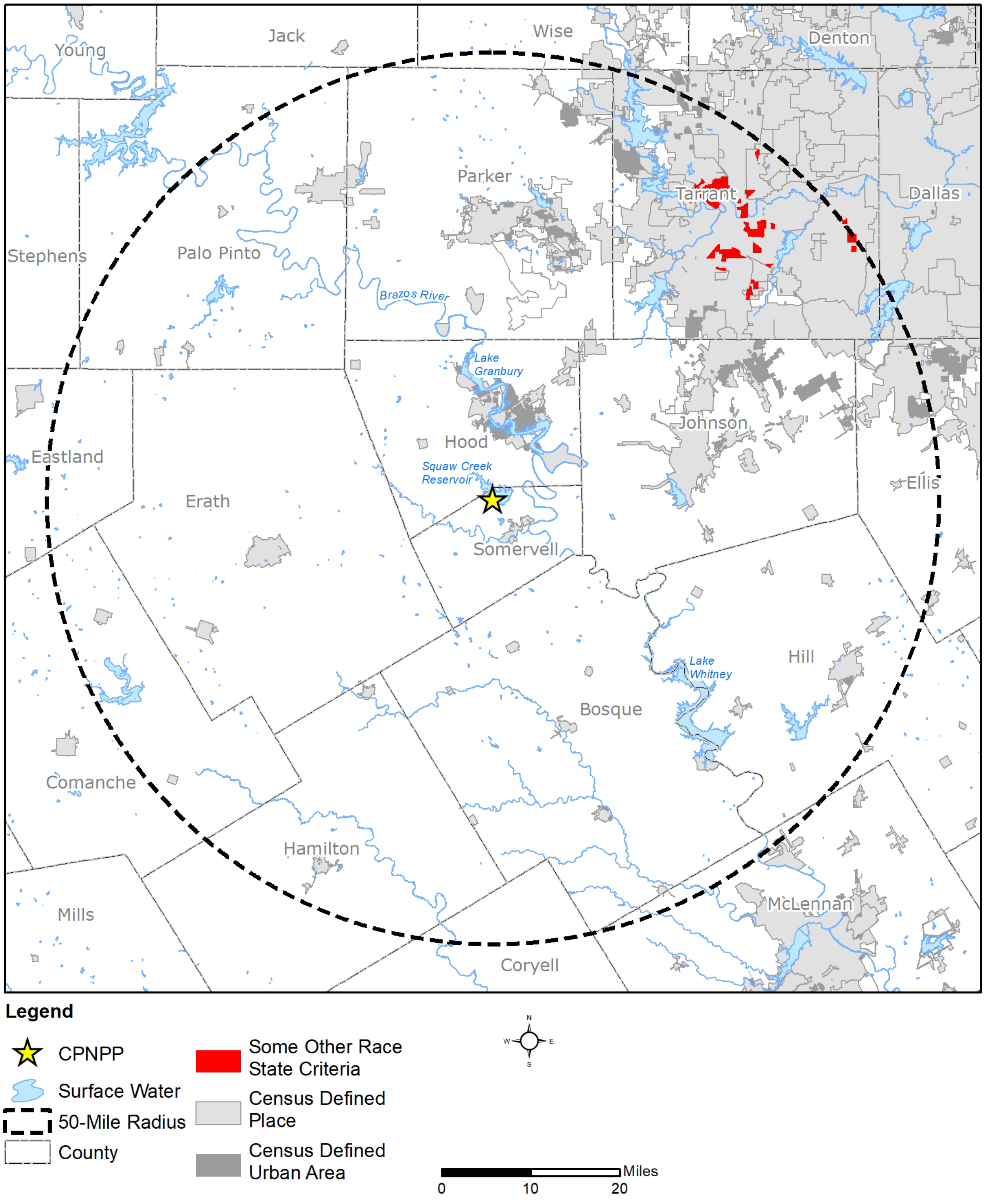


Figure 3.11-10 Some Other Race Populations (Individual State)

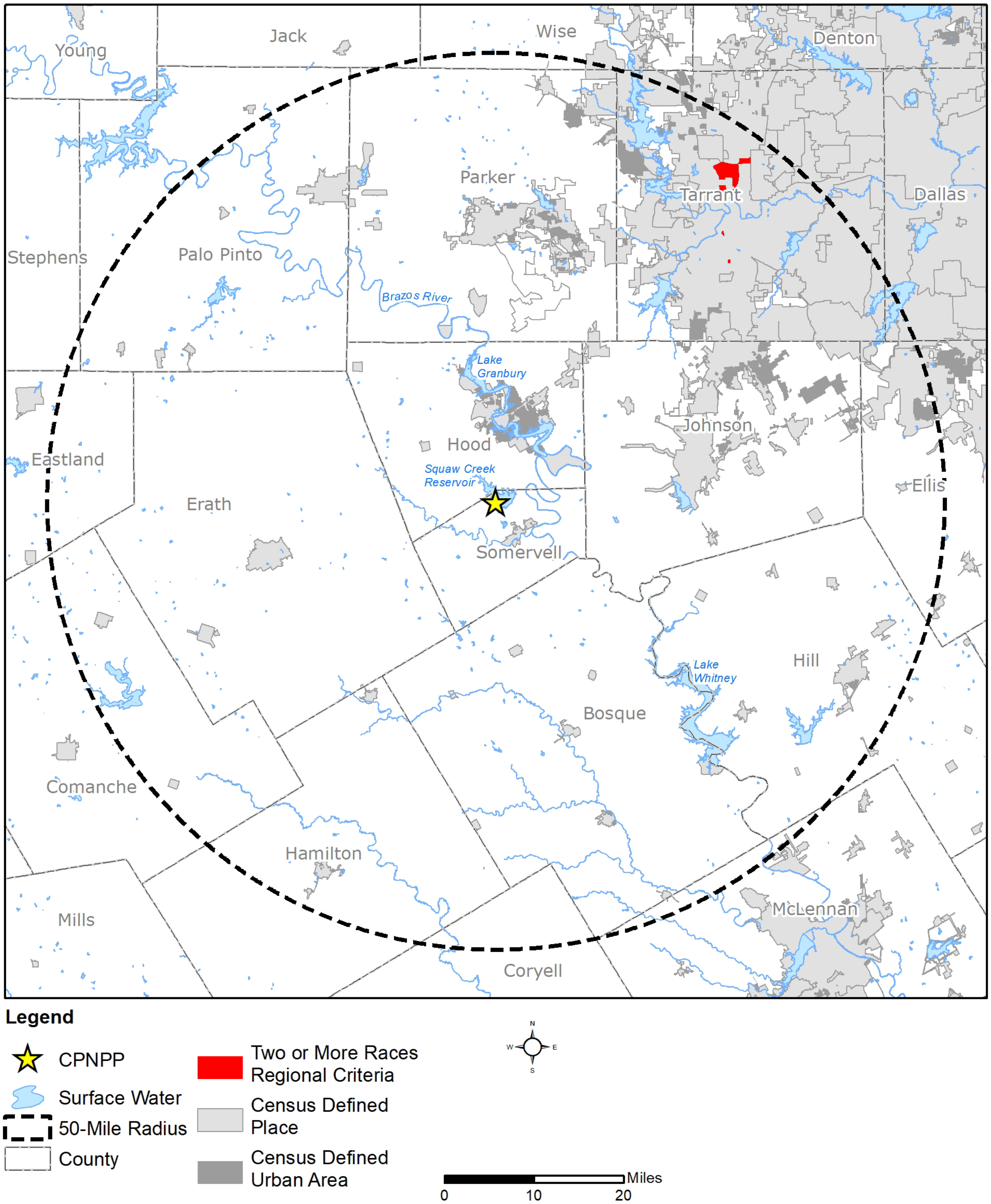


Figure 3.11-11 Two or More Races Populations (Regional)

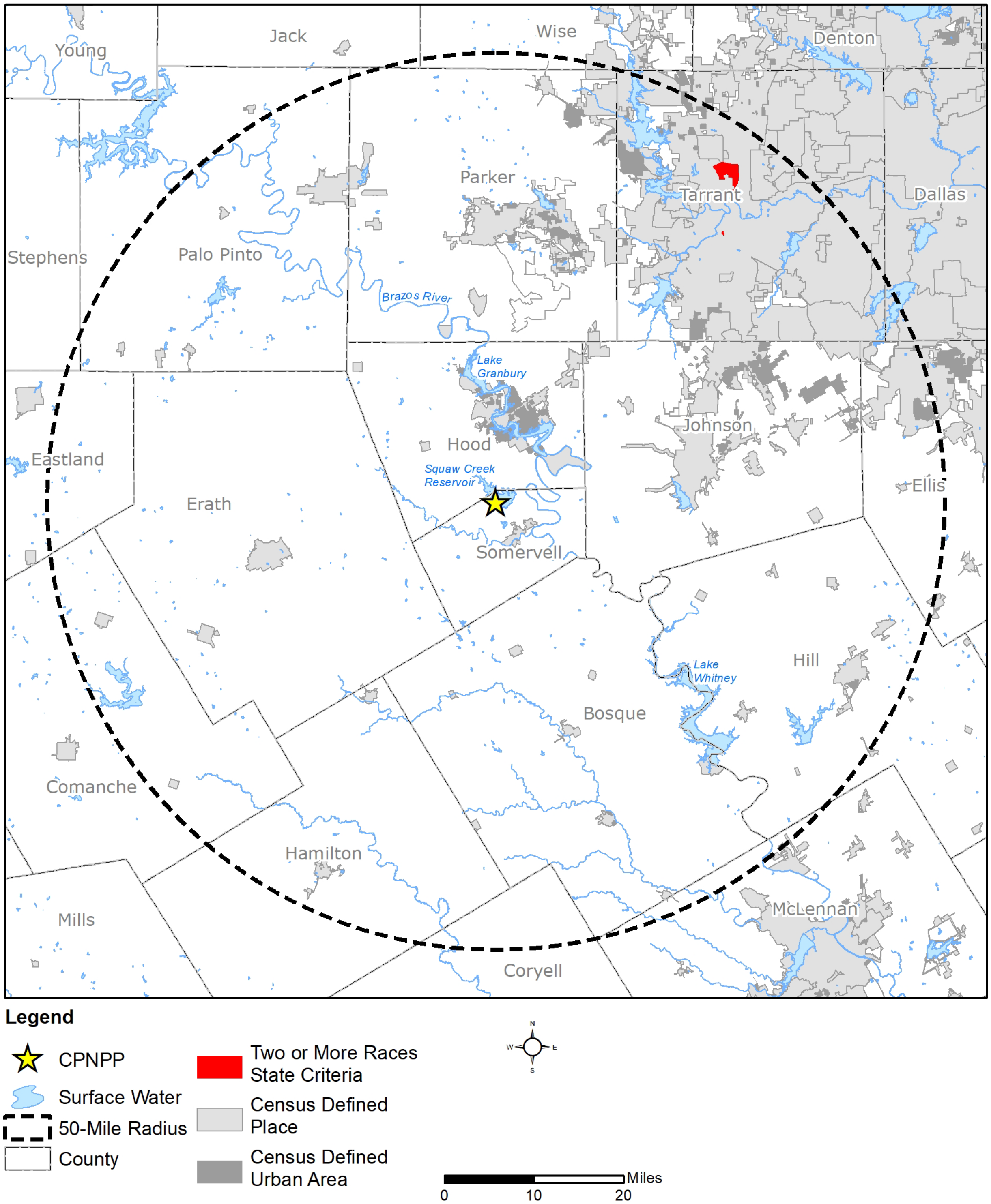


Figure 3.11-12 Two or More Races Populations (Individual State)

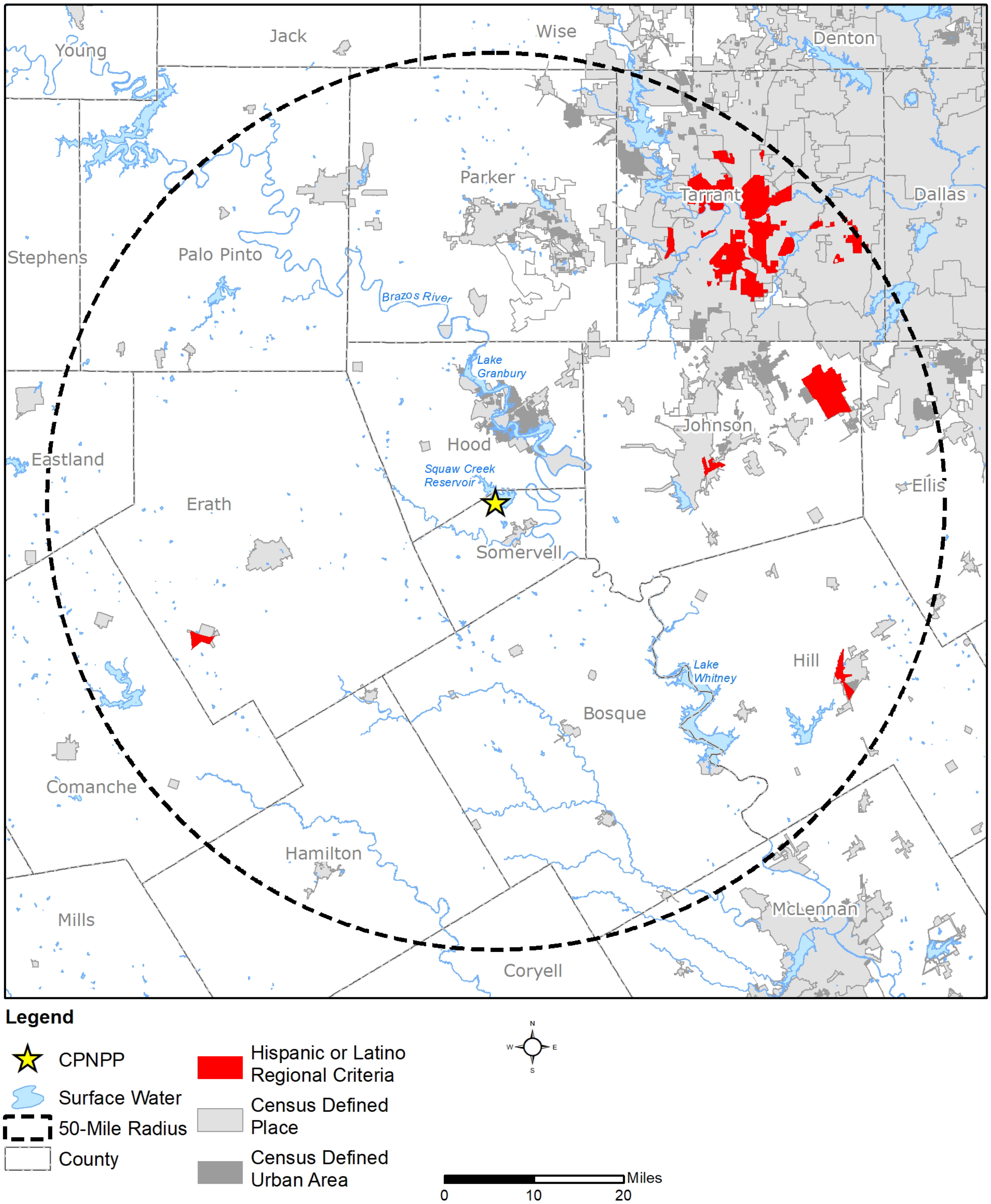


Figure 3.11-13 Hispanic or Latino Populations (Regional)

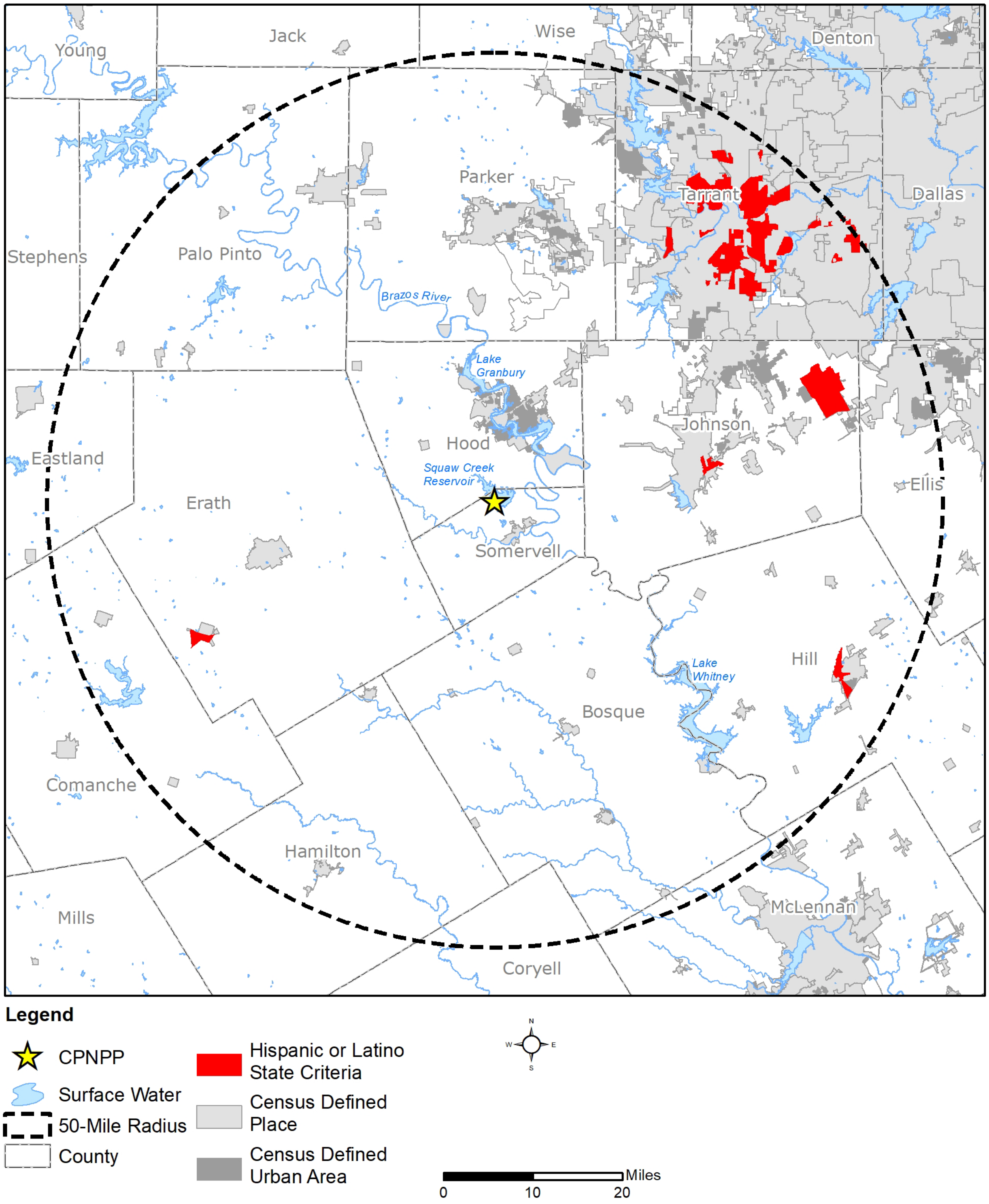


Figure 3.11-14 Hispanic or Latino Populations (Individual State)

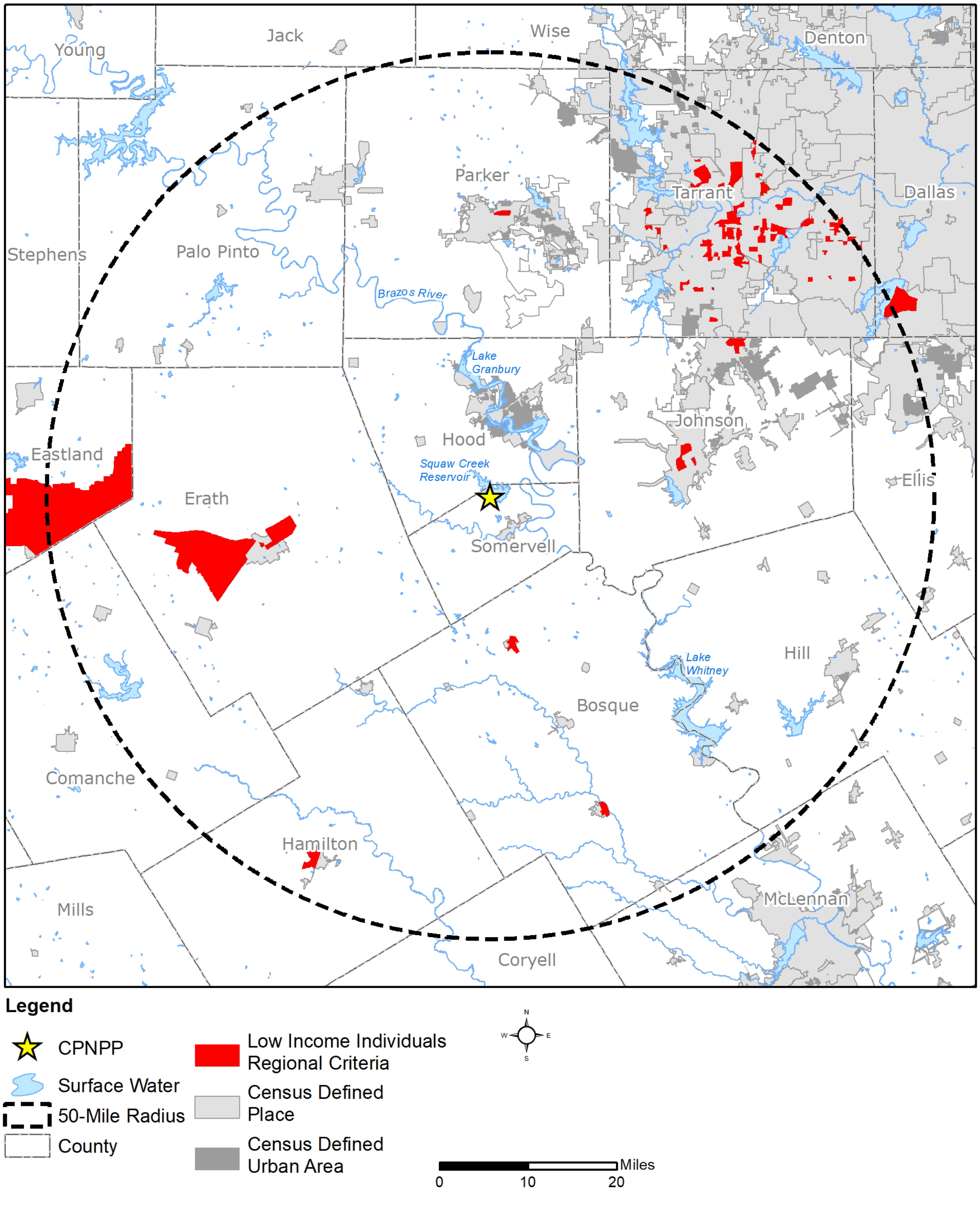


Figure 3.11-15 Low Income Individuals (Regional)

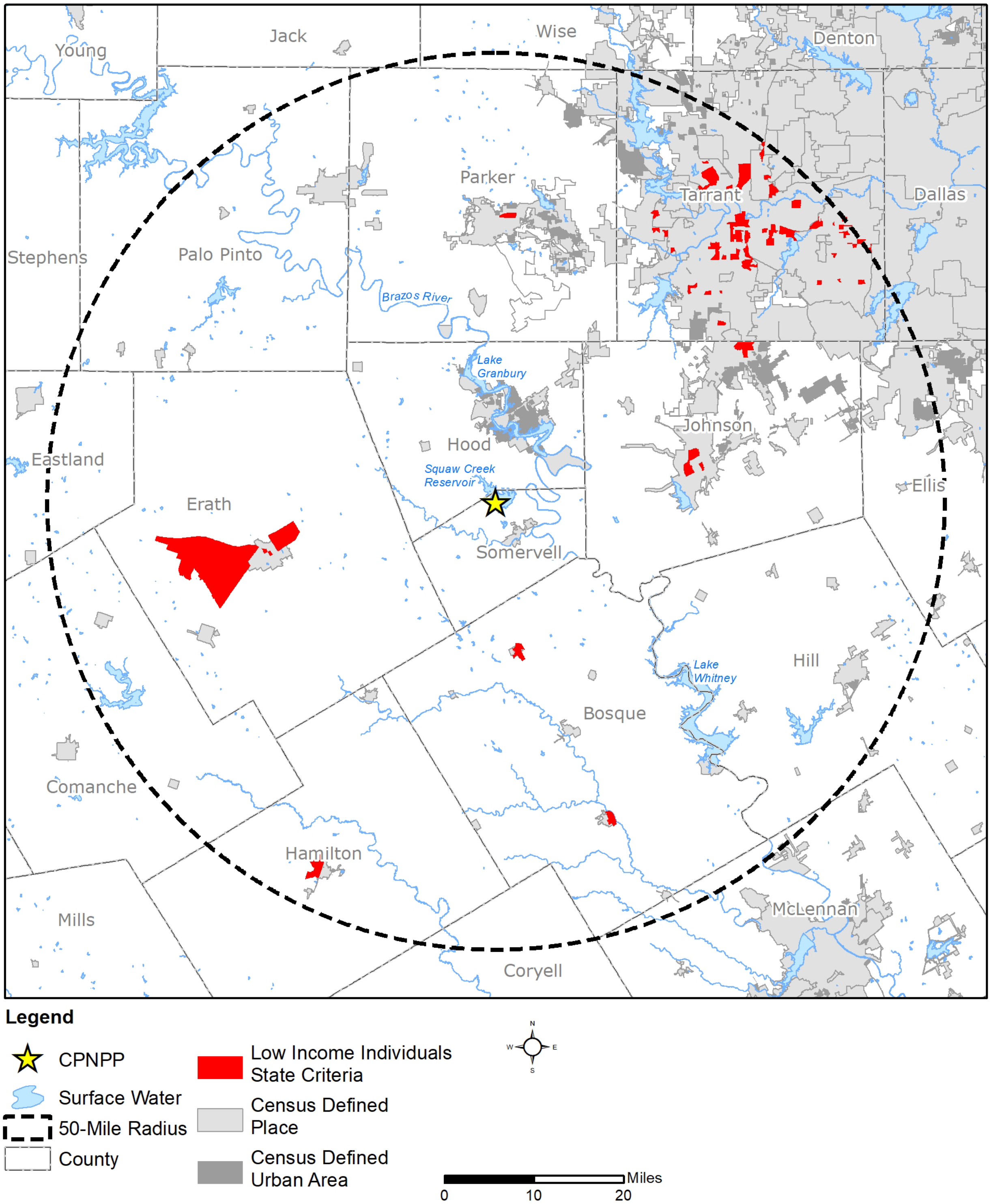


Figure 3.11-16 Low Income Individuals (Individual State)

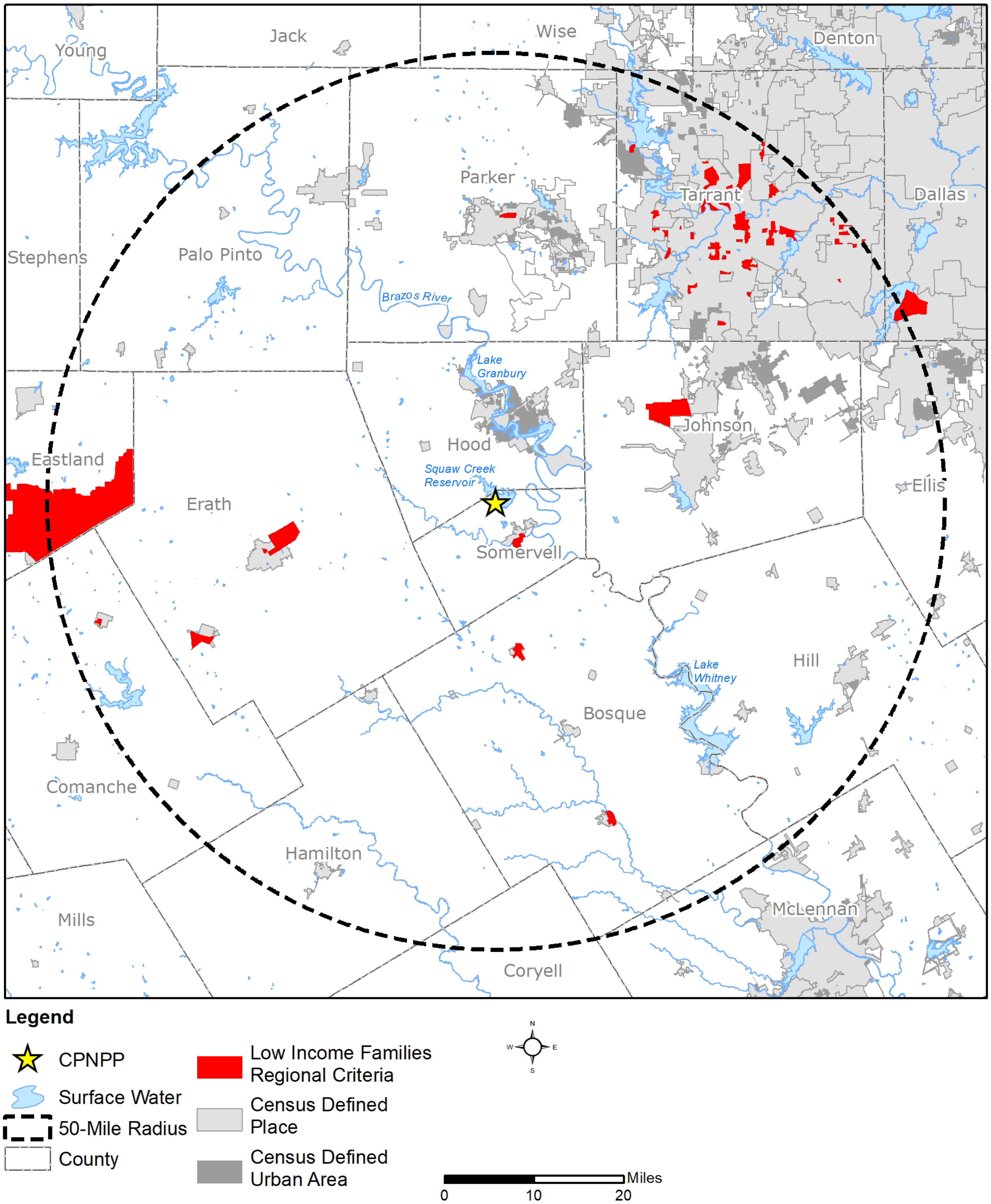


Figure 3.11-17 Low Income Families (Regional)

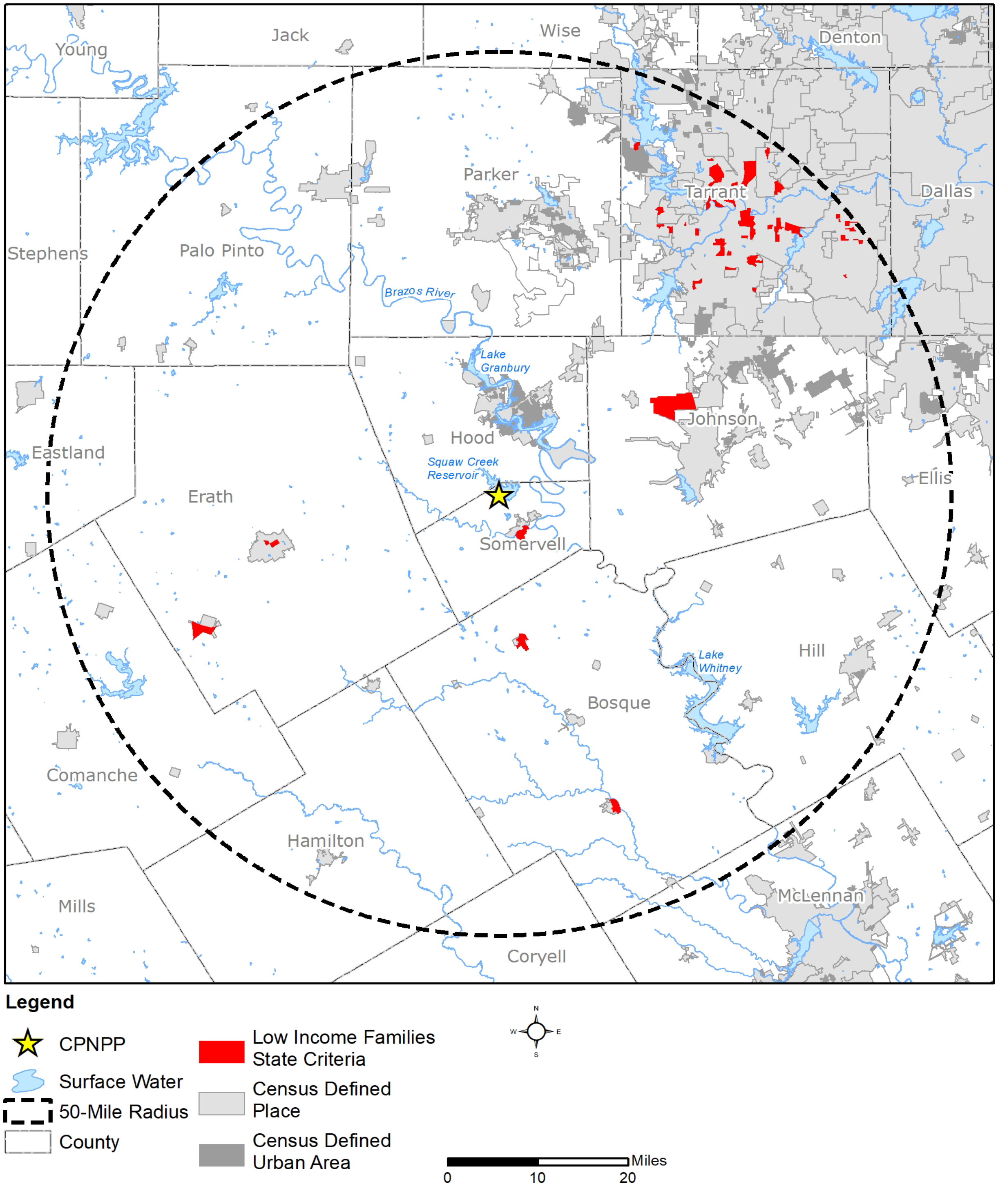


Figure 3.11-18 Low Income Families (Individual State)

3.12 Waste Management

In addressing the plant's radioactive and nonradioactive waste management systems and program, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information requested in this section can be incorporated by reference to Section 2.2 of the ER (NRC 2013b, Section 3.11). Therefore, consistent with NRC Regulatory Guide 4.2, Vistra OpCo is providing the information below to address CPNPP's radioactive and nonradioactive waste management systems and program.

3.12.1 Radioactive Waste Management

Section 2.2.6 includes a discussion of CPNPP's liquid, gaseous, and solid radwaste systems. The section provides a description of the systems, management of LLMW, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive waste.

3.12.2 Nonradioactive Waste Management

Section 2.2.7 includes a discussion of CPNPP's RCRA nonradioactive waste management program, types of waste generated, waste minimization practices, and permitted facilities currently utilized for disposition of waste.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The environmental report must include an analysis that considers . . . the environmental effects of the proposed action . . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The environmental report shall . . . discuss . . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]

The information submitted . . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]

The NRC has identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated these issues as Category 1, Category 2, or uncategorized. The NRC designated an issue as Category 1 if the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for offsite radiological impacts-collective impacts from other than the disposal of spent fuel and high-level waste).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue as Category 2, which requires plant-specific analysis. The NRC designated one issue as uncategorized (chronic effects of electromagnetic fields), signifying that the categorization and impact definitions do not apply to this issue. Until such time that this uncategorized issue is categorized, applicants for license renewal are not required to submit information on this issue [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 6]; therefore, this issue is not included in Tables 4.0-1, 4.0-2, or 4.0-3, nor is it addressed in Section 4.9. NRC rules do not require analyses of Category 1 issues that were resolved using generic findings [10 CFR Part 51, Subpart A, Appendix B, Table B-1] as described in the GEIS. Therefore, an applicant may reference the GEIS findings for Category 1 issues, absent new and significant information. The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

- Information that identifies a significant environmental issue not considered or addressed in the GEIS and consequently not codified in Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act-Regulations Implementing Section 102(2), of 10 CFR Part 51; or
- Information not considered in the assessment of impacts evaluated in the GEIS, leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.
- Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

4.0.1 Category 1 License Renewal Issues

The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(i)]

[A]bsent new and significant information, the analyses for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal . . . . (61 FR 28483)

Vistra OpCo has determined that, of the 60 Category 1 issues, eight are not applicable to CPNPP because they result from design or operational features that do not exist at the facility. Table 4.0-1 lists these eight issues and provides a brief explanation of why they are not applicable to the site. Table 4.0-2 lists the 52 issues which are applicable to the site. Vistra OpCo reviewed the NRC findings on these 52 issues and identified no new and significant information that would invalidate the findings for the site (Chapter 5). Therefore, Vistra OpCo adopts by reference the NRC findings for these Category 1 issues.

4.0.2 Category 2 License Renewal Issues

The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(ii)]

The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The NRC designated 17 issues as Category 2. Vistra OpCo has determined that, of the 17 issues shown in Table 4.0-3, 6 issues are not applicable to CPNPP because they are applicable to plants with a different type of cooling system or to a plant with greater groundwater withdrawals. For the 11 issues applicable to the site, the corresponding sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the CPNPP Units 1 and 2 OLs and, when applicable, discuss potential mitigation alternatives to the extent appropriate. With the exception of threatened and endangered species/EFH, historic and cultural resources, and environmental justice, Vistra OpCo has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in 10 CFR Part 51, Appendix B, Table B-1.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Consistent with NRC guidance, Vistra OpCo identified the significance of the impacts for the three Category 2 issues of threatened and endangered species/EFH, historic and cultural resources, and environmental justice as follows:

- For threatened and endangered species (ESA), the significance of the effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify Designated Critical Habitat. For EFH (Magnuson Stevens Fishery Conservation and Management Act), the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations. (NRC 2013a)

- For historic and cultural resources (NHPA), the significance of the effects from license renewal can be characterized based on a determination that: (1) no historic properties are present (no effect); (2) historic properties are present but would not be adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect). (NRC 2013b)
- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations. (NRC 2013b)

In accordance with NEPA practice, Vistra OpCo considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

4.0.3 Uncategorized License Renewal Issues

The NRC determined that its categorization and impact-finding definitions did not apply to the chronic effects of electromagnetic fields. Because the categorization and impact finding definitions do not apply as noted in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 5, applicants are not currently required to submit information on this issue.

4.0.4 Format of Issues Reviewed

Chapter 4 follows Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b) regarding content for the license renewal issues identified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. For Category 1 issues, the generic issues resolved by the NRC in NUREG-1437, Revision 1 (NRC 2013a), Vistra OpCo presents the results of its new and significant information review. For Category 2 issues which were not resolved in NUREG-1437, Revision 1, Vistra OpCo presents a site-specific analysis. The format for Category 2 issues is outlined below.

- *Issue:* Title of the issue.
- *Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1:* The findings for the issue from 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.
- *Requirement:* Restatement of the applicable 10 CFR 51.53 requirement.
- *Background:* A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Analysis:* An analysis of the environmental impact, taking into account information provided in the GEIS and 10 CFR Part 51, Subpart A, Appendix B, as well as current site-specific information. If an issue is not applicable, the analysis lists the explanation. The analysis section also provides a summary conclusion of the environmental impacts and identifies, as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts.

Table 4.0-1 Category 1 Issues Not Applicable to CPNPP

Issue	Comment
Land Use	
Offsite land use in transmission line rights-of-way (ROWs)	All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the CPNPP site boundaries.
Surface Water Resources	
Altered salinity gradients	CPNPP does not have cooling towers and does not discharge to an estuary.
Effects of dredging on surface water quality	No dredging has occurred, is planned, or is anticipated for CPNPP.
Groundwater Resources	
Groundwater quality degradation (plants with cooling ponds in salt marshes)	CPNPP is located on a freshwater body and does not utilize cooling ponds.
Terrestrial Resources	
Cooling tower impacts on vegetation (plants with cooling towers)	CPNPP uses once-through cooling.
Aquatic Resources	
Impingement and entrainment of aquatic organisms (plants with cooling towers)	CPNPP uses once-through cooling.
Thermal impacts on aquatic organisms (plants with cooling towers)	CPNPP uses once-through cooling.
Effects of dredging on aquatic organisms	No dredging has occurred, is planned, or is anticipated for CPNPP.

Table 4.0-2 Category 1 Issues Applicable to CPNPP (Sheet 1 of 2)

Resource	Issue
Land Use	Onsite land uses
	Offsite land uses
Visual Resources	Aesthetic impacts
Air Quality	Air quality impacts (all plants)
	Air quality effects of transmission lines
Noise	Noise impacts
Geologic Environment	Geology and soils
Surface Water Resources	Surface water use and quality (non-cooling system impacts)
	Altered current patterns at intake and discharge structures
	Altered thermal stratification of lakes
	Scouring caused by discharged cooling water
	Discharge of metals in cooling system effluent
	Discharge of biocides, sanitary wastes, and minor chemical spills
	Surface water use conflicts (plants with once-through cooling systems)
	Temperature effects on sediment transport capacity
Groundwater Resources	Groundwater contamination and use (non-cooling system impacts)
	Groundwater use conflicts (plants that withdraw less than 100 gpm)
	Groundwater quality degradation resulting from water withdrawals
Terrestrial Resources	Exposure of terrestrial organisms to radionuclides
	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)
	Bird collisions with plant structures and transmission lines
	Transmission line ROW management impacts on terrestrial resources
	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)
Aquatic Resources	Entrainment of phytoplankton and zooplankton (all plants)
	Infrequently reported thermal impacts (all plants)
	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication
	Effects of nonradiological contaminants on aquatic organisms
	Exposure of aquatic organisms to radionuclides
	Effects on aquatic resources (non-cooling system impacts)
	Impacts of transmission line ROW management on aquatic resources
	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses

Table 4.0-2 Category 1 Issues Applicable to CPNPP (Sheet 2 of 2)

Resource	Issue
Socioeconomics	Employment and income, recreation and tourism
	Tax revenues
	Community services and education
	Population and housing
	Transportation
Human Health	Radiation exposures to the public
	Radiation exposures to plant workers
	Human health impact from chemicals
	Microbiological hazards to plant workers
	Physical occupational hazards
Postulated Accidents	Design-basis accidents
Waste Management	Low-level waste storage and disposal
	Onsite storage of spent nuclear fuel
	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal
	Mixed-waste storage and disposal
	Nonradioactive waste storage and disposal
Uranium Fuel Cycle	Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste
	Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste
	Nonradiological impacts of the uranium fuel cycle
	Transportation
Termination of Nuclear Power Plant Operations and Decommissioning	Termination of plant operations and decommissioning

Table 4.0-3 Category 2 Issues Applicability to CPNPP (Sheet 1 of 2)

Resource Issue	Applicability	ER Section
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.5.1
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gpm)	Not Applicable	4.5.3
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	Not Applicable	4.5.2
Groundwater quality degradation (plants with cooling ponds at inland sites)	Not Applicable	4.5.4
Radionuclides released to groundwater	Applicable	4.5.5
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts)	Applicable	4.6.5
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.6.4
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.6.3
Special Status Species and Habitats		
Threatened, endangered, and protected species and EFH	Applicable	4.6.6
Historic and Cultural Resources		
Historic and cultural resources	Applicable	4.7
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) Note: The 10 CFR Part 51, Subpart A, Appendix B, Table B-1 finding states, "These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers." Thus, plants using lakes for cooling (like CPNPP) are included as plants where this Category 2 issue is applicable.	Applicable	4.9.1
Electric shock hazards	Applicable	4.9.2

Table 4.0-3 Category 2 Issues Applicability to CPNPP (Sheet 2 of 2)

Resource Issue	Applicability	ER Section
Postulated Accidents		
Severe accidents	Applicable	4.15.2
Environmental Justice		
Minority and low-income populations	Applicable	4.10.1
Cumulative Impacts		
Cumulative Impacts	Applicable	4.12

4.1 Land Use and Visual Resources

Impacts to land use and visual resources are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to land use and visual resources. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.2 Air Quality

Impacts to air quality are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to air quality. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.3 Noise

Impacts to noise are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to noise. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.4 Geology and Soils

Impacts to geology and soils are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to geology and soils. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.5 Water Resources

Impacts to water resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1, are listed in Section 4.0. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to water resources Category 1 issues. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The Category 2 issues for water resources are discussed below.

4.5.1 Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river . . . must be provided.

Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60 percent or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment (EA) by the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on "small" versus "large" rivers. However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. The NRC subsequently determined that use of the term "low flow" in categorizing river flow is of little value, considering that all rivers can experience low flow conditions. Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant's intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

4.5.2 Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize a closed-cycle cooling system for condenser cooling purposes. Therefore, this issue is not applicable and further analysis is not required.

4.5.3 Groundwater Use Conflicts (Plants that Withdraw More than 100 GPM)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells with combined pumping in excess of 100 gpm (378 liters per minute). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

Analysis

As presented in Section 3.6.3.2, four water supply wells were plugged in 2013. The PWSs associated with three other water supply wells were deactivated in 2018. The STC water well is used to supply water for cattle with groundwater withdrawal limited by the Prairie Lands Groundwater Conservation District to 281,750 gpy (0.54 gpm rate). The SCP Office water well had a maximum withdrawal of 32,104 gallons (0.06 gpm) in 2017 and 44,740 gallons (0.9 gpm) in 2018. The SCP Boat Dock water well had a maximum withdrawal of 162,060 gallons (0.31 gpm) in 2017 and 97,200 gallons (0.19 gpm) in 2018. SCP is currently closed to the public but is expected to reopen to visitors on a seasonal basis in the future. The one remaining 2020 PWS (PW#2130037) associated with the recreation/training water supply well (Rifle Range Well) was deactivated on August 24, 2021. The Rifle Range Well had a permitted maximum withdrawal rate of 82,000 gpy (0.16 gpm). The average withdrawal rate for the Rifle Range well was reported by Vistra OpCo as an average of 98.09 gpd (0.07 gpm) in 2020 and averaged 143.27 gpd (0.010 gpm) between 2016 and 2020.

It is not anticipated that groundwater withdrawals significantly above these reported quantities will be required during the LR operating term; therefore, because CPNPP pumps significantly less than 100 gallons (total onsite) of groundwater per minute, this issue is not applicable and further analysis is not required.

4.5.4 Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells. Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds. Therefore, this issue is not applicable and further analysis is not required.

4.5.5 Radionuclides Released to Groundwater

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

Requirement [10 CFR 51.53(c)(3)(ii)(P)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any GPP used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

Background [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons learned review of these incidents. On September 1, 2006, the task force issued its report: Liquid Radioactive Release Lessons Learned Task Force Report.

The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety were adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

Analysis

A description of the CPNPP GPP is presented in Section 3.6.2.4. Table 3.6-3 presents well construction details for the CPNPP groundwater monitoring wells, while Figure 3.6-5 shows the location of the wells. Table 3.6-8 presents information on 39 registered water wells located within a 2-mile band around the CPNPP property boundary, while Figure 3.6-8 shows the locations of these offsite wells.

As presented in Section 3.6.4.2.1, no unplanned liquid or gaseous radioactive releases occurred at CPNPP in 2018 and 2019. In 2020, as presented in Section 3.6.4.2, tritium levels detected in MW-11 ranged from 1,040 to 1,890 pCi/L, which are less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. In 2021, a courtesy notification was submitted to the NRC for approximately 2.7 millicuries of tritium released from a quantity of over 100 gallons of demineralized water due to the failure of a buried pipe. This amount of tritium is well below the reportable quantity of 100 Curies. The release material was excavated and the resin/water mixture that could be recovered was collected/containerized and handled properly.

Therefore, since water from plant uses continues to be processed and monitored in compliance with licensing and permitting, and monitoring demonstrates that the radionuclides do not exceed permissible regulatory levels, Vistra OpCo concludes that impacts from radionuclides to groundwater are SMALL and do not warrant additional mitigation measures in accordance with CPNPP's existing GPP.

4.6 Ecological Resources

Impacts to ecological resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1, are listed in Section 4.0. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to ecological resources Category 1 issues. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The Category 2 issues for ecological resources are discussed below.

4.6.1 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, OR LARGE. The impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current CWA 316(b) determinations or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from impingement and entrainment.

Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening techniques, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

Analysis

The two nuclear power generating units at CPNPP use a once-through cooling water system. Cooling water for both units is withdrawn from SCR. The intake structure at CPNPP is located in an excavated recess of the SCR shoreline and consists of 8 CWS pumps and 12 travelling screens. The intake extends approximately 50 feet below the surface of SCR. Noncontact cooling water is discharged from a common outfall located across the peninsula from the intake.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd). Under normal conditions, all four pumps operate. The plant can operate at reduced loads operating two or three pumps per unit.

CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps are located downstream of the traveling water screens to transport the screened flow to the condensers.

As presented in Section 3.7.7 and discussed below, a baseline entrainment and impingement study was conducted at CPNPP. For impingement, sampling was conducted weekly from October 18, 1993, through March 1994, semi-monthly from April 1994 through August 1994 and weekly from September through October of 1994. For entrainment, sampling was conducted weekly from April 6 through August 24 of 1994 (spawning season in most Texas reservoirs) using a half meter, 500-micron mesh net towed from a boat in the vicinity of the intake. The results indicated that there was no significant adverse environmental impact to the SCR as a result of CPNPP operations and that the plant was operating under the BTA.

The impingement study conducted from October 1993 through March 1994 consisted of weekly sampling and involved utilizing a basket inserted into the debris sump to collect fish off of the travelling screens. Approximately 262,498 fish, comprising 13 species, were impinged by the CWS during this timeframe. Ninety-six percent of those impinged were threadfin shad. Game fish including largemouth bass, white bass, channel catfish, and white crappie accounted for less than 1 percent combined of the total impingement. These results were consistent with those of plants of similar design and location. Forage species are most likely to dominate impingement losses due to their abundance, their pelagic habit, tendency to move in schools, and reduced physiological condition at high temperatures. The low number of gamefish impinged, and the high reproductive capacity of threadfin shad were determined to not create a significant impact on the gamefish community at SCR.

Additional sampling was completed biweekly from February 2006 through February 2007 by collecting samples impinged from the facilities intake screens. A total of 58,121 aquatic organisms, including 12 fish species, were collected in impingement samples at CPNPP. Threadfin shad accounted for 92 percent of the total impingement, followed by bluegill (4 percent), mud crab (2 percent), inland silverside (1 percent), and largemouth bass (1 percent). However, this total included a threadfin shad die-off that occurred in the reservoir on August 22 and 23, 2006, due to stress from high water temperatures. The number (39,071) of threadfin shad collected during this single event made up 69 percent of the total number of fish collected during the study.

Impingement rates (number of fish/million gallons) for each sample event from February 2006 through February 2007 were used to estimate total impingement for the study year in the SCR. The estimated total number of fish impinged was approximately 295,000. These estimates included approximately 253,000 threadfin shad and 28,844 bluegill. Approximately 83 percent of threadfin shad and 96 percent of bluegill were believed to be less than 1 year of age. Impingement rates were compared to various facility and environmental variables to identify possible relationships and water temperature appeared to be the only variable that really influenced impingement. This conclusion was made evident by the threadfin shad die off.

Entrainment sampling of ichthyoplankton was conducted from April through August 1994. Boat-mounted nets were towed in front of the trash racks weekly. The entrainment estimate utilized data on all species and life stages captured in the net. Two juveniles, Dorosoma and Lepomis, were captured and likely represent an overestimate of impact to their populations. Eggs and larvae were also sent to the lab and identified down to the genus. Daily, weekly, monthly, annual, and seasonal estimates for entrainment characterization were calculated based upon the actual and maximum operating conditions of the CWS. Taxa identified includes sunfish, shad, white bass, inland silverside, crappies, and drums. Assuming 100 percent mortality, 30 million eggs/larvae were estimated to have been entrained in 1994. The results indicated that drums, sunfish, threadfin, and gizzard shad likely accounted for most of the loss (from egg to juvenile) and game fish losses were likely minimal.

In 2015, SCR was designated as a CCRS. According to the EPA, CCRSs are highly effective in reducing impingement and entrainment by reducing intake flow. These reductions in flow and the concurrent reductions in impingement and entrainment impacts are among the highest reductions in adverse environmental impact possible at an intake structure. The use of SCR as a CCRS is considered the BTA for impingement as determined by the TCEQ.

In 2018, two fine mesh intake technologies were evaluated to make a BTA determination on entrainment, fine-mesh traveling water screens with fish friendly features, and narrow-slot cylindrical wedgewire screens. Further, an alternative water source and a mechanical draft CCRS were considered to reach a BTA determination. It was later determined that the CWIS is BTA, and the social costs of the alternatives were not justified by the social benefit. No additional control requirements are necessary beyond what Vistra OpCo is already doing.

A copy of Vistra OpCo's 316(b) permit and supporting documentation is attached as required by 10 CFR 51.53(c)(3)(ii)(B). During the period of extended operation, Vistra OpCo will perform additional studies similar to those currently required and will ensure that CPNPP continues to use the BTA to minimize entrainment and impingement to the fullest extent practicable to maintain compliance with the TPDES permit. The current permit expires in October 2024 and per TCEQ regulations for permit renewal a renewal application will be submitted by Vistra OpCo in a timely manner. Vistra OpCo concludes that impacts from impingement and entrainment of aquatic organisms during the proposed operating term would be SMALL. Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize the already existing SMALL impacts.

4.6.2 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

<u>Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1</u>

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

<u>Requirement [10 CFR 51.53(c)(3)(ii)(B)]</u>

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of a 316(a) variance in accordance with 40 CFR Part 125, or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes.

Background [GEIS Section 4.6.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, NRC classified heat shock as a Category 2 issues that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

Analysis

Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary, and using a variance, obtain alternative facility-specific thermal discharge limits [33 USC 1326]. The maximum thermal limit associated with the CPNPP TPDES permit is 116°F. The 316(a) determination under the TPDES permit (Attachment B) defines thermal effluent discharge limits that CPNPP adheres to, in order to reduce impacts on aquatic organisms. The current permit expires in October 2024 and a renewal application will be submitted by Vistra OpCo in a timely manner. A copy of Vistra OpCo's 316(a) variance and supporting documentation is attached as required by 10 CFR 51.53(c)(3)(ii)(B).

As discussed in Section 3.7.3, CPNPP has a once-through heat dissipation system and SCR is considered to be a CCRS. CPNPP withdraws cooling water from SCR at a peak rate of about 3,168 MGD for both units, which is equivalent to recirculating the entire volume of water in the reservoir every 16 days. In the summer, the recirculation is confined to the upper half of the water column, and it would take about 8 days to recirculate the upper half of the water column. CPNPP operates all four pumps on both Units 1 and 2 for the rate of 3,168 MGD; during the winter, three pumps per unit are operated for a rate of 2,376 MGD. SCR was created specifically as a source of cooling water for CPNPP. The reservoir also contains a SSI, which is connected to the reservoir by a 40-foot channel. According to the 2017 acoustic bathymetry survey, the reservoir, including the SSI, has a capacity of 149,732 acre-feet encompassing a surface area of 3,272 acres at the conservation elevation of 775 feet above mean sea level. The dam controls a drainage area of about 64 square miles.

Temperature distribution was studied shortly after initial operation of Units 1 and 2 in 1993. The results indicated that the thermocline decreased very slightly (less than 4°F) from 40 to 50 feet and then temperatures dropped sharply at 60 feet and then decreased slowly to the bottom of the reservoir. The area around the thermal plume at the time decreased only 2-4°F down to 15 feet. Warmer water and vertical mixing with depth, below 20 feet, have been observed in SCR since CPNPP Unit 1 became operational. In the first year that Units 1 and 2 were operational, temperatures below the thermocline down to 70 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1.0°F warmer, respectively, than 1991. Temperatures at 80 feet, however, have remained about 57°F since Unit 1 became operational. The study concluded that the decreased thermocline and increased heat budget down to 70 feet is likely result of CPNPP Unit 2 operation. (Luminant 2013b).

A thermal study was conducted in 2007 to assess increasing the thermal uprate to 3,650 MWt. The report utilized a compilation of previous studies as well as additional modelling techniques to evaluate intake temperatures and evaporation rates from the increase in thermal output. The three-dimensional model was run with full load conditions using the current reactor thermal output of approximately 3,458 megawatts (MW) per unit with a waste heat load of 2,260 MW per unit, also called the "base case." The base case was used for comparison of intake temperatures and evaporation rates against the "uprate case." The uprate case includes the nominal 3,650 MW thermal output per unit and an equivalent waste heat load of 2,400 MW per unit. The results indicated a small increase in temperature at both the intake and discharge locations. The difference between the base case and the uprate case at the discharge and intake structures was 1.2°F and 0.6°F, respectively. Another study in 2017 modeled the temperature changes in the SCR due to the thermal plume. Results indicated that the dilution effect of the submerged outfall location reduced the discharge temperature rise. The plume is estimated to be largest in mid-winter and smallest during the hottest part of the summer. The differential heat loss from the plume is driven by hydrometeorology. Colder temperatures imply a lower rate of heat dissipation and a correspondingly larger plume. Similarly, a higher wind speed entails higher heat transfer and a smaller plume. The mid-winter scenario is dominated by the much lower water temperatures, hence a much-enlarged plume with the model indicating a size of 1,864 acres during the normal-late summer, and 2,914 acres during normal mid-winter. The species present in the reservoir have adapted to the warmer temperatures. When the thermal impacts reach their higher limits during the summer months, fish and shellfish are able to move away from the plume and to other areas within the reservoir depending on their thermal requirements and tolerances. Studies conducted to monitor the fish community in the SSI found similar results, documenting 12 species.

The TCEQ approved designation of SCR as a CCRS in 2015. SCR is man-made, has a stocked and managed fishery, and has no documented state, federal, or threatened species, or critical habitat. Because Squaw Creek is designated a CCRS and was created specifically for the purpose of being used as a cooling water source for CPNPP, the fish and shellfish community is not expected to be diverse. However, the species present are more adapted to warmer water and continued stocking of sport fish maintains the aquatic community near CPNPP. The thermal discharge likely has little long-term impact on the aquatic community of SCR. CPNPP is operating in conformance with its TPDES permit and therefore, it remains in compliance with CWA requirements. Because there are no planned operational changes during the proposed LR operating term that would increase the temperature of CPNPP's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted.

4.6.3 Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic)…ecological communities must be provided.

Background [GEIS Section 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

Analysis

As discussed in Section 3.7.3, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable, and further analysis is not required.

4.6.4 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CRF Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action of water availability and competing water demands, the flow of the river, and related impacts on riparian (terrestrial) ecological communities must be provided.

Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

Analysis

As discussed in Section 3.7.3, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

4.6.5 Effects on Terrestrial Resources (Non-Cooling System Impacts)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Applications of BMPs would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats.

Background [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear powerplant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time.

Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the site (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment related construction activities. Land disturbed during the construction of new ISFSIs would range from about 2.5–10 acres. Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce wildlife disturbance in adjacent habitats, could greatly reduce the impacts of continued operations and refurbishment activities.

<u>Analysis</u>

Refurbishment Activities

As discussed in Section 3.7.8.4, no LR-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

Operational Activities

Terrestrial resources are described in Section 3.7.2. No LR-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. Vistra OpCo would continue to conduct ongoing plant operational and maintenance activities during the proposed LR operating term. However, these activities are anticipated to occur within previously disturbed habitats.

Ground's maintenance consists of mowing roadside habitat periodically during the growing season, tree trimming in the spring and fall, as well as regular cleaning of the yards. Pipeline maintenance is not regularly scheduled; however, vegetation management and leak repairs were performed in 2019. Additional maintenance outside of scheduled activities is completed through a preventative maintenance work order.

Furthermore, as discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide use, further serve to minimize impacts to terrestrial resources.

For example, Vistra OpCo has a procedure in place to document BMPs for any ground disturbing activities as well as a stormwater permit for any disturbances greater than an acre. This procedure provides guidance for meeting the terms and conditions of TPDES general permit No. TXR050000 for monitoring and reporting storm water outfall discharges. In addition, monthly monitoring activities identified in the procedure are intended to go beyond SWPPP compliance by including proactive measures to minimize potential environmental impacts of station activities. These measures include quarterly visual monitoring, a monthly comprehensive site evaluation, as well as weekly equipment inspections.

Although the need for additional onsite storage space for spent fuel is not known to be required during the license renewal term, previously disturbed tracts of land in the vicinity of the existing ISFSI are likely to be sufficient for the construction of a new ISFSI and to require similar acreage. Vistra OpCo has guidance in place for management of ground-disturbing activities, should they occur.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the proposed LR operating term for CPNPP. Therefore, Vistra OpCo concludes the impacts to the terrestrial ecosystems from the proposed LR are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

4.6.6 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and EFH would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with federal laws protecting wildlife, including but not limited to, the ESA, and EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

Background [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act and impacts to mammal species protected under the Marine Mammal Protection Act.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on federally or state-listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

Analysis

Refurbishment Activities

As discussed in Section 3.7.8.5, no LR-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to threatened, endangered, and protected species, or EFH, and no further analysis is required.

Operational Activities

As discussed in Section 3.7.8.5, no EFH exists at SCR and no HAPCs or EFH areas protected from fishing are located on or adjacent to CPNPP. No EFH exists within any enclosed freshwater habitat. Therefore, CPNPP operations have NO EFFECT on EFH.

As discussed in Section 3.7.8.1, there are five federally protected species under the ESA in Hood and Somervell counties. In addition, as discussed in Section 3.7.8.2, nine species are listed as state protected, although four of these are cross listed under the ESA.

Suitable habitat for the following federal and state listed species is not located within the portions of the CPNPP site used for operations: black rail, Texas fawnsfoot, Texas heelsplitter, and Brazos River water snake. Black rails prefer tidal marshes on the coast and inhabit grassy marshes inland (Audubon 2021b). A review of the TXNDD and eBird species observation data yielded no observations of black rails within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a). Specimens of Texas fawnsfoot have been documented within 6 miles of CPNPP in the

Brazos River (TPWD 2022a). However, it is considered intolerant of reservoirs and therefore is not likely to be found in SCR (TPWD 2021a; TPWD 2021b). The Brazos River water snake has been documented within 6 miles of CPNPP and is endemic in the Brazos River (TPWD 2022a). The current known range of the Texas heelsplitter does not occur within 6 miles of the CPNPP site. Occurrences of these species within these areas would be incidental or is unlikely unless intentionally or unintentionally relocated. Due to the lack of suitable habitat, and the unlikely probability of these species to occur on the CPNPP site, the continued operation of CPNPP will have NO EFFECT on these species.

Habitat for seven federal and state protected species is either located near the CPNPP site, or the species are highly mobile and may occur onsite and warrant further discussion. These species are golden-cheeked warblers, piping plovers, rufa red knots, white-face ibises, whooping cranes, and THLs. However, piping plovers and rufa red knots are only considered for protection under the ESA for wind projects.

Marginal habitat for THLs may be on portions of the CPNPP site not used for operations. During the site visits for the CPNPP Unit 3 and 4 COLA, harvester ant colonies were found onsite. Harvester ants are the THL's primary source of food and can be indicative of their presence onsite. Following this observation, the site was surveyed for individuals, and none were found onsite. (Luminant 2013b) There have been no reports of the THL at the CPNPP site since the time of the 2007 survey. Maintenance activities at the site have been largely limited to previously disturbed areas and there have been no activities/developments at the CPNPP site that would have resulted in increased habitat availability for the THL. Further, no land disturbance has been identified during the LR term that would have potential impacts to the THL. Compliance with all regulatory requirements associated with these listed species will continue to be an administrative control practiced by Vistra OpCo for the life of the facility. As such, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on the THL.

Habitat for the golden-cheeked warbler exists near SCR and individuals have been documented within 6 miles of CPNPP (eBird 2021; TPWD 2022a). However, informal surveys for the golden-cheeked warbler and the black-capped vireo were conducted during April 2007 at various times of day over the course of three days. Recordings of the songs and calls of both species were studied prior to field survey, and survey methods consisted of walking transects on an east-west axis spaced approximately 100 meters apart. Neither species was audibly nor visually identified during the April survey. (Luminant 2013b) Further, no tree or vegetation clearing is proposed during the LR term that would potentially impact this species. As such, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on the golden cheeked warbler.

Piping plovers and red knots are shorebirds that use open habitats, such as beaches and mudflats. Both are small birds not known to be exceptionally prone to collision mortality, so the likelihood of collision with tall structures associated with CPNPP is expected to be minimal. Piping plovers and red knots are only federally considered for wind projects but are also state listed as threatened for both Hood and Somervell counties (TPWD 2021a; TPWD 2021b; USFWS 2021b). Potential habitat for both species likely exists along the Brazos River, which is within the 6-mile vicinity of CPNPP; however, review of the TXNDD and eBird species observation data yielded no observations of these species within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a). Compliance with all regulatory requirements associated with these listed species will continue to be an administrative control practiced by Vistra OpCo for the life of the facility; thus, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on piping plovers or red knots.

Habitat exists for the white-faced ibis along the Brazos River and portions surrounding SCR. The white-faced ibis seems to prefer freshwater marshes, where it can find insects, newts, leeches, earthworms, snails, and especially crayfish, frogs, and fish. They roost on low platforms of dead reed stems or on mud banks. During the nesting season, they are colonial and will construct a deep cup of dead reeds among beds of bulrushes, on floating mats of dead plants, or they may nest in trees. A review of the TXNDD and eBird species observation data yielded multiple observations of this species along SCR and the Brazos River (eBird 2021; TPWD 2022a).

Suitable stopover habitat for the whooping crane exists within the 6-mile radius. Their preferred stopover habitat includes areas along rivers, in grain fields, and in shallow wetlands. A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a).

Vistra OpCo is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support LR likely would be limited to previously disturbed areas onsite, and no additional land disturbance has been identified for the purpose of the LR. In addition, there are no plans to alter plant operations in a way which would affect threatened, endangered, and protected species during the proposed LR operating term.

Activities on the CPNPP site are evaluated to ensure compliance under Chapter 68 of the TPWD code, BGEPA, ESA, and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Compliance with all regulatory requirements associated with these species will continue to be an administrative control practice by Vistra OpCo for the life of the CPNPP facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize impacts to these species. Further, as discussed in Section 3.7.8, no state or federally listed species have been documented within areas used for operations; thus, the continued operation of CPNPP will have NO EFFECT on these species.

As discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs that the site is subject to, such as those presented in Chapter 9, further serve to minimize impacts to any threatened, endangered, and protected species. In an effort to obtain an independent review, letters requesting consultation have been submitted to the USFWS and TPWD. Responses to these requests have been received. Both agencies recommend the evaluation of the proposed actions for the potential to result in adverse impacts to listed species and to include a determination. Through this review, it has been determined that operation of the site would have NO EFFECT on any federally protected or state-listed species. Copies of the consultation letters to the USFWS and TPWD and their responses are provided in Attachment C.

In summary, no LR-related refurbishment activities have been identified. As discussed above, the continued operation of the site would have NO EFFECT on any federally protected or state-listed species. Therefore, Vistra OpCo concludes that the impacts from the proposed LR would not affect threatened, endangered, and protected species in the vicinity of CPNPP and mitigation measures beyond Vistra OpCo's current management programs and existing regulatory controls are not warranted.

4.7 Historic and Cultural Resources

The following sections address the historic and cultural issues applicable to CPNPP, providing background on issues and analysis regarding the proposed LR operating term.

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Continued operations associated with license renewal are expected to have no license renewal-related impacts as no refurbishment or construction activities have been identified; administrative procedure ensures protection of historic properties in the event of excavation activities. The NHPA requires the federal agency to consult with the State Historic Preservation Officer (SHPO) and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

Requirement [10 CFR 51.53(c)(3)(ii)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the NHPA.

Background [GEIS Section 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by ground-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through: (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or building), landscaping, agricultural, or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

Analysis

Refurbishment Activities

As presented in Section 2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

Operational Activities

As presented in Section 3.8.5, there have been five previous cultural resources surveys within the 7,700-acre CPNPP property (Table 3.8-1). While there are 33 entries on the THC Atlas, there are no NRHP eligible cultural resources confirmed within the 7,700-acre CPNPP property (Table 3.8-1). There are no structures within the CPNPP property listed on the historic sites' atlas. The Hopewell Cemetery is located within the CPNPP property and is protected by state burial laws.

As presented in Section 3.8.6, although no LR-related ground-disturbing activities have been identified, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. These consist of a control of site excavation procedure and an excavation permit plan for the unanticipated discovery of any cultural resources over 50 years of age. Therefore, no adverse effects are anticipated to these sites during the CPNPP proposed LR operating term.

The area within a 6-mile radius of the site, is archaeologically sensitive (Table 3.8-3). There are 108 offsite cultural resources within 6 miles of CPNPP. Adverse impacts, however, would only occur to such sites as a result of soil-intrusive activities. Because Vistra OpCo has no plans to conduct such soil-intrusive activities at any location outside of the property boundary under a renewed license, no adverse effects to these archaeological sites would occur.

There are four NRHP listed aboveground historic properties within a 6-mile radius of the site (Table 3.8-4). These four NRHP listed resources include the Somervell County Courthouse, Barnards Mill, the Oakdale Park Historic District, and the Glen Rose Downtown Historic District. All four of these NRHP listed structures within 6 miles of the CPNPP property but are over 4.5 miles away from the CPNPP facility. Due to the distance, and the local terrain, aesthetic, and noise impacts to these resources as a result of the continued operations of CPNPP are not expected, and no adverse effects to the physical or historical integrity of these sites are anticipated.

As discussed above, no LR-related refurbishment or construction activities have been identified. No offsite NRHP-listed historic properties will be adversely impacted as a result of continued operations of CPNPP, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of this LRA. In addition, administrative procedural controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. Therefore, Vistra OpCo concludes that there will be no adverse effects as a result of continued operation of CPNPP during the proposed CPNPP operating term, and additional mitigation measures beyond Vistra OpCo's existing procedural administrative controls are not warranted. As described in Section 3.8, the THC and Native American groups recognized as potential stakeholders have been notified by Vistra OpCo of the proposed action (Attachment D).

4.8 Socioeconomics

Impacts to socioeconomics are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to socioeconomics. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.9 Human Health

4.9.1 Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

Requirement [10 CFR 51.53(c)(3)(ii)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

Background [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria* spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the OL is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affect water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

Analysis

As mentioned above, *Naegleria* spp. is the thermophilic organism of greatest concern regarding nuclear power plant thermal discharges. As presented in Section 3.10.1, *Naegleria* spp. is ubiquitous in nature and thrives in heated water bodies at temperatures ranging from 95–106°F or higher. In compliance with the TDPES permit (included in Attachment B), CPNPP's discharge area could have temperatures above 95°F (Attachment B). However, as explained in Section 3.10.1, the submerged discharge is pumped to a deep arm of the SCR and the discharge outlet terminates at 35–40 feet in lake depth, promoting high-velocity mixing. In-water barriers restrict approach by the public to the discharge point by more than 1,800 feet. Should SCR experience an increase in ambient water temperature from climate change, the lower depths of the lake would remain cooler than surface temperatures and high-velocity mixing would continue to rapidly incorporate the heated discharge bringing the temperature back to ambient conditions.

The risk of contracting primary amebic meningoencephalitis, the infection from *N. fowleri,* is very low. There have been 37 cases of primary amebic meningoencephalitis in Texas through 2020 (CDC 2020). The risk of infection is higher in shallow, still waters. SCR is a deep lake and CPNPP's cooling water system pumps and wind provide water movement, so the water is not still. Further, the route of infection is through the nasal passages which requires immersion and as stated in Section 3.10.1, SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri* and lake conditions along with restricting access to the discharge area and not allowing swimming would further reduce the risk of *N. fowleri* infection. These conditions would also reduce the risk of infection from other human pathogens mentioned in Section 3.10.1. Therefore, the microbiological hazard to the public from CPNPP's thermal discharge during the LR term would be SMALL.

Vistra OpCo consulted the Texas Department of State Health Services, the state agency responsible for environmental health, regarding the potential existence and concentration of the above microorganisms in the receiving waters for plant cooling water discharge. The Texas Department of State Health Services' initial response indicated that there are no known reports of outbreaks in the human population of reportable disease caused by thermophilic organisms in the recent past related to CPNPP that would prompt investigation by the Department. A second response agrees that continued operations would not have an impact with regard to public health risk from the thermal discharge. Correspondence with the Texas Department of State Health Services regarding the CPNPP thermal discharge is included in Attachment E.

4.9.2 Electric Shock Hazards

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Electrical shock potential is of small significance for transmission lines that are operated in adherence with the National Electrical Safety Code (NESC). Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

Requirement [10 CFR 51.53(c)(3)(ii)(H)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 mA. With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received OLs with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

Analysis

As discussed in Section 3.10.2, the in-scope transmission lines (Figure 2.2-2) span between the switchyards and the power block and are wholly within the OCA. Thus, any risk to the public is minimized due to restricted site access. Section 3.10.2 also discusses the evaluation of the in-scope transmission lines for compliance with the NESC and processes to maintain compliance. The lines were evaluated in 2008 as part of the CPNPP uprate project for their compliance with 2007 NESC clearance standards. The study found that the lines were in compliance with NESC standards with exception of the clearance over one light pole which was subsequently corrected. The 2017 NESC, the current code, does not require modification of existing installation that comply with previous versions of the code. Therefore, the in-scope transmission lines comply with current NESC clearance standards. Vistra OpCo also has procedures in place to review and control proposed structural changes to maintain compliance with the NESC clearance standards. Finally, procedures govern the use of equipment near transmission lines to maintain adequate distance to prevent electrical shock. Given that the GEIS determined that the electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC, the electric shock hazards from the CPNPP in-scope transmission lines are SMALL.

4.10 Environmental Justice

The NRC identified only one issue for environmental justice. This is a Category 2 issue and is discussed below, providing background and the analysis identified as pertaining to the proposed LR operating term.

4.10.1 Minority and Low-Income Populations

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040).

Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's OL, including any planned refurbishment activities, and ongoing and future plant operations.

Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

Analysis

Refurbishment Activities

As presented in Section 2.3, no LR-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Vistra OpCo's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of CPNPP during the LR operating term would either be SMALL or non-adverse. Therefore, high, or adverse impacts to the general human population would not occur.

As described in Section 3.10, CPNPP maintains a REMP. With this program, Vistra OpCo monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding CPNPP. The results of the program indicate CPNPP has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the CPNPP LR term.

Section 3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC 2020c). Section 3.11.3 describes the search for subsistence populations near CPNPP, of which none were found. The figures accompanying Section 3.11.2 show the locations of minority and low-income populations within a 50-mile radius of CPNPP. None of those locations, when considered in the context of impact pathways described in this chapter, are expected to be disproportionately impacted.

Therefore, no disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated as a result of LR.

4.11 Waste Management

Impacts to waste management are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to waste management. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.12 Cumulative Impacts

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

Requirement [10 CFR 51.53(c)(3)(ii)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

Background [GEIS Section 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., National Pollutant Discharge Elimination System (NPDES)) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

Analysis

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of CPNPP during the proposed LR operating term with past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such actions.

Vistra OpCo considered potential cumulative impacts during the proposed LR operating term in its environmental analysis associated with the resources discussed in the following sections. For the purposes of this analysis, past actions are those related to the resources at the time of plant licensing and construction; present actions are those related to the resources at the time of current operation of the power plant; and future actions are those that are reasonably foreseeable through the end of plant operation, which would include the proposed 20-year license renewal term. These criteria are in line with Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR Part 1508.7 and include individually minor, but collectively significant, actions taking place over a specified period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

As discussed in Section 2.3, no LR-related refurbishment activities have been identified. As indicated in Section 3.1.4, no major changes to CPNPP Units 1 and 2 operations or plans for future expansion of plant infrastructure during the LR term are anticipated. The effects of past actions are already reflected in the description of the affected environment in Chapter 3. CPNPP has determined that the current onsite ISFSI pad has enough space for canister storage to operate through the current licensing term, but insufficient space to operate through the proposed LR operating term. However, planning the expansion of the CPNPP ISFSI for the proposed LR operating term is not reasonably foreseeable, because ISFSI expansion plans would depend on the status of the DOE's future performance of its obligation to accept SNF or the availability of other interim storage options. If future planning includes the expansion of CPNPP ISFSI storage capabilities onsite during the proposed LR operating term, there is more than sufficient room to expand the ISFSI in the area adjacent to the existing pad. This would cause no significant environmental impact.

Section 3.1.4 describes other (non-CPNPP) projects in the vicinity of CPNPP. The TxDOT continues road maintenance and construction projects, and the SCWD has been adding new waterlines to the county distribution network. More water lines are anticipated to be installed in the future, but currently a schedule has not been established.

4.12.1 Land Use and Visual Resources

CPNPP operations have a SMALL impact on the land use (NRC 2013b). The land use impact of CPNPP is characterized as SMALL in Section 4.1. As described in Section 3.1.4, there are currently no planned projects for the CPNPP site, therefore nothing is expected to require a change in land use. As described in Section 3.1.1 and illustrated in Figure 3.1-1, the CPNPP vicinity falls within rural portions of both Hood and Somervell counties and its boundary encloses SCR. As discussed in Section 3.2.1, there are no zoning or land development regulations in place for unincorporated areas containing CPNPP.

Land use changes are anticipated for the TxDOT's ongoing road maintenance and construction projects. Because of the relatively small amount of land change due to road widening as compared to the rest of the land use in the county, the land use impacts due to this project are not expected to contribute significantly to cumulative land use impacts. Therefore, the cumulative land use impact of CPNPP and other reasonably foreseeable projects in the region would be SMALL.

As stated in Section 3.2.3, the surrounding hilly terrain provides some screening of predominate visual features of the site, these features are visible in some areas. However, the continued use of existing structures associated with CPNPP would not alter their visual impact. The visual characteristics of other reasonably foreseeable projects in the region are surface and subsurface projects that will not contribute to cumulative visual impacts. Because the visual impacts due to CPNPP are SMALL, not expected to change or to contribute to other projects, the cumulative visual impacts are expected to be SMALL.

4.12.2 Air Quality and Noise

4.12.2.1 Air Quality

Section 3.3.3 discusses regional air quality and CPNPP air emission sources. Nine of the 19 counties within the region, including Somervell County, are in attainment. Ten counties make up the non-attainment area for 8-hour ozone (2008 standard). Nine of those counties make up the non-attainment areas for 8-hour ozone (2015 standard). Also as presented in Section 3.3.3, there is no mandatory Class I federal areas within 100 miles of CPNPP.

CPNPP air pollutant emissions are minimal and stem from intermittent use, maintenance, and testing of stationary diesel generators, fire pumps, and an auxiliary boiler. For air emission details at CPNPP, see Section 3.3.3.2. The planned projects listed in Section 3.1.4 could result in localized temporary air emissions from construction and demolition equipment. Implementing fugitive dust BMPs and maintaining portable equipment in proper working order will minimize air emissions. Compliance with the existing air permit and any future permit would minimize impacts to air quality.

Section 3.2.2 describes the area surrounding CPNPP as rural and undeveloped. The state of Texas provides municipalities with the authority to implement and enforce zoning regulations. There are no laws giving county governments the same authority. The future land use changes for the area surrounding CPNPP are not reasonably foreseeable because there are no zone areas surrounding the site. Therefore, land adjacent to the site is expected to remain the same and is not expected to have air emission sources. The area will continue to experience air emissions from vehicles on the adjacent roadways and boating on the SCR. Any air emissions from future projects would be subject to state air permitting and regulations. The cumulative air quality impact would be SMALL.

4.12.2.2 Climate Change

Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase, ozone levels will not necessarily increase because ozone formation is also dependent on the relative amounts of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States, however, must continue to comply with the CAA and ensure air quality standards are met. (NRC 2015)

Meteorological conditions conducive to ozone formation occur when high-pressure systems dominate local weather patterns. Clear skies and stagnate air on warm sunny days allow for the highest concentrations of ozone (TCEQ 2021b). Because the fuel source for Units 1 and 2 do not produce carbon dioxide (CO_2) emissions or other GHG emissions, the continued operation of Units 1 and 2 would avoid millions of tons of GHGs from a fossil fuel-fired alternative such as the natural gas-fired combined-cycle (NGCC) alternative discussed in Chapter 7.

Given that climate change trends in air temperature and precipitation are increasing but continued operation would contribute only small emissions of GHGs from minor air emission sources, the cumulative impact on climate change from present and future actions would be SMALL. Moreover, continued operation of CPNPP avoids the emission of millions of tons of CO_2 from alternative fossil-fuel generation (Section 7.2.3.1.3), positively impacting the climate change factor of CO_2 concentrations.

4.12.2.3 Noise

CPNPP operations have a SMALL impact on the noise environment (NRC 2013a). The surrounding land use discussed above in Section 4.12.1 is rural and no development is reasonably foreseeable. Therefore, cumulative noise impacts from continued plant operations over the license renewal term would be SMALL.

4.12.3 Geology and Soils

Impacts to geology and soils could result from ground-disturbing activities and stormwater runoff. As noted in Section 2.3, CPNPP has no plans to conduct LR-related refurbishment or replacement activities. Section 3.1.4 discusses future projects that may include road widening and water pipeline production in the vicinity of CPNPP.

The NRC concluded that a site's impact on geology and soils would be SMALL (NRC 2013a). Although no ground-disturbing activities are reasonably foreseeable, any onsite ground-disturbing activities during the proposed LR operating term would be governed by a stormwater construction permit and/or the SWPPP. Given ground disturbances at the CPNPP site would be limited to the current site area, subject to construction and stormwater permitting and applicable BMPs, the cumulative land use impact would be SMALL.

4.12.4 Water Resources

4.12.4.1 Surface Water

Surface water use impacts for once-through cooling was generically determined by the NRC to be SMALL (NRC 2013a). Any modifications would be under a TPDES permit issued by the TCEQ, and water use impacts would be considered by TCEQ prior to issuance of the permit. There are no plant operations or modifications planned for the proposed LR operating term including any modifications that would alter current patterns at the intake and discharge structures.

As for surface water quality cumulative impacts, CPNPP complies (Chapter 9) with its TPDES permit discharge limits and the discharge rapidly mixes in the SCR. As discussed in Section 3.6.4.1, there are no impaired waters identified near CPNPP. Therefore, the cumulative impact to surface water quality would be SMALL. Given CPNPP compliance with its TPDES permit and compliance with stormwater permits and regulations, CPNPP would have only a small contribution to any surface water quality cumulative impact.

4.12.4.2 Groundwater

As presented in Section 3.6.4.2, the quality of groundwater at the site is unsuitable for irrigation due to local soil conditions and the sodium content of the water. As stated in Section 3.6.3.2, groundwater use from aquifers in the vicinity of CPNPP is not expected to increase significantly because the aquifers are variable in their hydraulic characteristics and quality. Potable water is supplied by the SCWD. There are four remaining water supply wells (one at the rifle range, one at the Somervell Training Center, and two at SCP). No groundwater is withdrawn from the site as part of plant operations.

It is not anticipated that groundwater withdrawal for operations will be required during the proposed LR operating term. As discussed above, land development in the CPNPP vicinity is not anticipated. CPNPP will continue to maintain and implement its site-specific spill prevention plans to prevent spills that would contaminate soils, groundwater, and surface water during the proposed LR operating term. Therefore, the cumulative impact to groundwater resources would be SMALL.

4.12.4.3 Climate Change

Climate change can affect the availability of water resources due to climatic changes such as changes in temperature and precipitation patterns (NRC 2013a). The availability of water is expected to decline due to warmer temperatures, increased evaporation, and increased transpiration reducing average river flows (EPA 2016). However, CPNPP withdraws water exclusively from the SCR for operational purposes and uses a once-through cooling system, which reduces demand on water resources. A substantial amount of supplemental water from Lake Granbury and other sources is available under an existing agreement with the BRA (Section 3.6.3). As discussed above, CPNPP operations do not require significant surface water consumption or any groundwater withdrawals, and CPNPP operates in compliance with its permits for water withdrawals and discharges. Because CPNPP uses a once-through cooling system and complies with its permitted withdrawals, its contribution to the cumulative impacts on water availability would be SMALL.

Warmer water and higher air temperatures can reduce the efficiency of thermal power plant cooling technologies. In addition, discharge permit conditions may limit operations for some power plants as water temperatures rise (NRC 2013a). However, the primary function of SCR is to act as a cooling water reservoir for CPNPP (NRC 2008c). Although no changes are reasonably foreseeable, if any changes were to occur, CPNPP would continue to operate within permitted conditions.

Given that the continued operation would have a SMALL impact on water resources and its continued operation could avoid millions of tons of CO_2 from alternative fossil-fuel generation, the continued operation of CPNPP could be viewed as a net beneficial contribution to climate change impacts.

4.12.5 Ecological Resources

4.12.5.1 Terrestrial

The impacts on terrestrial species during the proposed LR term are described as SMALL in Section 4.6.5. The continued operation of CPNPP Units 1 and 2 is governed by regulations, CPNPP procedures, and plans. As discussed in Section 9.6, CPNPP has administrative controls in place to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Successful application of the regulations, procedures, plans, and administrative controls would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations (NRC 2013a). Regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide usage, further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to CPNPP property and would have minimal opportunity to contribute to cumulative impacts.

As discussed in Sections 3.7.8.1, 3.7.8.2, and 4.6.6, habitat for federally and state-listed terrestrial species does occur on the CPNPP site. However, adherence to regulatory and permit requirements to avoid take of protected species and CPNPP administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to these species. Vistra OpCo is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas of the CPNPP site. There is no contribution to cumulative impacts on protected species from CPNPP. Overall, the cumulative impacts to terrestrial ecological resources are anticipated to be SMALL.

4.12.5.2 Aquatic

Aquatic ecological communities at CPNPP could be impacted through impingement and entrainment and thermal discharges to the surface waters and wetlands. As discussed in Section 4.6.1, aquatic resource impacts due to impingement and entrainment during the proposed LR operating term were concluded to be SMALL. Ongoing studies ensure that CPNPP continues to use the BTA to minimize entrainment and impingement and comply with the TPDES permit. As discussed in Section 4.6.2, aquatic resource impacts due to thermal discharge during the proposed LR term were concluded to be SMALL. Because the SCR is a man-made reservoir created specifically for the purpose of being used as a cooling water source for CPNPP, continually stocked with sport fish, and designated as a CCRS, the thermal discharge likely has little long-term impact on the aquatic community of SCR.

Because the SCR is a man-made reservoir and complies with the TPDES permit, it is not expected to contribute to cumulative aquatic ecological impacts in the region.

4.12.5.3 Climate Change

According to the EPA, climate change could impact terrestrial species in the vicinity due to drier conditions and desertification causing changes in habitat (EPA 2016). As discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and any impacts minimized, through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Adherence to regulatory and permit requirements to avoid take of protected species and CPNPP administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to terrestrial species. Therefore, the cumulative impacts of climate change and CPNPP activities on terrestrial species would be SMALL.

According to the EPA, as average temperatures increase evaporation, average rainfall is likely to decrease during winter, spring, and summer. The increased evaporation and decreased rainfall are both likely to reduce the average flows of rivers and streams (EPA 2016). As presented in Section 4.12.4, the SCR is a man-made reservoir with limited ecological value and is in compliance with the TPDES permit. Any impacts to aquatic species in the SCR are not expected to contribute to cumulative aquatic ecological impacts for the region. The continued operation of CPNPP would be a small contributor to climate change effects that impact vulnerable aquatic species due to rising temperatures. Therefore, cumulative impacts to aquatic ecological communities from CPNPP and climate change are anticipated to be SMALL during the proposed LR operating term.

4.12.6 Historic and Cultural Resources

As presented in Section 2.3, no refurbishment activities or other construction activities are currently planned to support LR operations. Therefore, the LR consists of an administrative action relative to historic and cultural resources. Although construction of the existing CPNPP facility itself would have impacted any archaeological resources that may have been located within its footprint, much of the surrounding area remains largely undisturbed. As stated in Section 4.7, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. The section also states that there will be no adverse effects on historic and cultural resources as a result of continued operations of CPNPP during the proposed LR operating term. Therefore, no cumulative adverse effects are anticipated to cultural resources on the site during the proposed LR operating term or due to reasonably foreseeable future projects.

4.12.7 Socioeconomics

As discussed in Section 2.5, the proposed LR does not include plans to add permanent workers, so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure including transportation would not change. Tax payments from the operating plant (Section 3.9.5) are anticipated to continue through the proposed LR operating term and the economic contributions of the plant's workers, thus the beneficial socioeconomic impacts would also continue. Thus, significant beneficial socioeconomic impacts would also continue during the proposed LR operating term.

4.12.8 Human Health

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR Part 20 and 40 CFR Part 190. For this analysis, the region of influence is the surrounding 50-mile region.

No other nuclear facilities were presented in Section 3.1.1 as being within 50-miles of the site. As presented in Section 3.10.3, CPNPP prepares annual radiological environmental operating reports and annual radiological effluent reports. The report for 2019 indicate that doses to members of the public comply with NRC and EPA radiation protection standards and are not increasing. The 3-year (2016–2018) average annual occupational dose [(TEDE)] was 0.089 rem. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)].

The cumulative impact of CPNPP's Units 1 and 2 operation and any other radiation sources would be expected to be SMALL because all routine releases and occupational exposure would be subject to federal regulations. Therefore, operating CPNPP for an additional 20-year period would not cause an increase in annual radioactive effluent releases.

Nonradiological human health impacts occur with temperatures optimal to grow thermophilic organisms such as those listed in Section 3.10.1. As mentioned in Sections 3.10.1 and 4.9.1 these temperatures occur near a submerged outlet into a deep arm of the SCR. However, public access to the outlet is restricted and swimming is not allowed in the reservoir. Section 4.9.1 concluded that public risk is SMALL. There are no other thermal discharges in SCR. Therefore, the CPNPP's thermal discharge would not contribute to any other thermal discharges since there would be no overlap. Therefore, the cumulative nonradiological health impact is SMALL.

Compliance with NESC and CPNPP procedures minimize occupational risk from electrical shock hazards (Section 4.9.2). As described in Section 2.2.5.5, CPNPP maintains as comprehensive occupational safety program. Therefore, cumulative impacts to human health from nonradiological hazards are not expected. The cumulative impacts on human health are expected to be SMALL.

4.12.9 Waste Management

As presented in Section 2.2.6, the comprehensive regulatory controls in place for management of radiological waste and CPNPP's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed LR operating term. The NRC oversees the licensing of radiological waste treatment and disposal facilities. There are four facilities providing low-level radioactive waste disposal services in the United States (NRC 2020d).

As presented in Section 3.10.3, CPNPP's annual reports indicate that radiological doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards. There are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of CPNPP (NRC 2021b).

As presented in Sections 2.2.6 and 2.2.7, CPNPP has programs in place to manage its hazardous and nonhazardous waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed LR operating term would allow the impacts to be SMALL. The other facilities within the 50-mile region of CPNPP are also required to comply with appropriate EPA and state requirements for the management of radioactive and nonradioactive wastes. Thus, the cumulative waste management impact would be SMALL.

4.13 Impacts Common to all Alternatives: Uranium Fuel Cycle

Impacts to the uranium fuel cycle are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to uranium fuel cycle. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.14 Termination of Nuclear Power Plant Operations and Decommissioning

Impacts to the termination of nuclear power plant operations and decommissioning are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to termination of nuclear power plant operations and decommissioning. Therefore, Vistra OpCo incorporates the NRC findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.15 Postulated Accidents

4.15.1 Category 1 Issue—Design-Basis Accidents

The following Category 1 issue related to postulated accidents was reviewed for new and significant information that could make the generic finding as described in the GEIS (NRC 2013e) not applicable to CPNPP: Issue 65—Design-Basis Accidents.

Section 5.3 of the 1996 GEIS discusses the impacts of potential accident, their consequences, and addresses the general characteristics of design-basis accidents (DBAs), including characteristics of fission products, meteorological considerations, possible exposure pathways, potential adverse health effects, avoiding adverse health effects, accident experience and observed impacts, and emergency preparedness. In the 2013 LR GEIS (NRC 2013e), the NRC found that the environmental impacts of DBAs are of SMALL significance for all nuclear plants. This conclusion was reached because the plants were designed to successfully withstand these accidents, and a licensee is required to maintain the plant within acceptable design and performance criteria, including during any LR term. It is also stated that the environmental impacts during a LR term should not differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Impacts from DBAs would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change; (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual; and (3) have been previously determined acceptable.

The GEIS also observes that additional experience has contributed to improved plant performance as measured by trends in plant-specific performance indicators, a reduction in operating events, and lessons learned that improve the safety of all the operating nuclear power plants. This is also confirmed by analysis which indicates that, in many instances, improved plant performance and design features have resulted in reductions in initiating event frequency, core damage frequency (CDF), and containment failure frequency.

To receive NRC approval to operate a nuclear power plant, an applicant for an initial OL must submit a safety analysis report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that prevent and mitigate accidents. The NRC staff (the staff) reviews the application to determine if the plant design meets the NRC's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the staff evaluate to ensure that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. Many of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the nuclear power plant. 10 CFR Part 50 and 10 CFR Part 100 describe the acceptance criteria for DBAs.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the nuclear power plant to withstand these accidents is demonstrated to be acceptable before issuance of the OL. The results of these evaluations are found in license documentation such as the applicant's FSAR - the staff's safety evaluation report, and the final environmental statement (FES). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the nuclear power plant, including any period of extended operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for LR, the environmental impacts, as calculated for DBAs, should not differ significantly from initial licensing assessments over the life of the nuclear power plant, including the LR period. Accordingly, the design of the nuclear power plant, relative to DBAs during the extended period, is considered to remain acceptable; therefore, the environmental impacts of those accidents were not examined further in the GEIS.

<u>Conclusions for Design Basis Accident Consequences</u>

The environmental impacts of DBAs are of small significance for all nuclear power plants because the plants were designed to withstand these accidents. Due to the requirements for nuclear plants to maintain their licensing basis and implement aging management programs during the LR term, the environmental impacts during a LR term are not expected to differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Therefore, for the purposes of LR, DBAs are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs makes them a part of the CLB of the plant; the CLB of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under LR. The NRC, through its CLB oversight, has not determined that the plant's design basis is unacceptable.

Vistra OpCo reviewed the NRC findings on this issue and identified no new and significant information. Therefore, Vistra OpCo adopts and incorporates by reference the findings in the GEIS and Table B-1 for this issue.

4.15.2 Category 2 Issue—Severe Accidents

CPNPP submitted an application for an OL which was approved in 1990 for Unit 1 (NRC 1990b) and in 1993 for Unit 2 (NRC 1993). A severe accident mitigation design alternatives (SAMDAs) evaluation was performed to support the Nuclear Regulatory Commission's (NRC's) review of the initial licensing application (TU 1989).

NUREG-0775, "Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2" (NRC 1989), documents the NRC's evaluation of the alternative of facility operation with the installation of severe-accident-mitigation design features. The NRC did not discover any substantial changes in the proposed action as previously evaluated in the FES (NRC 1989) that are relevant to environmental concerns nor significant new circumstances or information relevant to environmental concerns and bearing on the licensing of CPNPP Units 1 and 2.

A set of SAMDAs was developed for CPNPP to address the accident sequences or sequence groups identified in the FES as well as risk contributors identified in more recent studies which could be applicable to CPNPP. This was done on a generic basis since a plant-specific probabilistic risk assessment (PRA) for CPNPP was not available at the time of the NRC review. In assessing the risk reduction potential, each SAMDA was conservatively assumed to avert all the residual risk estimated in NUREG-0775. This risk reduction was compared to the estimated costs associated with each SAMDA based on $1,000 per averted person-rem. None of the nine SAMDAs were found to be cost effective. This conclusion was due in large part to the low population around the CPNPP site and low residual risk. In light of these insights, the NRC concluded that there was no basis to require modifications to the plant for the purpose of further mitigating environmental concerns.

In summary, the NRC did not find any new information that would call into question the FES conclusion that "the risks of acute fatality from potential accidents at the site are small in comparison with the risks of acute fatality from other human activities in a comparably sized population" and that "there are no special or unique features about the CPNPP site and environs that would warrant special or additional engineered safety features for CPNPP." (NRC 1989)

In the longer term, severe accident issues were being pursued by the NRC in a systematic way for all utilities through the Severe Accident Program (SAP) described in SECY-88-147 (NRC 1988), "Integration Plan for Closure of Severe Accident Issues." The plan included provisions for an Individual Plant Examination (IPE) (TU 1992) for each operating reactor, a Containment Performance Improvement (CPI) Program, and an Accident Management (AM) Program. These programs were intended to produce a more complete picture of the risk profiles of operating plants and the benefits of potential design improvements, including SAMDAs. The NRC stated that the SAP is the proper vehicle for addressing severe accident issues at nuclear power plants, including CPNPP.

Since that time, additional rulemaking, much of it in support of extended OLs, was promulgated. In accordance with 10 CFR 51.53(c)(3)(ii)(L) and Table B-1 of Appendix B to 10 CFR Part 51, Subpart A, LR ERs must provide a consideration of alternatives to mitigate severe accidents if the NRC staff has not previously considered such alternatives for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an EA. Some plants (e.g., Limerick Generating Station) performed analyses of SAMDAs as components of initial plant licensing environmental reviews. Hence, the NRC considered such analyses in the EISs regarding initial plant licenses for those plants.

A LR applicant for a plant that has already had a severe accident mitigation alternatives (SAMA) analysis considered by the NRC as part of an EIS, supplement to an EIS, or EA, does not need to provide another SAMA analysis in the LR ER. In the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (61 FR 28467), the 1996 Part 51 Final Rule determined that the original Comanche Peak SAMDA analysis was a SAMA analysis for purposes of this Part 51 rule. More specifically, the Commission's statement of considerations for the 1996 Part 51 rulemaking point to the original SAMDA analysis and states as follows: "NRC staff considerations of severe accident mitigation alternatives have already been completed and included in an EIS or supplemental EIS for Limerick, Comanche Peak, and Watts Bar. Therefore, severe accident mitigation alternatives need not be reconsidered for these plants for license renewal."

In forming its basis for determining which plants needed to submit SAMA analyses at LR, the Commission noted that all licensees had undergone, or were in the process of undergoing, more detailed site-specific severe accident mitigation analyses through processes separate from LR, specifically the CPI, IPE, and Individual Plant Examination of External Events (IPEEE) programs. Considering these studies, the Commission stated that it did not expect future SAMA analyses to uncover "major plant design changes or modifications that will prove to be cost-beneficial." As stated in Appendix E of NUREG-1437, Revision 1 on Page E-45 (NRC 2013e), the NRC's experience in completed LR proceedings has confirmed this prediction. Nevertheless, the applicant's ER must contain any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(iv)].

NEI 17-04, Revision 1 (NEI 2019b) provides a model approach for assessing the significance of new information of which the applicant for renewal of a nuclear power reactor OL is aware that relates to either (1) the SAMDA analysis or SAMA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 50 (or Part 54) of the reactor's initial (or renewed) OL or (2) the SAMDA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 52 of the reactor's combined license and the design certification incorporated therein by reference, if any.

The analyses below follow the model approach in NEI 17-04, Revision 1 (NEI 2019b), for determination of whether there is new and significant information regarding the SAMA analyses. The NRC staff has reviewed the NEI 17-04, Revision 1, document and found it to be acceptable for use by the licensees that have communicated their intent to apply for subsequent license renewal (SLR) after December 31, 2019. For the CPNPP LR, the consideration of new and significant changes since the time of the initial licensing is consistent with the GEIS (NRC 2013e) Supplement 49 (NRC 2014). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether or not a SAMA is cost beneficial, but it also depends on a SAMA's potential to significantly reduce risk to the public (NEI 2019b).

The following Category 2 issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

The NRC has ruled that when a plant qualifies for the exception from the requirement to consider SAMAs in 10 CFR 51.53(c)(3)(ii)(L), the exception operates to designate this Category 2 issue as the "functional equivalent" of a Category 1 issue (NRC 2013f). Accordingly, Vistra OpCo reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS (NRC 2013e) concerning this issue to be inapplicable to CPNPP.

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. LR ERs for plants for which SAMAs have been previously considered need not consider SAMAs.

The assessment process for new and significant information related to the first generic conclusion (i.e., the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants) of the GEIS included: (1) interviews with subject matter experts on the validity of the conclusions of the 2013 GEIS as they relate to CPNPP; and (2) review of documents related to predicted impacts of severe accidents at CPNPP. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMDAs were previously evaluated by the NRC for CPNPP during the initial licensing application (TU 1989).

Developments in the following areas included:

- New internal events information
- External events
- New source term information
- Power uprates
- Higher fuel burnup
- Other considerations, including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Dai-Ichi Near Term Task Force.

New Internal Events

In the 2013 GEIS, the NRC reviewed the boiling water reactor (BWR) and pressurized water reactor (PWR) accident frequencies (CDF) for internal events that formed the basis for the environmental impacts shown in the 1996 GEIS, finding them in most cases to be comparable to or higher than updated accident frequencies.

In the 2013 GEIS, the NRC notes that changes in the likelihood of accidents that release substantial amounts of radioactive material to the environment affect the probability-weighted offsite consequences from airborne, surface water, and groundwater pathways, as well as the resulting economic impacts from such pathways. Considering the decreasing trend observed in the likelihood of severe accidents caused by internal events since 1996 and the conservative dose values used in the 1996 GEIS, the 2013 GEIS concludes that the 1996 GEIS estimates of offsite consequences from severe accidents initiated by internal events remain valid.

Since the CPNPP licensing application and SAMDA evaluation (TU 1989), there have been many improvements to the plant's risk profile. CPNPP did not use a PRA model quantification to evaluate its noted SAMDAs in the original operation license but has subsequently performed evaluations of external events in its IPEEE (TU 1995). The current CPNPP PRA has an updated internal events model as well as an updated internal fire study and internal flooding study; other external events have not been explicitly incorporated into the CPNPP PRA model of record. The Revision 3 CPNPP PRA had an internal events CDF of approximately 9.30E-6/year. The

Revision 3 PRA internal events including internal flooding CDF is 9.37E-6/year. The noted CPNPP IPE CDF was 5.72E-5/year and was based on Unit 1 and determined to be applicable to both Unit 1 and Unit 2. The current model of record (Revision 5) PRA has a CDF of approximately 1.1E-6/year for each unit. The current internal events including internal flooding CDF is 1.22E-6 and 1.25E-6 per year for Unit 1 and Unit 2, respectively. The current internal events including internal flooding LERF is 1.11E-7 and 1.12E-7 per year for Unit 1 and Unit 2, respectively. These PRA model refinements represent an approximately 98 percent reduction in CDF from the IPEEE CDF (about a factor of 46) and an approximately 88 percent reduction in CDF from the Revision 3 CDF (about a factor of 7) for each unit for the internal events (i.e., excluding internal flooding) PRA. Therefore, Vistra OpCo concludes that no new and significant information exists for CPNPP concerning offsite consequences from severe accidents initiated by internal events. Accordingly, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP renewal.

Revision 4 of the CPNPP PRA was peer reviewed in March 2011 following the Nuclear Energy Institute process. The Facts and Observations generated by this peer review were addressed in 2015 and 2016 and subsequently reviewed in November 2019 as having closed all peer review findings. Revision 5 of the CPNPP PRA maintains those resolutions.

External Events

In the 2013 GEIS, the NRC reviewed accident frequencies (CDFs) for external events reported in NUREG-1150 and NUREG/CR-5305, finding them to be generally one or more orders of magnitude lower than the CDFs that formed the basis of the 1996 GEIS. The primary focus of the assessment was on seismic and fire events, which the NRC had determined would contribute most to plant risk from external events. In the 2013 GEIS, internal fire events were considered external events. Therefore, "internal fire" is categorized as an "external" event in this document for consistency with the 2013 GEIS usage. Based on a comparison of the risks from internal events to risks from seismic and fire events, the 2013 GEIS concluded that it would be reasonable to assume that contributions to plant risk from fire events and seismic events are each comparable to the contribution from internal events, although a preliminary assessment from Generic Issue 199 indicated that, on average, updated seismic CDFs remained slightly (approximately 30 percent) less than the internal events CDF.

As for seismic risk, CPNPP is located in an area with low seismic activity. According to the CPNPP individual plant examination of external events, the CPNPP-specific seismic screening program was approved by the NRC based on a walkdown of structures, systems, and components rather than having a full seismic margin assessment calculation (TU 1995). In its response to post-Fukushima Near Term Task Force recommendation 2.1, CPNPP re-evaluated its seismic risk by comparing its updated plant-specific Ground Motion Response Spectrum (GMRS) developed by the Electric Power Research Institute against the 1.3 times the site's safe shutdown earthquake (SSE) level, and concluded that the updated GMRS was lower than the site's safe shutdown earthquake at a range of 1 Hz to 100Hz, indicating that the seismic hazard at CPNPP is low and bounded by the design basis value of 0.10g peak ground acceleration.

NRC staff confirmed that the GMRS developed by the NRC staff are bounded by the CPNPP SSE over the same range. Therefore, a seismic risk evaluation, spent fuel pool evaluation, and a high frequency confirmation were not merited for CPNPP (NRC 2016).

A high winds PRA has not been developed for CPNPP. Section 5.1.4 and Table 5.1.6 of the IPEEE (TU 1995) indicates that the overall CDF for tornados at CPNPP is estimated at approximately 3.7E-06. Station Blackout (SBO) is the principal contributor to the overall CDF for tornados. The dominant contributor to the SBO sequences is the random failure of both diesel generators following the tornado strike. Based on the qualitative evaluation documented on Table 2-1 of Appendix A, no potential cost-effective SAMAs were identified for high winds and tornados at CPNPP. Therefore, a quantitative high wind evaluation is not merited for CPNPP.

Because the CPNPP internal fire PRA model has been developed since the time of the SAMDA, it is considered new information and is used in the quantitative PRA calculation to evaluate SAMAs for the potential for significance.

Vistra OpCo concludes that no new and significant information exists for CPNPP concerning offsite consequences of severe accidents caused by external events. As such, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP LR.

New Source Term Information

Based on a comparison of NRC studies from 1982 (NUREG-0773 (NRC 1982) and 1997 NUREG/CR-6295 (NRC 1997a), which included data for CPNPP, the 2013 GEIS concluded that the 1997 source term information indicated that the timing from dominant severe accident sequences is comparable to the analysis forming the basis of the 1996 GEIS. Generally, the release frequencies and release fractions estimated in the 1997 study were significantly lower than previously estimated. Thus, the environmental impacts used as the basis for the 1996 GEIS (i.e., the frequency-weighted consequences) were higher than impacts that would be estimated using the 1997 source term information. Therefore, the updated estimates of offsite consequences remained within the bounds of the 1996 GEIS evaluation.

For the new and significant evaluation, SAMAs were grouped if similar, and all were evaluated for the impact they would have on the CPNPP Source Term Category (STC) frequencies if they were implemented. No SAMAs were found to reduce at least one STC frequency by at least 50 percent.

Vistra OpCo reviewed and determined that the previously evaluated source terms (TU 2015) used to assess offsite radiological consequences of severe accidents are bounded by the conclusions of the 2013 GEIS and are considered appropriate for CPNPP license renewal.

Power Uprates

The NRC approved an approximate 4.8 percent SPU for CPNPP on June 27, 2008, from reactor core power of 3,458 MWt to 3,612 MWt (TU 2007). The increase was supported by plant modifications to replace high-pressure turbines as well as setpoint changes for the reactor trip system and the engineered safety features actuation system.

The analysis input to the PRA model was updated with a small change to model results that is included in the current CDF and LERF values. The Unit 1 LERF changed from 4.87E-07 to 4.91E-07 and Unit 2 LERF changed from 6.11E-07 to 6.32E-07. Based on this evaluation, it is concluded that the risk increases due to the impacts of the power uprate conditions for internal events, external events, and shutdown operations are very small and within the acceptance criteria of Regulatory Guide 1.174 (TU 2007).

Since the PRA was previously updated, the effects of the power uprate are also included in the quantitative SAMA evaluations for the CPNPP license renewal.

Higher Fuel Burnup

The 2013 GEIS evaluates updated information from NUREG/CR-6703 (NRC 2001) to account for the effect of future increased fuel burnup on consequences of postulated accidents as predicted in the 1996 GEIS. The future peak burnup considered in the 2013 GEIS was 62 gigawatt-days per metric ton of uranium (GWd/MTU) for PWRs. Average peak rod fuel burn-up limit for each CPNPP unit during the terms of the extended licenses will not exceed 62,000 MWd/MTU.

Taken in combination with the other information presented in the 2013 GEIS, the NRC concluded that increased peak fuel burnup from 42 to 75 GWd/MTU for PWRs would have effects on risk and environmental impacts of severe accidents that are bounded by the 1996 GEIS. Because CPNPP peak fuel burnup is within the range considered by the NRC in the 2013 GEIS for PWRs, Vistra OpCo concludes that no new and significant information exists for CPNPP concerning the effect of peak fuel burnup on risk and environmental impacts of severe accidents. Accordingly, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP renewal.

Low Power and Shutdown Events

As discussed in SECY 97-168, existing regulatory controls for shutdown operations have evolved through a series of industry actions which have been successful in achieving an acceptable level of safety of low power and shutdown operation. (NRC 1997b). Therefore, the offsite consequences of severe accidents, considering low power and shutdown events, would not exceed the impacts predicted in either the 1996 or 2013 GEIS. At CPNPP, low power and shutdown events are in line with the conclusions in the GEIS. Vistra OpCo concludes that no new and significant information exists for CPNPP concerning lower power and shutdown events.

Spent Fuel Pool Accidents

Consistent with NUREG-1738, the impacts of accidents in spent fuel pools (SFPs) at CPNPP is comparable to or lower than those from reactor accidents and are bounded by the 1996 GEIS.

There are no spent fuel configurations that would distinguish CPNPP from the evaluated plants such that the assumptions in the 1996 and 2013 GEIS would not apply. The 2013 GEIS (NRC 2013e) indicates that analyses performed and mitigative measures employed since 2001 have further lowered the risk of accidents involving spent fuel pools. As a result of post-Fukushima Near-Term Task Force 2.1 recommendations, implementation of diverse and flexible coping strategies (FLEX), provides additional resources to maintain SFP water inventory and risk reduction. Therefore, Vistra OpCo concludes that there is no new and significant information related to SFP accidents at CPNPP.

<u>BEIR VII Risk Coefficient</u>

The risk coefficients from biological effects of ionizing radiation (BEIR) VII are applicable to the health effects from radiation exposures and cancers associated with them. As stated in SECY-05-0202, "the major conclusion is that current scientific evidence is consistent with the hypothesis that there is a linear, no-threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. This conclusion is consistent with the system of radiological protection that the NRC uses to develop its regulations. Therefore, the NRC's regulations continue to be adequately protective of public health and safety and the environment." (NRC 2005). Additionally, the 2013 GEIS (NRC 2013e) confirms that using newer risk coefficients like BEIR VII is expected to have a small impact on the results presented in the 1996 GEIS. Because the CPNPP SAMA analysis does not find any SAMAs that reduced the risk metrics by at least 50 percent, no offsite doses are computed as part of a full Level 3 evaluation. Therefore, the BEIR VII risk coefficients have no impact on the CPNPP SAMA Stage 1 analysis, and there is no new and significant information.

<u>Uncertainties</u>

The 1996 GEIS used 95th percentile upper confidence bound estimates whenever available for its estimates of the environmental impacts of severe accidents, which applies conservatism to cover uncertainties. The 2013 GEIS (NRC 2013e) concludes that "the impact and magnitude of uncertainties, as estimated in the 1996 GEIS, bound the uncertainties introduced by the new information and considerations." The 2013 GEIS also concludes "the reduction in estimated environmental impacts from the use of new internal event and source term information outweighs any increases from the consideration of external events, power uprates, higher fuel burnup, low power and shutdown risk, and spent fuel pool risk." The assessments in the previous sections provide additional information and insights to areas of uncertainty. It is concluded that there is no new and significant information regarding uncertainties at CPNPP.

Another consideration for uncertainty is population growth. According to NEI 17-04, Revision 1, Section 2.1, population growth is considered new information, but not necessarily significant for the Stage 1 analysis. Detailed population information including population projection information is presented in Section 3.11.1 of this report. For the 50-mile radius from the plant, the 2020 permanent population was 5,910,067, and the projected 2053 permanent and transient population is 9,465,735. This is less than a factor of two change that overlaps the 40 to 60 years renewal period of interest.

As can be seen from the data in Tables 5.10 and 5.11 of the 1996 GEIS, the estimated risk of early and latent fatalities from individual postulated nuclear power plant accidents is SMALL using very conservative 95th-percentile, upper-confidence bound estimates for environmental impact. The early and latent fatalities represent only a small fraction of the risk to which the public is exposed from other sources. As provided in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," the CDF risk metric is used as a surrogate for the individual latent cancer fatality risk, and the LERF risk metric is used as a surrogate for the individual early fatality risk. Given the substantial reduction in the CPNPP CDF by a factor of 46 (5.72E-05/1.22E-06), as explained in the PRA internal events section above, and the currently small CPNPP LERF value of 1.11x10-7/year demonstrates that the risk of early and latent fatalities from individual postulated nuclear power plant accidents has decreased since the issuance of the 1996 GEIS (NRC 1996b). Furthermore, as discussed in Section E.3.3 of the 2013 GEIS, more recent estimates give significantly lower release frequencies and release fractions for the source term than was assumed in the 1996 GEIS. Specifically, the 2013 GEIS states that "a comparison of population dose from newer assessments illustrates a reduction in impact by a factor of 5 to 100 when compared to older assessments, and an additional factor of 2 to 4 due to the conservatism built into the 1996 GEIS values." The effect of this reduction in total dose impact far exceeds the effect of a population increase. It can be concluded that the overall effect of increased population around the plant during the CPNPP period of extended operation does not result in significant increases in impacts. Thus, it can be concluded that no new and significant information exists for CPNPP concerning population increases that would alter the conclusions reached in the 2013 GEIS.

The CPNPP SAMAs are evaluated against the 50 percent risk reduction maximum benefit (MB) calculation for new and significant determination in the Stage 1 analysis. Per Section 3.1 of NEI 17-04, "*if a plant is able to demonstrate that none of the SAMAs evaluated in the Stage 1 assessment are potentially significant, then the Stage 2 inputs, such as the projected population within a 50-mile radius of the plant, should be listed as "new information", but no work to estimate the actual 50-mile population is required*."

Therefore, the NRC conclusion in the 1996 and 2013 GEISs that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the CPNPP LR and is incorporated herein by reference.

Therefore, the effect of population growth is expected to be bounded by the assessment in the 1996 GEIS.

It is concluded that there is no new and significant information regarding population increases at CPNPP.

Conclusion of Severe Accident Consequences

No new and significant information was identified for the areas listed above. The CDF from internal events has followed a decreasing trend at CPNPP since the previous SAMDA analysis was performed (TU 1989). Physical changes in the plant have significantly reduced risk in aspects of the PRA. Also, changes have been implemented at the site in response to Fukushima Dai-Ichi Near Term Task Force recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in CPNPP PRA model.

As stated in the 2013 GEIS, "given the difficulty in conducting a rigorous aggregation of these results (due to the differences in the information sources utilized), a fairly simple approach is taken." The 2013 GEIS estimated the net increase by a factor of 4.7 for consideration of the five areas leading to an increase in best-estimate impacts, external events, spent fuel pool accidents, higher fuel burnup, low power and reactor shutdown events, and population increase. (NRC 2013f).

For CPNPP, the newer internal event information accounts for a decrease in CDF by a factor of seven. The conservatism in the upper bound estimates utilized in the 1996 GEIS account for other potential reductions in risk, including a factor of 5 for newer source term and population dose, an additional factor of 2 to account for conservatism built in the 1996 GEIS, and a factor of 3 to address areas of uncertainty. These factors are on the conservative end of the ranges provided. When these factors are applied, the net change in risk for CPNPP is reduction by a factor 12.3 (7 + 5 + 2 + 3 – 4.7 = 12.3).

Therefore, the NRC conclusion in the 2013 GEIS that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the CPNPP LR, is incorporated herein by reference, and no further analysis is needed.

Regarding the second conclusion (i.e., LR ERs for plants for which SAMAs have been previously considered need not consider SAMAs) of the GEIS, the subsections below describe the methodology and review of SAMAs to demonstrate there is no new and significant information.

4.15.3 Methodology for Evaluation of New and Significant SAMAs

4.15.3.1 Overview

The evaluations of the CPNPP LR SAMAs are consistent with the NEI 17-04 Revision 1 methodology (NEI 2019b). The relevant steps from the methodology are described in the following subsections.

NEI 17-04 Revision 1 provides a model approach for assessing the significance of new information of which the applicant for renewal of a nuclear power reactor OL is aware that relates to either (1) the SAMDA analysis or SAMA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 50 (or Part 54) of the reactor's initial (or renewed) OL or (2) the SAMDA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 52 of the reactor's combined license and the design certification incorporated therein by reference, if any.

At the direction of the Commission (61 FR 28467), the NRC Staff asked the applicant in a request for additional information (Exelon 2014), why the set of potentially cost beneficial SAMAs that were identified for plants similar in design to Limerick after the performance of Limerick's 1989 Severe Accident Mitigation Design Alternatives (SAMDA) analysis were not new and significant information. This event was site-specific; however, because a similar request could be made of any LR/SLR applicant, it may be advisable for applicants to consider whether potentially cost beneficial SAMAs identified in U.S. license renewal applications (LRAs) after submittal of the SAMA analysis for the analyzed plant could be new information.

- BWRs should assess SAMAs from other BWRs and PWRs should assess SAMAs from other PWRs.

If there is a basis for excluding this body of SAMAs from the pool of "new information" to be evaluated for significance, the rationale should be documented.

NEI 17-04 (Revision 1) (NEI 2019b) describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis. In Stage 1, the LR/SLR applicant uses PRA risk insights and/or risk model quantifications to estimate the percent reduction in the MB associated with (1) all unimplemented "final plant-specific" SAMAs for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and determined to be applicable to but not already implemented at the analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents a 'seriously different picture' of the environmental impacts compared to the previously issued final environmental impact statement (FEIS)," the first stage examines whether these potentially cost-beneficial SAMAs might reduce severe accident risk substantially. If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50 percent or more, then the applicant may document the conclusion that there is no new and significant information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to have the potential to reduce the MB by 50 percent or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50 percent or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants that can demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described in the following subsections.

4.15.3.1.1 Definitions of New and Significant Information

The following definitions of "new" and "significant" involve significant reproduction of material from reference (NEI 2019b). Portions that do not apply to CPNPP have been revised or removed, but the relevant portions of the methodology are identical.

As discussed by the NRC in Section 5.3.9 of NUREG-1437, Supplement 49 (NRC 2014), "New information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring. The implication of this statement is that "significance" is not solely related to cost benefit, but also depends on a SAMA's potential to significantly reduce risk to the public.

4.15.3.2 Definition of "New" Information

"New" information pertains to data used in a SAMA analysis that has changed or become available since the time the preceding SAMDA analysis was performed.

NUREG-0775, "Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2" (NRC 1989), documents the NRC's evaluation of the alternative of facility operation with the installation of severe-accident-mitigation design features. The NRC did not discover any substantial changes in the proposed action as previously evaluated in the FES (NRC 1989) that are relevant to environmental concerns nor significant new circumstances or information relevant to environmental concerns and bearing on the licensing of CPNPP Units 1 and 2.

A set of SAMDAs was developed for CPNPP to address the accident sequences or sequence groups identified in the FES as well as risk contributors identified in more recent studies which appear to be applicable to CPNPP. This was done on a generic basis since a plant-specific PRA for CPNPP was not available at the time of the NRC review. In assessing the risk reduction potential, each SAMDA was conservatively assumed to avert all the residual risk estimated in NUREG-0775. This risk reduction was compared to the estimated costs associated with each SAMDA based on $1,000 per averted person-rem. None of the nine SAMDAs were cost effective. This was due in large part to the low population around the CPNPP site and low residual risk. In light of these considerations, the NRC had no basis for concluding that modifications to the plant were justified for the purpose of further mitigating environmental concerns.

In summary, the NRC did not find any new information that would call into question the FES conclusion that "the risks of acute fatality from potential accidents at the site are small in comparison with the risks of acute fatality from other human activities in a comparably sized population" and that "there are no special or unique features about the CPNPP site and environs that would warrant special or additional engineered safety features for CPNPP."

In the longer term, severe accident issues were being pursued by the NRC in a systematic way for all utilities through the SAP described in SECY-88-147 (NRC 1988b), "Integration Plan for Closure of Severe Accident Issues." The plan includes provisions for an IPE (TU 1992) for each operating reactor, a CPI Program, and an AM Program. These programs were intended to produce a more complete picture of the risk profiles of operating plants and the benefits of potential design improvements, including SAMDAs. The NRC believes that the SAP is the proper vehicle for addressing severe accident issues at nuclear power plants, including CPNPP.

There are some inputs to the SAMDA analysis that are expected to change, or to potentially change, for all plants. These inputs include:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
    - Population, as projected within a 50-mile radius of the plant
    - Value of farm and non-farm wealth
    - Core inventory (e.g., due to power uprate)
    - Evacuation timing and speed
    - Level 3 methodology updates
- NUREG/BR-0058 (NRC 2004) cost-benefit methodology updates.

In addition, other changes that could be "new information" are dependent on plant activities or site-specific changes. These types of changes include:

- The identification of a new hazard.
- An updated plant risk model (e.g., a fire PRA that replaces the IPEEE analysis).
    - The impacts of plant changes included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.
    - Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed, but because the best estimate assessment/understanding of the risk has changed, it is considered to be "new information."

4.15.3.3 Definition of "Significant" Information

Consistent with the NEI 17-04 methodology (NEI 2019b), the CPNPP PRA model is used to determine the level of significance of new information. The PRA models reflect the most up-to-date understanding of plant risk at the time of the analysis. As noted above, the criterion established for new information being "potentially significant" is if the new information would cause the MB calculated for any previously unimplemented, potentially cost beneficial SAMA for CPNPP to be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the CDF or any of the significant Level 2 release category group frequencies in the PRA model by more than a factor of two, then that SAMA could not reduce the MB by 50 percent or more. Therefore, that SAMA would not be considered evidence that new and potentially significant information exists and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section 2.0.

All SAMAs were screened using the Stage 1 qualitative or quantitative screening criteria from NEI 17-04 (See Section 2.0) (NEI 2019b). Therefore, Stage 2 of the NEI guidance (update/development of the Level 3 PRA for detailed benefit calculations) was not required, and all SAMAs were found to not meet the criteria for "new and significant information" in Stage 1.

4.15.4 Analysis of New and Significant SAMAs

4.15.4.1 Stage 1 Assessment: Overview

For the CPNPP LRA, new and significant changes since the issuance of the OL were considered. The list of candidate SAMAs for the CPNPP LRA was developed from plant-specific and industry sources. For the plant-specific portion, the CPNPP PRA are examined for insights. The purpose is to determine if there is any new and significant information regarding the SAMDA analyses that would affect the decision to renew the OL. Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the CPNPP PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the plant-specific initiating event and equipment data utilized, and improvements in state-of-the-art analysis of severe accidents. Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

For evaluation of the industry sources, the supplements of NUREG-1437, Revision 1 (NRC 2014) were examined for SAMAs found to be cost-effective at plants similar to CPNPP. Any such items found to be cost-effective at similar plants were considered for their significance at CPNPP. Industry SAMAs from Table 14 of NEI 05-01 was also reviewed to identify potential cost-effective SAMAs.

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to CPNPP, or already exist at CPNPP (including plant modifications since issuance of the OL). In addition, two other screening criteria were applied to eliminate SAMAs that have excessive cost. These SAMAs were screened if they were not found to reduce the CPNPP MB by >50 percent.

The remaining SAMAs were then grouped (if similar) based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the CPNPP CDF and significant source term category (STC) grouped frequencies (i.e., Small Early Release Frequency (SERF), Large Late Release Frequency (LLRF) and Large Early Release Frequency (LERF)) if implemented. If any of the SAMAs reduced the total CDF, SERF, LLRF or LERF by at least 50 percent, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As seen below in Section 2.2 and Section 3.0, all SAMAs were screened as not significant without the need to perform a Level 3 PRA.

4.15.4.2 Stage 1 Assessment – Identification and Qualitative Screening

A total of 283 industry SAMAs, 2 SAMAs from Table 14 of NEI 05-01 (NEI 2005), 9 SAMDAs from the initial OL (TU 1989), and 5 plant-specific SAMAs were considered in the LRA, yielding a total of 301 SAMAs considered. A total of 24 were retained after the qualitative screening evaluation. This list of 24 SAMAs was then further edited into nine cases for bounding SAMA evaluation. This grouping is presented in Table 4.15-2.

4.15.4.3 Stage 1 Assessment – Quantitative Screening

This section presents the quantitative screening of the CPNPP SAMAs. The NEI 17-04 (NEI 2019b) methodology considers a potential SAMA to not be significant unless it reduces the MB by at least 50 percent. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF and no STC frequency being reduced by at least 50 percent. Since the MB is the sum total of the contribution of each STC, if no STC decreases by at least 50 percent, then the total MB reduction cannot exceed 50 percent. However, the approach of evaluating every STC is not necessary to ensure the MB reduction is less than 50 percent. Many individual STCs have a frequency that is insignificant, and while an insignificant STC could in theory be reduced by >50 percent, its impact on MB would be negligible. Additionally, many STCs have conditional offsite consequences that are negligible compared to the dominant STC groups (i.e., SERF, LLRF and LERF).

For this analysis, the significant STC groups (i.e., SERF, LLRF and LERF) are summed to calculate percentage reduction. If the total CDF and total STC group is not reduced by 50 percent or more, then the MB is also not reduced by 50 percent or more and the SAMA is screened. SAMAs screened in this manner are not considered "significant" and are screened as part of the Stage 1 assessment.

The evaluations were selected conservatively to provide assurance that they are bounding. As seen in Table 4.15-2, none of the bounding quantitative screening evaluations resulted in a reduction of total CDF or total LERF greater than 50 percent. Therefore, a Stage 2 assessment is not required and was not performed.

4.15.5 Conclusions for New and Significant SAMAs

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration, eliminating many of the industry SAMAs from further consideration. For the remaining industry SAMAs and for the CPNPP-specific SAMAs to evaluate, a series of bounding quantitative analyses were performed. These analyses demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the CPNPP MB by 50% or greater.

Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMDA analysis for CPNPP.

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 1 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
71	Callaway	185	Add the ability to automatically align emergency core cooling system (ECCS) to recirculation mode upon refueling water storage tank depletion.	Evaluate the impact on the internal events and fire events models for the operator action to switch over to cold leg recirculation by adding automatic capability to align ECCS to recirculation mode upon refueling water storage tank depletion. This evaluation was further refined to remove overly conservative assumptions for fire impact on SERF scenarios. The refined modeling approach credits the same set of Engineered Safety Features Actuation System signals that automatically align the residual heat removal pump suction to the containment sump upon RWST depletion in addition to the current Operator action.	HRAREC
221	Sequoyah 1, 2	32			
227	Sequoyah 1, 2	106			
230	Sequoyah 1, 2	249			
248	Three Mile Island-1	15			
289	CPNPP	SAMDA # 4			

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 2 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
284	NEI 05-01, Table 14	39	Replace two of the four electric safety injection pumps with diesel-powered pumps.	Evaluated the impact of providing diversity within the high and low-pressure safety injection (SI) system by evaluating the reliability of the internal events and fire events models while reducing common cause failure of the system by replacing two of the four ECCS motor pumps (high-pressure Centrifugal Charging pump (HPSI) and intermediate-pressure Safety Injection (IPSI)) with diesel-powered pumps. A second evaluation was performed as part of the proposed modeling strategy in which now three of the six ECCS motor pumps (high-pressure Centrifugal Charging pump (HPSI) and intermediate-pressure Safety Injection (IPSI) and low-pressure Residual Heat Removal pump (LPSI)) were replaced with diesel-powered pumps.	ECCSCCF ECCSCCF-3

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 3 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
285	NEI 05-01, Table 14	44	Replace ECCS pump motors with air-cooled motors.	Evaluated the reliability of the internal events and fire events models by removing Component Cooling Water (CCW) dependency on ECCS equipment. It is important to mention that the 3 ECCS motor-driven pumps (Safety Injection pump, Residual Heat Removal pump and Centrifugal Charging pump) motors are cooled through natural convection to the environment and do not have a direct dependency on CCW. However, the room itself is cooled by using safety chilled water which has a direct dependency on CCW so therefore, to remove this dependency, the basic events that represent the likelihood of any ECCS pump are set to fail if room cooling is lost.	ECCSR

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 4 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
13	Braidwood 1, 2	1	Add a service water pump	Evaluated the reliability of the internal events and fire events models by removing the Service Water System dependency on the Emergency Diesel Generators (EDG) and ECCS equipment in order to increase the availability of cooling water. This was performed by removing the dependency for Train A components that rely on Service Water. This is a bounding strategy to evaluate the impact of adding a service water pump. A second evaluation was performed by changing the probability of failure to start and failure to run of the service water pump to reflect having a second swing SSW pump that would also need to fail. The impact of this new setting represents a better estimate of the impact of the swing pump. This SAMA was also identified as CPNPP SAMDA #1.	ECCSWS ECCSWS-P
15	Braidwood 1, 2	3			
18	Braidwood 1, 2	6			
26	Braidwood 1, 2	16			
39	Byron 1, 2	1			
41	Byron 1, 2	3			
51	Byron 1, 2	16			
97	Cook 1, 2	160			
286	CPNPP	SAMDA # 1			
227	Sequoyah 1, 2	106	Automate RWST refill.	Evaluated the impact of the internal events and fire events models for the addition of an automatic capability to switch over to refill the RWST. This was accomplished by assuming that the operator action to refill the RWST was completely reliable.	HRARWST
230	Sequoyah 1, 2	249			
244	Three Mile Island-1	10			

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 5 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
108	Crystal River	35	Update PORV controls to open automatically when operator action was previously required.	Evaluated the impact of the internal events and fire events models for the addition of an automatic capability to implement feed and bleed. This was accomplished by assuming that the operator action to implement feed and bleed was completely reliable.	HRAFB
299	CPNPP	N/A 0	Install incipient detection system(s) for risk-significant cabinets in the MCR and SWGR rooms.	Credited incipient detection in high-risk cabinets in the Main Control Room, Cable Spreading Room, and Switchgear Rooms.	FPRAINC
300	CPNPP	N/A	Install fire barriers above SWGR room electrical cabinets.	Credited fire barriers above high-risk cabinets in MCR, Cable Spreading Room, and switchgear rooms. Assume fire does not impact PRA targets above the cabinet but still fails adjacent PRA targets	FPRABAR
301	CPNPP	N/A	Hot short prevention design for Head Vent and Pressurizer Vent valves component circuits.	Credited hot short prevention design for high-risk components (e.g., Head Vent, Pressurizer Vent valve, and PORV).	FPRAHS

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 1 of 4)

Gate	Truncation	Base Model Result	Case HRAREC	MB %	Case ECCSCCF	MB %	Case ECCSCCW	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	1.01E-06	0.00	9.66E-07	4.36
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.77E-09	0.00	2.76E-09	0.36
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.75E-07	0.00	8.32E-07	4.91
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	1.02E-07	0.00	1.00E-07	1.96
Fire								
CDF	1.00E-11	4.20E-05	3.96E-05	5.71	4.08E-05	2.86	4.05E-05	3.57
SERF	1.00E-12	2.81E-06	2.41E-06	14.23	1.54E-06	45.20	1.53E-06	45.55
LATE	1.00E-12	1.48E-05	1.15E-05	22.30	1.22E-05	17.57	1.19E-05	19.59
LERF	1.00E-12	5.72E-06	5.25E-06	8.22	5.63E-06	1.57	5.61E-06	1.92
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	4.06E-05	5.58	4.18E-05	2.79	4.15E-05	3.59
SERF	-	2.81E-06	2.41E-06	14.22	1.54E-06	45.15	1.53E-06	45.51
LATE	-	1.57E-05	1.24E-05	21.05	1.31E-05	16.59	1.27E-05	18.78
LERF	-	5.82E-06	5.35E-06	8.07	5.73E-06	1.55	5.71E-06	1.92

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 2 of 4)

Gate	Truncation	Base Model Result	Case ECCSWS	MB %	Case HRARWST	MB %	Case HRAFB	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	9.75E-07	3.47	1.01E-06	0.00	9.48E-07	6.14
SERF	1.00E-14	2.77E-09	2.55E-09	7.94	2.77E-09	0.00	2.77E-09	0.00
LATE	1.00E-13	8.75E-07	8.38E-07	4.23	8.75E-07	0.00	8.53E-07	2.51
LERF	1.00E-14	1.02E-07	9.95E-08	2.45	1.02E-07	0.00	9.88E-08	3.14
Fire								
CDF	1.00E-11	4.20E-05	4.08E-05	2.86	3.84E-05	8.57	3.99E-05	5.00
SERF	1.00E-12	2.81E-06	1.53E-06	45.55	1.51E-06	46.26	1.61E-06	42.70
LATE	1.00E-12	1.48E-05	1.22E-05	17.57	1.19E-05	19.59	1.20E-05	18.92
LERF	1.00E-12	5.72E-06	5.72E-06	0.00	5.17E-06	9.62	5.67E-06	0.87
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	4.18E-05	2.87	3.94E-05	8.37	4.08E-05	5.03
SERF	-	2.81E-06	1.53E-06	45.51	1.51E-06	46.22	1.61E-06	42.66
LATE	-	1.57E-05	1.30E-05	16.82	1.28E-05	18.50	1.29E-05	18.00
LERF	-	5.82E-06	5.82E-06	0.04	5.27E-06	9.45	5.77E-06	0.91

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 3 of 4)

Gate	Truncation	Base Model Result	Case FPRAINC	MB %	Case FPRABAR	MB %	Case FPRAHS	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	1.01E-06	0.00	1.01E-06	0.00
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.77E-09	0.00	2.77E-09	0.00
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.75E-07	0.00	8.75E-07	0.00
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	1.02E-07	0.00	1.02E-07	0.00
Fire								
CDF	1.00E-11	4.20E-05	3.64E-05	13.33	3.22E-05	23.33	4.20E-05	0.00
SERF	1.00E-12	2.81E-06	2.81E-06	0.00	2.81E-06	0.00	2.81E-06	0.00
LATE	1.00E-12	1.48E-05	1.46E-05	1.35	1.46E-05	1.35	1.48E-05	0.00
LERF	1.00E-12	5.72E-06	4.84E-06	15.38	4.83E-06	15.56	5.72E-06	0.00
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	3.74E-05	13.02	3.32E-05	22.79	4.30E-05	0.00
SERF	-	2.81E-06	2.81E-06	0.00	2.81E-06	0.00	2.81E-06	0.00
LATE	-	1.57E-05	1.55E-05	1.28	1.55E-05	1.28	1.57E-05	0.00
LERF	-	5.82E-06	4.94E-06	15.12	4.93E-06	15.29	5.82E-06	0.00

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 4 of 4)

Gate	Truncation	Base Model Result	Case ECCSCCF-3	MB %	Case ECCSSWS-P	MB %
Internal Events						
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	9.75E-07	3.47
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.55E-09	7.94
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.38E-07	4.23
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	9.95E-08	2.45
Fire						
FIRE CDF	1.00E-11	4.20E-05	4.08E-05	2.86	4.08E-05	2.86
FIRE SERF	1.00E-12	2.81E-06	1.54E-06	45.20	1.53E-06	45.55
FIRE LATE	1.00E-12	1.48E-05	1.22E-05	17.57	1.22E-05	17.57
FIRE LERF	1.00E-12	5.72E-06	5.72E-06	0.00	5.72E-06	0.00
MB for Both Internal Events and Fire						
CDF	-	4.30E-05	4.18E-05	2.79	4.18E-05	2.87
SERF	-	2.81E-06	1.54E-06	45.15	1.53E-06	45.51
LATE	-	1.57E-05	1.31E-05	16.59	1.30E-05	16.82
LERF	-	5.82E-06	5.82E-06	0.00	5.82E-06	0.04

5.0 NEW AND SIGNIFICANT INFORMATION

The ER must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)] The NRC has stated however that an applicant is not required to perform site-specific validation of GEIS conclusions of Category 1 issues (NRC 1996c).

License renewal applicants are required to analyze only those issues the NRC has not resolved generically. While NRC regulations do not require an applicant's ER to contain analyses of the impacts of those Category 1 environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

5.1 New and Significant Information Discussion

The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

a) Information that identifies a significant environmental issue that was not considered or addressed in the GEIS and consequently not codified in Table B-1, Summary of Findings on National Environmental Policy Act (NEPA) Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act—Regulations Implementing Section 102(2), of 10 CFR Part 51; or

b) Information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1;

c) Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

Based on available guidance and the definitions of SMALL, MODERATE, and LARGE impacts provided by the NRC in 10 CFR 51, Appendix B, Table B-1, Footnote 3, and presented below, Vistra OpCo expects that any new information regarding Category 1 issues with MODERATE or LARGE impacts would be significant. Section 4.0.2 presents the NRC's definitions of SMALL, MODERATE, and LARGE.

5.2 New and Significant Information Review Process

The new and significant information assessment described below meets or addresses regulatory guidance provided above.

Vistra OpCo's new and significant information review process is carried out through its ongoing environmental planning, assessment, monitoring, and compliance activities and through site-specific reviews conducted for the LR ER. Vistra OpCo has knowledge of the license renewal process, the CPNPP site, licensing and permitting, environmental and regulatory issues, license renewals, the NEPA process, and other nuclear industry activities which could potentially provide new and significant information.

Vistra OpCo's new and significant information review included establishment of applicable and non-applicable Category 1 issues through:

- Review of the CPNPP Units 1 & 2 OL stage ER and the GEIS for its Category 1 discussions;
- Identification and review of past or potential modifications to CPNPP, including environmental impacts; and
- Identification and assessment of equipment and operations with the potential to result in changes in emissions, releases, discharge points, land use, noise levels, etc., considering environmental reviews since initial operations, and those anticipated during the proposed LR term.

Vistra OpCo applied an investigative process for purposely seeking new information related to the Category 1 environmental issues through:

- Environmental review team discussions with Vistra OpCo and CPNPP subject matter experts on the Category 1 issues as they relate to the plant;
- Review of permits and reference materials related to environmental issues at the plant, the environmental resource areas related to Category 1 issues, and information collected for regulatory compliance status;
- Review of recent publicly available information, or information held by Vistra OpCo, particularly data or reports from the past five years, related to the resource area and each applicable Category 1 impact issue, as summarized in the appropriate section of the LR ER in Chapter 3.0, Affected Environment;
- Review of environmental monitoring and reporting required by regulations related to the CPNPP site and operations;
- Review of Vistra OpCo environmental programs and procedures related to the CPNPP site and operations;
- Review of correspondence and permitting documentation related to oversight of CPNPP facilities and operations by state and federal regulatory agencies (activities that would bring significant issues to the plant's attention), to identify site-specific environmental concerns; and

- Review of previous initial and subsequent license renewal applications for issues relevant to CPNPP Units 1 and 2 LR application.

In addition, Vistra OpCo is made aware of and stays abreast of new and emerging environmental issues and concerns on an ongoing basis through:

- Review of nuclear industry publications, operational experience, and participation in nuclear industry organizations;
- Contact with state and federal resource agencies with regulatory jurisdiction over environmental regulation; and
- Information resulting from the information-seeking process was assessed to determine if it is new, and significant, applying the following considerations:
    - Was the information included in or available for the GEIS analysis of the Category 1 issue?
    - Does the information identify an environmental issue not generically considered in the GEIS, and consequently not codified in 10 CFR 51, Appendix B, Table B-1?
    - Does the information present a seriously different picture of the environmental consequences of the action than previously considered, leading to an impact finding different from that included in the GEIS or codified in regulation?
    - Does the information involve a new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity (MODERATE or LARGE) and/or scope (context) not previously recognized?

5.3 New and Significant Information Review Results

As a result of this review, Vistra OpCo is aware of no new and significant information regarding the environmental impacts of LR associated with CPNPP. The findings in NUREG-1437, Revision 1, for the applicable Category 1 issues are therefore incorporated by reference. New and significant information review methodology and results applicable to the issue of severe accidents, which is the functional equivalent of a Category 1 issue for CPNPP (NRC 2013f) is addressed separately in Section 4.15.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

Chapter 4 incorporates by reference NRC findings and analysis for the 52 Category 1 issues that apply to CPNPP, all of which have SMALL environmental impacts. In addition, Chapter 4 presents site-specific analysis of the 17 Category 2 issues, 11 of which are applicable to CPNPP. Table 6.1-1 identifies the environmental impacts that renewal of the CPNPP OL would have on resources associated with the Category 2 issues.

Vistra OpCo has reviewed the environmental impacts of renewing the CPNPP OLs and concluded that further mitigation measures beyond those presented in Section 6.2 and listed in Table 6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for Vistra OpCo's conclusion.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 1 of 4)

Resource Issue	ER Section	Environmental Impact
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.1	No impact. Issue is not applicable (NA) because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gpm) [10 CFR 51.53(c)(3)(ii)(C)]	4.5.3	No impact. Issue is NA because CPNPP does not withdraw more than 100 gpm.
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.2	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize a closed-cycle cooling system.
Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)]	4.5.4	No impact. Issue is NA because CPNPP uses a once through cooling system and does not utilize cooling ponds.
Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)]	4.5.5	SMALL impact. Water for station uses continues to be processed and monitored in compliance with licensing and permitting resulting in SMALL impacts and do not warrant additional mitigation measures.
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)]	4.6.5	SMALL impact. No refurbishment or other license-renewal-related construction activities have been identified; adequate management programs and regulatory controls in place to prevent impacts outside of previously disturbed areas.
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.4	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 2 of 4)

Resource Issue	ER Section	Environmental Impact
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.1	SMALL impact. Because the plant complies with the current TPDES permit, will comply with the future renewal of the permit, and will implement any best available technology requirement to minimize impacts of impingement and entrainment, the impacts would be SMALL during the proposed LR operating term.
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.2	SMALL impact. Because there are no planned operational changes during the proposed LR operating term that would increase the temperature of CPNPP's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted.
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.3	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat [10 CFR 51.53(c)(3)(ii)(E)]	4.6.6	NOT LIKELY ADVERSELY AFFECT. No LR-related refurbishment activities have been identified. The continued operation of the site would NOT LIKELY ADVERSELY AFFECT any federally protected or state-listed species. Therefore, Vistra OpCo concludes that the impacts from the proposed LR are not likely to affect threatened, endangered, and protected species in the vicinity of CPNPP and mitigation measures beyond Vistra OpCo's current management programs and existing regulatory controls are not warranted.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 3 of 4)

Resource Issue	ER Section	Environmental Impact
Historic and Cultural Resources		
Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)]	4.7	No adverse effects on historic properties. No refurbishment or other license-renewal related construction activities have been identified; administrative procedure ensures protection of these type resources in the event of excavation activities.
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)]	4.9.1	SMALL impact. Conditions necessary for optimal growth of pathogens and human interaction are limited by the depth of the discharge, water movement, the type of recreational activities allowed on the lake, and the discharge area's location away from public access.
Electric shock hazards [10 CFR 51.53(c)(3)(ii)(H)]	4.9.2	SMALL impact. The NRC determined electric shock potential is of small significance for transmission lines that are operated in adherence with the NESC. All in-scope transmission lines are located completely within the CPNPP site and are NESC compliant.
Postulated Accidents		
Severe accidents [10 CFR 51.53(c)(3)(ii)(L)]	4.15.1	SMALL Impact: Utilizing appropriate qualitative screening criteria many of the industry SAMAs were eliminated from consideration. The remaining SAMAs were evaluated, and none would reduce the CPNPP maximum benefit by fifty percent. Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMDA analysis for CPNPP.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 4 of 4)

Resource Issue	ER Section	Environmental Impact
Environmental Justice		
Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)]	4.10.1	No disproportionately high and adverse impacts or effects on minority and low-income populations identified.
Cumulative Impacts		
Cumulative Impacts [10 CFR 51.53(c)(3)(ii)(O)]	4.12	SMALL adverse to SMALL beneficial impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, surface water, ground water, ecological resources, and waste management. SMALL adverse to SMALL beneficial for socioeconomics and climate change. No effect on aquatic resources, historic and cultural resources, and human health.

6.2 Mitigation

6.2.1 Requirements [10 CFR 51.45(c) and 10 CFR 51.53(c)(3)(iii)]

The environmental report must include an analysis that considers and balances . . . alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

6.2.2 Response

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*, specifies that the applicant should identify any ongoing mitigation and should discuss the potential need for additional mitigation. However, applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC 2013a)

As discussed in Section 6.1, impacts associated with CPNPP license renewal do not require the implementation of additional mitigation measures. The permits and programs discussed in Chapter 9 (i.e., TPDES permit; stormwater program; air permit; SPCC program; hazardous waste management program; cultural resource protection plan; and environmental review programs) that currently mitigate the operational environmental impacts of CPNPP are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

6.3 Unavoidable Adverse Impacts

6.3.1 Requirement [10 CFR 51.45(b)(2)]

The environmental report shall . . . discuss . . . any adverse environmental effects which cannot be avoided should the proposal be implemented . . . . [10 CFR 51.45(b)(2)]

6.3.2 Response

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit, because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. As previously discussed in Chapter 4, no LR-related refurbishment or construction activities have been identified. Therefore, the environmental impacts to be evaluated for license renewal are those associated with continued operation during the renewal term.

Vistra OpCo adopts by reference the NRC findings for the 52 Category 1 issues (NRC 2013b) applicable to CPNPP, including discussions of any unavoidable adverse impacts. In addition, Vistra OpCo identified the following site-specific unavoidable adverse impacts associated with license renewal:

- The majority of land use at CPNPP would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of CPNPP). Uranium mining associated with the nuclear fuel cycle also has offsite land use implications.
- Aquatic organisms would continue to be impinged and entrained at the intake structure, but as discussed in Section 4.6.1, these impacts were determined to be SMALL.
- Normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to the SCR at or below TCEQ approved concentrations. Compliance with the TPDES permit would ensure that impacts remain SMALL.
- Operation of CPNPP results in the generation of SNF and waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of CPNPP results in a very small increase in radioactivity in the air. The incremental radiation dose to the local population resulting from CPNPP operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the members of the public from CPNPP's gaseous releases would be well within the allowable limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Operation of CPNPP also creates a very low probability of accidental radiation exposure to inhabitants of the area.

6.4 Irreversible or Irretrievable Resource Commitments

6.4.1 Requirement [10 CFR 51.45(b)(5)]

The environmental report shall . . . discuss . . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]

6.4.2 Response

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of CPNPP for the period of extended operation will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of SNF, low-level radioactive wastes generated as a result of plant operations, and sanitary wastes generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of CPNPP that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no LR-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

However, if CPNPP ceases operations on or before the expiration of the current OLs, the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to run the plant. Significant resource commitments would also be required if transmission lines are needed to connect the plant to the electrical grid.

6.5 Short-Term Use Versus Long-Term Productivity of the Environment

6.5.1 Requirement [10 CFR 51.45(b)(4)]

The environmental report shall . . . discuss . . . the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity . . . . [10 CFR 51.45(b)(4)]

6.5.2 Response

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since CPNPP began operations in 1990. The CPNPP FEIS for Units 3 and 4 evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of CPNPP (NRC 2011, Section 10.3). The period of extended operation will not alter the short-term uses of the environment from the uses previously evaluated in the CPNPP FEIS. The period of extended operation will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the CPNPP OLs would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by CPNPP into a park or an industrial facility after decommissioning are quite different. However, extending CPNPP operations would not alter, but only postpone, the potential long-term uses of the site that are currently possible.

In summary, no LR-related refurbishment activities have been identified that would alter the evaluation of the CPNPP FEIS for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

The environmental report shall . . . discuss . . . alternatives to the proposed action . . . . [10 CFR 51.45(b)(3)]

The applicant shall discuss in this report the environmental impacts of alternatives and any other matters . . . . The report is not required to include discussion of need for power or economic costs and benefits of . . . alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation . . . . [10 CFR 51.53(c)(2)]

A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license . . . . The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC 2013b GEIS, Section 2.3)

7.1 No Action Alternative

As described in Section 2.1, the proposed action is to renew the OLs for CPNPP Units 1 and 2 for an additional 20-year period. The only other alternative under consideration is the no-action alternative, which would be the decision not to renew the CPNPP OLs. If the CPNPP OLs are not renewed, the 2,460 MWe (net) of baseload power would not be available for distribution in Texas during the proposed LR operating term from 2030–2050 for CPNPP Unit 1 and from 2033–2053 for CPNPP Unit 2. The no-action alternative will identify replacement power sources for the loss of CPNPP generation.

In accordance with 10 CFR 51.53(b)(3), this ER will discuss a no-action alternative to the proposed license renewal and a range of alternatives for replacement baseload power sources. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs (NRC 2013b). The replacement power alternative generation must also equal the baseload capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor.

The replacement power sources being considered under the no-action alternative are presented in Section 7.2.1. Section 7.2.2 will identify the no-action alternative power sources evaluated that were not considered reasonable power sources for the replacement of the CPNPP generation.

7.1.1 Decommissioning Impacts

The NRC's definition of decommissioning as stated in 10 CFR 20.1003 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license; or
- Release of the property under restricted conditions and termination of the license.

The NRC-evaluated decommissioning options include the following:

- Immediate dismantling soon after the facility closes (DECON).
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR).
- Permanent entombment on the site in structurally sound material such as concrete that is maintained and monitored (ENTOMB).

All the decommissioning options must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, Vistra OpCo would continue operating CPNPP until the existing OLs expire. Upon expiration of the OLs, CPNPP would cease operations and initiate decommissioning procedures in accordance with NRC requirements. The NRC GEIS evaluated decommissioning environmental impacts for land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management and P2. Vistra OpCo considers the GEIS description of decommissioning impacts as representing the actions it would perform for the CPNPP decommissioning. Therefore, Vistra OpCo relies on the NRC's conclusions regarding the environmental impacts of decommissioning CPNPP. In NUREG-0586, NRC also reviewed the potential for significant adverse socioeconomic impacts on communities that host nuclear power plants from workforce reductions and tax revenue losses when plants cease operations. Should CPNPP's OLs not be renewed, significant adverse socioeconomic impacts to Somervell County would be likely given that CPNPP is a major employer and taxpayer in the County.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. CPNPP will have to be decommissioned eventually, regardless of the NRC decision on license renewal. License renewal will only postpone decommissioning for another 20 years. The GEIS states the timing of decommissioning does not change the environmental impacts associated with this activity. The NRC findings as described in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 state that delaying decommissioning until after the license renewal term would result in SMALL environmental impacts. Vistra OpCo relies on the NRC's findings.

The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of CPNPP generation. Vistra OpCo concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the GEIS. Decommissioning impacts would be SMALL and could overlap with operation of a CPNPP replacement.

7.2 Energy Alternatives that Meet System Generating Needs

In accordance with 10 CFR 51.53(c)(2), Vistra OpCo considered a range of alternatives to replace generation if the CPNPP OLs are not renewed. Vistra OpCo considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC 2013b, Section 2.3). These alternatives were evaluated based on their ability to provide reliable baseload power and capacity and to be operational prior to the expiration of the current OLs.

7.2.1 Energy Alternatives Considered as Reasonable

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs. The replacement power alternative generation must also provide baseload capacity previously supplied by the nuclear plant. The alternatives analysis identified the following power sources as meeting the NRC criteria for reasonableness in the replacement of CPNPP generation during the proposed LR operating term. These energy alternatives considered reasonable are further discussed in Section 7.2.3.

- Advanced light-water reactors (ALWRs) utilizing approved design with mechanical draft cooling towers (MDCTs) located at the CPNPP site.
- Small modular nuclear reactors with MDCTs located at the CPNPP site.
- Natural gas combined cycle units with MDCTs located at the CPNPP site.
- Combination of natural gas combined cycle units with MDCTs at the CPNPP site and offsite solar and wind installations.

7.2.2 Energy Alternatives Not Considered Reasonable

The full range of energy alternatives as described in the GEIS include power sources that will require development of new generation and power alternatives that will not require new generation, such as purchased power (NRC 2013b, Section 2.3). Vistra OpCo considered all the alternatives described in the GEIS for replacement of the CPNPP generation. This section will address the energy alternatives not considered reasonable for additional evaluation.

7.2.2.1 Purchased Power

CPNPP is a merchant plant and provides power for distribution to Texas customers. The Electric Reliability Council of Texas (ERCOT) manages the electric grid. The loss of CPNPP's generating capacity could introduce uncertainties in electricity reliability within the ERCOT territory. To replace CPNPP's generation on a long-term basis through purchased power would likely require the development of new generation facilities.

Potential environmental impacts associated with purchased power could be substantial and exceed the impacts associated with the continued operation of CPNPP. Potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the regional grid. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Renewable energy generation can have a large development footprint that can convert natural habitats to an industrial site. The conversion of forest and even agricultural lands to an industrial site can result in impacts to habitat that may adversely impact wildlife and plant species. Additional transmission capacity may be required to distribute electricity from renewable or fossil generation and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and view shed impairment, and degradation of wetlands and stream crossings.

Given the uncertainties of purchasing baseload power at the scale of CPNPP's generation capacity on a long-term basis and the environmental impacts for developing new generation purchased power was not considered a reasonable replacement alternative.

7.2.2.2 Plant Reactivation or Extended Service Life

In recent years, Vistra OpCo has closed coal-fired plants in Texas (i.e., Sandow, Big Brown, and Monticello) (Luminant 2017b; Luminant 2017c). Both Big Brown and Monticello were subsequently sold (FC Times 2020). The Sandow (1,137 MWe; Luminant 2011) and Trinidad (244 MWe; Luminant 2021c) plants could potentially be reactivated, and the service life of other plants could be extended, such as the 2,250 MWe coal-fired Martin Lake power plant originally commissioned in 1977 (Luminant 2015). Vistra OpCo also owns several natural gas-fired plants in Texas (Luminant 2021c), some of which could potentially continue to be operated past their expected service life. Reactivating or continuing to operate fossil fuel-fired plants would result in much higher air pollutant emissions than those from nuclear power plants. In addition, continuing to operate fossil fuel-fired generation sources is counter to Vistra OpCo GHG emission targets. Vistra OpCo established a goal to achieve a 60 percent reduction in CO_2 equivalent emissions by 2030, as compared to the 2010 baseline, and has a long-term objective to achieve net zero carbon emissions by 2050 (Vistra 2020). Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental impacts with continued use of fossil fuel-fired generation sources.

7.2.2.3 Conservation and Energy Efficiency Measures (Demand-Side Management)

Demand side management (DSM) includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand within the ERCOT territory by 2,460 MWe to be considered a reasonable alternative. Reliance on DSM as a reasonable alternative to CPNPP is uncertain because it relies on voluntary participation rather than mandatory energy efficiency from compliance with codes and standards (e.g., building codes and appliance energy use ratings) and realized savings of energy needed to replace CPNPP's large capacity. Vistra OpCo is a merchant generator and does not have a service territory with a customer base for which it is responsible for meeting their power needs; therefore, there are no state policy or law requirements to implement DSM programs. As such, DSM is not a reasonable replacement alternative for CPNPP.

7.2.2.4 Wind

The combination alternative includes a wind component of two or three utility scale (200–500 MWe) wind farms. However, replacing CPNPP's generating capacity with a discrete wind alternative would require 10 or more utility scale wind farms, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Wind is intermittent, typically cycles significantly over a 24-hour period, is not dispatchable and low-capacity factors can be experienced for several days at a time due to variable wind patterns. Therefore, wind generation by itself is not capable of providing baseload power. For a wind farm to replace a baseload energy source, capacity significantly in excess of CPNPP generation coupled with large amounts of energy storage would have to be included for the facility. Due to the amount of wind generating capacity needed to replace the entire CPNPP baseload generation and the lower efficiencies in producing electricity from wind power (a maximum of 50 percent; ERCOT 2018) versus nuclear power (approximately 92 percent; EIA 2021c), the land acreage required for a discrete wind alternative is larger than other alternatives being considered in this ER. The land needs for wind generation include land parcel(s) that can host a wind farm where turbines are spaced for operation and linked with other turbines and with power converters and connections with transmission infrastructure. Within the wind farm acreage, land would be permanently disturbed for wind turbine bases and power infrastructure as well as temporary construction areas such as laydown and worker support areas. The DOE (2015) developed three land use metrics for these acreage considerations-- 85 acres per MW for wind farm boundaries, 2.47 acres per MW for construction footprint, and 0.74 acres per MW for permanent structures. To replace 2,460 MWe from CPNPP with wind power would require about 5,000 MWe to account for the much lower generating capacity of wind versus nuclear. Based on the DOE metrics, the acreage requirements are about 430,000 acres for wind farms, 12,000 acres for construction footprint, and 3,700 acres for permanent structures. Furthermore, additional MWs would have to be installed to charge batteries to provide firm power, compensating for wind's intermittent nature, further increasing acreage requirements. The wind farm acreage would require many installations to bring together enough available land parcels, each with the potential to significantly impact land use even with the spaced wind turbines allowing for compatible uses such as crop cultivation and livestock grazing. Other impacts from wind generation include impacts to terrestrial ecology from land disturbance and avian mortality from operations. Therefore, discrete wind would not be a superior alternative to continued operation of CPNPP.

Installation and siting of offshore wind farms require careful consideration to bathymetry and offshore construction concerns. Siting is further complicated by shipping lanes, fishing rights, wildlife migration patterns, military operations, and other environmental concerns. Wind installations also pose aesthetic impact concerns, and the larger turbines require greater offshore distances to minimize aesthetic impacts. Environmental impacts associated with the construction and operation of a large utility-scale offshore wind facility could range from MODERATE to LARGE and would require multiple installations.

7.2.2.5 Solar

The combination alternative includes a solar component of three 200-MWe solar installations with battery storage. However, replacing CPNPP's generating capacity with a discrete solar alternative would require more solar installations with energy storage, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Larger capacity solar installations would reduce the number of installations, but not the overall acreage needed. Samson Solar Energy Center, a 1,310-MW solar farm, is planned for 18,000 acres spanning three counties in northeastern Texas (Invenergy 2020; Energy Capital Media 2021). To replace CPNPP's generation, two solar farms similar in size to the Samson Solar Energy Center providing storage would be required.

Solar generation is intermittent by nature, typically cycles significantly over a 24-hour period, is not dispatchable and low-capacity factors can be experienced for several days at a time due to cloud cover. This type of generation volatility on a large scale can create distribution and/or transmission instability. For solar power to be viable as a discrete source of large amounts of energy that is reliably available for the regional grid at all hours of the day, capacity significantly in excess of the CPNPP generation coupled with large amounts of battery storage or additional generation capacity would be needed to produce energy for storage.

Due to the amount of solar generating capacity needed to replace the entire CPNPP baseload generation and the lower efficiencies in producing electricity from solar power versus nuclear power, the land acreage required for a discrete solar alternative is larger than other alternatives being considered in this ER. Using a capacity factor of 25 percent, replacing the 2,460 MW CPNPP would require about 9,800 MW. Using the Samson Solar Energy Center mentioned above as a guide, such a facility(ies) would require 135,000 acres. Furthermore, additional MWs would have to be installed to charge batteries to provide firm power, compensating for solar's intermittent nature, further increasing acreage requirements. To acquire this much acreage through purchase or lease would require many installations, each with the potential to significantly impact land use Depending on the location of the solar facilities, the land use disturbances could result in moderate to large impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete solar would not be a superior alternative to continued operation of CPNPP.

7.2.2.6 Hydropower

The DOE's Oak Ridge National Laboratory assessed the ability of existing non-powered dams across the country to generate electricity. The non-powered dams in Texas do not provide the scale of power generation capacity needed to replace CPNPP's generation capacity (ORNL 2012). The study assessed the dam with the greatest generation potential in Texas to be approximately 152 MWe with the second greatest potential dropping sharply to 42.2 MWe.

Construction of a new large-scale hydropower facility would require significant siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts would be large for land use, water resources, socioeconomics, ecology, and cultural resources.

The lack of potential for large hydroelectric power facilities at existing dams in Texas and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the CPNPP generation.

7.2.2.7 Geothermal

The National Renewable Energy Laboratory graded the geothermal resources of the United States. Most of Texas is graded as having the least or next to the least potential for geothermal energy and none of Texas was graded as having the most potential (NREL 2018). Therefore, geothermal energy is not considered a reasonable power source for the replacement of the CPNPP generation.

7.2.2.8 Biomass

Biomass includes wood waste, municipal waste, manure, certain crops, and other types of waste residues used to create electricity. Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources.

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the CPNPP baseload generation, it would take the construction of many biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants. Large biomass plants are generally 50 MWe, with the largest ones being slightly more than 100 MWe (NRC 2019). Replacing the generating capacity of CPNPP using only biomass would require the construction of 25 large facilities.

Biomass plants require storage facilities for the fuel products and for waste ash/residue for the wood, crop, and agriculture waste types. Wood waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood waste plant could be significant, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. Air emissions are also an issue with biomass plants, and construction of a plant would require installation of maximum achievable control technology to comply with the CAA. The combustion of the fuel also results in air emissions that must be controlled to meet air quality regulations.

Overall, the construction and operation of biomass plants of the size necessary to act as an alternative to CPNPP would result in MODERATE environmental impacts to land use, water quality, ecological resources, and air quality.

Baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts to land from constructing and operating the facility. In addition, without the construction of multiple smaller facilities, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate. Therefore, biomass is not considered a reasonable alternative to CPNPP's baseload generation.

7.2.2.9 Fuel Cells

Current fuel cell installations for large-scale stationary power are significantly smaller scale than what is needed as a reasonable replacement of CPNPP's generating capacity with much of the systems installed for individual customers. Larger applications generally provide from hundreds of kilowatts to tens of MW of power (DOE 2017; Duke Energy 2019). Fuel cells as a utility-scale generation alternative are not presently competitive with other alternatives. Therefore, fuel cells are not considered a reasonable alternative to CPNPP's baseload generation.

7.2.2.10 Ocean Wave and Current Energy

The technology to harness hydrokinetic energy is in development with many demonstration projects deployed around the world (DOE 2019). The Federal Energy Regulatory Commission (FERC) has licensing authority over hydrokinetic energy projects deployed in the United States. Currently, there are three licensed pilot projects and four projects seeking permits or holding a preliminary permit. The largest project is a 20-MWe marine project. The largest inland project is a 6-MWe project proposed for the Mississippi River. (83 FR 11192; FERC 2020).

Given hydrokinetic technology is in the early stages of commercial application and projects have low generation capacities, ocean wave and current energy is not considered a reasonable alternative in the time frame necessary to be an alternative to CPNPP's baseload generation.

7.2.2.11 Oil-fired

Oil-fired generation emits large amounts of CO_2 and HAPs, making it undesirable for utilities looking to reduce air pollutants and comply with regulations. Also, as presented in Section 7.2.2.2, Vistra OpCo's long-term sustainability strategy involves closing fossil fuel-fired units to assist in achieving the goal of a 60 percent reduction in CO_2 equivalent emissions by 2030 (Vistra 2020). Based on the greater environmental impacts and cleaner energy source policies and regulations, oil-fired generation is not a reasonable alternative.

7.2.2.12 Coal-fired

Coal-fired plants are being retired throughout the United States. As discussed in Section 7.2.2.2, Vistra OpCo is similarly closing coal-fired plants to reduce GHG emissions. The NRC recently considered a supercritical pulverized coal facility as an alternative to renewing the River Bend Station Unit 1 OL but found license renewal to be the preferred alternative. The supercritical pulverized coal facility alternative had operating impacts greater than license renewal, in addition to the environmental impacts inherent with new construction projects. (NRC 2018) Based on the greater potential environmental impacts, coal-fired generation is not a reasonable alternative.

7.2.3 Environmental Impacts of Alternatives

7.2.3.1 Advanced Light-Water Reactors Nuclear Alternative

The ALWR nuclear alternative consists of construction and operation of ALWRs on the CPNPP site and assumes no additional transmission corridors would need to be developed to support the plant. The NRC issued a FEIS in 2011 for the construction and operation of two ALWRs on the CPNPP site CPNPP Units 3 and 4). The design of the proposed ALWRs was the US-APWR, each with a rated and design net output of approximately 1,600 MWe (NRC 2011, Section 3.2.1.1). The review of the US-APWR has since been suspended indefinitely (NRC 2020e). NRC's FEIS conclusions for construction impacts of the reactors form the basis for the ALWR alternative's impacts; however, this ALWR alternative is not specific to any specific reactor design.

7.2.3.1.1 Land Use

Based on the assessment of CPNPP Units 3 and 4 (NRC 2011), the construction would occur on approximately 275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the south border for the blowdown treatment facility (BDTF), which includes the treatment and evaporation ponds. Of these 675 acres, permanent structures would occupy approximately 550 acres, requiring conversion of seven acres of prime farmland on the CPNPP site to industrial use and 154 acres of prime farmland adjacent to the south border to industrial use. This acreage is not under cultivation and is owned by Vistra OpCo. The prime farmland conversion was determined to represent only 0.1 percent of the prime farmland in the 6-mile vicinity in the 2011 assessment. The NRC also considered offsite land use impacts from the influx of construction workers, concluding limited offsite land-use changes in the vicinity primarily for short-term housing would be expected. (NRC 2011)

Use of the CPNPP site for development of replacement generating units would not change the use of the CPNPP from its current use of power generation. Use of the 400 acres owned by Vistra OpCo outside of the existing CPNPP site would be a change in land use and would involve a conversion of 154 acres of prime farmland to industrial use. However, as stated above, the conversion would only impact a fraction of the prime farmland in the vicinity. (NRC 2011)

Using the CPNPP Units 3 and 4 construction footprint for the ALWR alternative has the ALWR plant located in unincorporated Somervell County and within the extraterritorial jurisdiction area of the city of Glen Rose (CGR 2021a). There are no zoning or land development regulations in place for unincorporated areas of Somervell County and because the footprint falls outside of the corporate city limits of Glen Rose, the city's zoning regulations do not apply to the ALWR footprint (Section 3.2.1). Therefore, development of an ALWR would not be subject to zoning or land development regulations and there would be no impact on land use from a zoning standpoint.

Therefore, with changes in land use affecting only 400 acres and a small percentage of prime farmland, and with limited land use conversion in the vicinity for housing, the land use from development of an ALWR plant would be SMALL. For comparison, the NRC determined the land use construction impact for CPNPP Units 3 and 4 to be SMALL (NRC 2011, Section 4.1.1)

In addition, the discharge pipeline from the BDTF to Lake Granbury would extend beyond the 400-acre area where the BDTF would be located. The pipeline would largely be installed within the existing pipeline ROW for supplying Units 1 and 2 with water from Lake Granbury, which would be used for the ALWR's supply. Installation of the discharge piping in the existing ROW would temporarily impact another 64 acres for construction. The discharge pipeline would diverge from the existing ROW for 1.4 miles to connect to a proposed discharge structure in Lake Granbury. For a temporary construction 100-foot ROW, the acreage impacted would be 17 acres, which would decrease to 8.5 acres for a permanent ROW 50 feet in width. This small acreage for construction and permanent ROWs would not increase the land use impact destinations presented above. (NRC 2011, Section 4.1.2)

During operations, the above-mentioned acreage would continue to be used as an industrial site. Operation of the blowdown facility sited on the 400 acres along the southern property boundary would result in salt deposition on surrounding land. With effective mitigation measures, the affected area could be confined to the CPNPP site plus the 400-acre area. However, the effectiveness of the mitigation measures (directional sprayers and fencing) is uncertain and the potential for impacting up to an estimated 44 offsite properties within an adjacent rural residential area remains (NRC 2011, Section 5.1.1). Waste from operations would also consume capacity within offsite landfills; however, landfill capacity is expected to be expanded to meet future demand and with compliance with state siting regulations have only a small impact on land use. Given that the impact to offsite land due to salt deposition could be noticeable, the impact of operations on land use would be SMALL to MODERATE. The NRC's 2011 assessment concluded the same anticipated impact level regarding operations (NRC 2011, Section 5.1.1).

7.2.3.1.2 Visual Resources

The ALWR structures and other structures close to the nuclear power block would be constructed west of and in close proximity to the existing CPNPP structures and largely be constructed on developed land. This portion of the ALWR plant would blend with the industrial character of the existing plant. The MDCTs would be constructed on the adjacent peninsula north of the existing plant in an area of Ashe juniper woodland-savanna and mixed hardwood forest (NRC 2011, Section 4.3.1.1), expanding the industrial appearance of the plant. The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The BDTF area, approximately 400 acres along the southern site boundary, is primarily covered by Ashe juniper woodland-savanna (NRC 2011, Section 4.3.1.1). As shown in Figure 3.2-1, these areas continue as described in 2011. The visual resources impact for the reactor and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area and fall within the residences view of SCR. However, the hilly topography of the area would reduce the visibility of the plant features for the nearby residents. Overall, visual impact of this alternative would be SMALL. NRC's 2011 assessment also concluded that visual impacts of construction and operations would be small (NRC 2011, Sections 4.4.1.4 and 5.4.1.4).

7.2.3.1.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, wind erosion, and other general construction activities and managed in accordance with regulatory requirements and application of BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) to minimize potential impacts. Vistra OpCo would be required to modify the existing CPNPP air permit to address construction as well as obtain a permit for a concrete batch plant to support construction. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and earthmoving, would create pollutants. All equipment is anticipated to be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be intermittent for the duration of construction activities with localized effects. As discussed in Section 3.3, Somervell County is in attainment for all criteria pollutants. With implementation of mitigation measures and properly serviced equipment, the anticipated impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions. Air quality impacts would also result from vehicular emissions associated with plant operations. Potential emissions of criteria pollutants and CO_2 emissions would be minimal and similar to CPNPP (see Section 3.3). The NRC estimated CO_2 equivalent emissions at about 16,000 metric tons annually for CPNPP Units 3 and 4, with about 60 percent coming from periodic testing of diesel generators and with workforce transportation accounting for most of the rest (NRC 2011, Section 5.7.1). Under this ALWR alternative scenario, these emissions would be offset by CPNPP Units 1 and 2 ceasing operations. Implementation of the ALWR nuclear alternative would result in a beneficial air quality impact when compared with fossil-fuel fired alternatives (see Table 7.2-1).

The MDCTs would have air emissions and atmospheric effects from drift and plumes. Cooling tower drift consists of the liquid droplets entrained in the exhaust air stream. A plume forms when the saturated water vapor that leaves the top of the tower encounters cooler air and very small water droplets condense out of the air. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by Vistra OpCo and would be in accordance with any applicable limits and restrictions for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., PM_{10} and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. However, impacts on vegetation due to the deposition would be expected to be localized and primarily onsite. Atmospheric effects of plumes could include fogging and shadowing. Cooling tower impact modeling was conducted for Units 3 and 4. The NRC's review of the modeling results concluded that the atmospheric impacts of the cooling tower operation would be minimal (NRC 2011, Section 5.7.2).

Overall, air quality impacts of operations and the effects of drift to offsite areas would be expected to be SMALL. NRC's 2011 assessment characterized air quality impacts for construction of Unit 3 and 4 as resulting in temporary impacts to local air quality, similar to any large-scale building project and the air quality impacts of operation as not noticeable (i.e., small) (NRC 2011, Sections 4.4.1.6 and 5.7.1).

7.2.3.1.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD. Construction activities resulting in offsite sound levels above this range would be temporary. Locations near the CPNPP site with potential sensitivity to noise, include residences, churches, and a children's home. The nearest residence is 0.8 miles southwest of the site (CPNPP 2021). Noise at the nearest residence was estimated to be comparable to background levels (50 to 55 dBA) (NRC 2011, Section 4.4.1.5). The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise sources associated with the operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. Many of these noise sources are confined indoors or would be infrequent. The operating ALWR plant would have noise sources and levels not unlike those of the existing operating units with the exception of the

MDCTs. The sound would be attenuated by the surrounding buildings and structures and distance to the site border.

Noise from a cooling tower generally consists of sounds created by the motors, the speed reduction or power transmission units, the fans, and the cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5).

Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, noise impacts from construction and operations would be SMALL. The NRC's 2011 assessment also concluded that noise impacts of construction and operations would be small (NRC 2011, Sections 4.4.1.5 and 5.4.1.5).

7.2.3.1.5 Geology and Soils

The NRC assessed site preparation and construction of Units 3 and 4 for hydrological alterations. Site preparation and construction would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material, including the removal of an existing structure, an existing Class II landfill, a foundation, and paved areas and the relocation of an onsite rail line. Potential erosion and sedimentation from these activities would be controlled using appropriate BMPs included in a SWPPP such as vegetative buffer zones, silt fencing, straw bales, slope breakers, and other soil-erosion-prevention measures, as well as diversionary channels to sedimentation basins. The excavations would be expected to require minimal dewatering based on the construction of the existing units. Water from the excavations would be directed to a sedimentation basin. Final site grading would be designed to ensure that runoff would drain away from safety-related structures via drainage channels or sheet flow and subsequently to SCR through catch basins or as unobstructed overland flow. (NRC 2011, Section 4.2.1)

Through compliance with permit conditions, adherence to stormwater regulations, and applying erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.1.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of an ALWR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water needs and are anticipated to be met by surface water sources. The excavations would be expected to require minimal dewatering based on the construction of the existing units and no other groundwater withdrawals are expected for construction. Impacts due to groundwater usage would be SMALL.

The NRC assessed the surface water usage for constructing Units 3 and 4 (NRC 2011, Section 4.2.2.1). Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be met by municipal supply and estimated to be less than the volume allocated by the SCWD for the plants. Impacts of the withdrawal on stream flow in the Paluxy River (which supplies Wheeler Branch Reservoir and from which the SCWD makes withdrawals) would be minimal. The NRC's 2011 estimate was the withdrawal volume would be equivalent to 0.3 percent of the mean annual flow and 5 percent of lowest recorded annual flow in the Paluxy River at Glen Rose. Water for dust suppression and general cleanup would be withdrawn from the SCR and would have a negligible impact on the SCR supply. The NRC concluded that the surface water use impacts of construction and pre-construction activities for Units 3 and 4 would be small. Likewise, construction of an ALWR alternative would be expected to be SMALL.

Operations water demand for potable water, service water, and fire protection would also be met by available municipal supply. Cooling water needs would be meet by withdrawals from Lake Granbury piped into the SCR. However, because the ALWR plant would use closed-cycle cooling, water consumption would be greater than the existing units. Withdrawals for Units 3 and 4 were estimated at approximately 63,000 gpm (140 cfs) and consumption was estimated at approximately 38,200 gpm (85 cfs) (NRC 2011). The NRC concluded that water use for operation of CPNPP Units 3 and 4 would have a moderate impact on surface water resources. This impact level was based on modelling that indicated 1) decreases in the time that both Lake Granbury and Possum Kingdom Lake is at full pool; and 2) changes to the flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The NRC's impact conclusion for CPNPP Units 3 and 4 would be bounding for operation for the ALWR plant (i.e., no greater than MODERATE). No groundwater use is expected.

Construction of the ALWR plant could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. CPNPP operates under a general permit for industrial stormwater, TPDES general permit No. TXR050000. CPNPP maintains and implements an SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs used to prevent or reduce the pollutants in stormwater discharges. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on groundwater and surface water quality would be SMALL.

Vistra OpCo assumes the same treatment and discharge to Lake Granbury as assessed for Units 3 and 4 would serve the ALWR units. The BDTF would allow the blowdown to Lake Granbury to comply with Texas surface water quality standards for Lake Granbury. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in the reservoir, resulting in a small net increase in the total dissolved solids concentration in Lake Granbury and downstream. Under low-flow conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses. (NRC 2011, Section 5.2.3.1).

The ALWR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality. The NRC considered the potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low flow conditions as a moderate impact, with the overall impact to surface water being small to moderate (NRC 2011, Section 5.2.3.1). This previous assessment would be bounding for the ALWR plant.

7.2.3.1.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

Based on the CPNPP Unit's 3 and 4 assessment (NRC 2011), the construction would occur on approximately 275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the southern boundary for the BDTF. The development areas contain no old growth timber, unique or sensitive plants, or unique or sensitive plant communities. After the proposed facilities are built, approximately 125 of the disturbed acres would be revegetated. Much of the 123 acres for the reactors was previously disturbed for construction of the existing units and is of relatively low-quality wildlife habitat. The MDCTs would be located on a largely undeveloped peninsula that extends into SCR immediately northwest of the existing units. About 152 acres on the peninsula would be disturbed. The peninsula is covered primarily by Ashe juniper woodland-savanna and to a lesser extent by mixed hardwood forest. Construction of the BDTF would clear 313 acres of Ashe juniper woodland-savanna, 34 acres of grassland, 45 acres of mixed hardwood, and 8 acres of developed and previously disturbed land. The vegetation communities are common throughout Somervell and Hood counties, the affected terrestrial habitats would be a small percentage of the total acreage of these cover types in the vicinity (less than 2 percent of any cover type in the vicinity). The NRC's 2011 CPNPP Unit's 3 and 4 assessment determined that the net permanent loss of 445 acres of natural terrestrial habitat (without a history of past disturbance from building Units 1 and 2) would affect only about 10 percent of the natural habitat available on the CPNPP site plus the BDTF site. (NRC 2011, Section 4.3.1.1, 4.3.1.3)

As mentioned in Section 7.2.3.1.1, the discharge piping from the BDTF to Lake Granbury would extend offsite and disturb approximately 81 acres (64 acres construction ROW along the existing pipeline corridor, plus 17 acres for divergent portions of the discharge pipeline). Most of the disturbance is along the existing ROW, and as described in the 2011 Units 3 and 4 EIS, would transect low-density residential areas. The small acreage that would diverge from the existing pipeline would include construction along the Lake Granbury shoreline. (NRC 2011, Section 4.1.2)

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys with a focus on threatened and endangered species. The endangered golden-cheeked warbler has been documented in the nearby Dinosaur Valley State Park. The species is dependent on mature

Ashe juniper habitat and various species of oak. The 2007 and 2009 surveys for the species did not find favorable habitat; however, the further maturing of the onsite Ashe juniper could present favorable habitat at the time of development for an ALWR alternative. Input from TPWD's predictive habitat model indicates the potential for suitable golden-cheeked warbler habitat at the CPNPP site (see the golden-cheeked warbler predictive habitat model results included as an attachment to the TPWD response letter included in Attachment C). Other than the potential for suitable habitat to support the endangered golden-cheeked warbler, construction of the ALWR alternative would have small impact on terrestrial resources; however, given the potential for permanent removal of suitable golden-cheeked warbler habitat, the impact would be SMALL to MODERATE. The NRC concluded that construction activities would not noticeably reduce the local diversity of plants or plant communities or associated wildlife (i.e., small impacts). (NRC 2011, Section 4.3.1.1, 4.3.1.3)

No additional habitat removal would be expected to occur during operations. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures are included in site procedures and programs to minimize impacts to the species. As mentioned in Section 7.2.3.1.1, operation of the BDTF would result in salt deposition on surrounding land. The deposition area would be on previously developed land. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts attributable to operations would be SMALL.

Aquatic

A new intake structure for the ALWR plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the ALWR plant. Discharge would be routed to Lake Granbury. Based on the CPNPP Unit's 3 and 4 assessment (NRC 2011, Section 4.3.2.1), construction of a ALWR alternative would not result in the loss of aquatic habitat in SCR, although impacts on the aquatic resources of SCR could potentially result from soil erosion and other runoff from building activities. Construction of the intake and discharge would be conducted under the appropriate stormwater permit, employing BMPs to minimize sedimentation to surface water. The construction footprint also encompasses several small aquatic resources and would result in their filling. However, based on the small sizes of the potentially affected intermittent streams, wetlands, and stock pond and the minimal aquatic communities they support, the NRC concluded that the impacts of construction and pre-construction activities on these aquatic resources would be minimal for Units 3 and 4. Impacts from construction of a ALWR plant would be similar and SMALL.

As a replacement alternative, the ALWR plant would not require new intake at Lake Granbury; however, the blowdown to Lake Granbury would require a new discharge structure on Lake Granbury. Construction conducted under the appropriate permits employing BMPs to minimize sedimentation to surface water and minimizing the construction footprint would result in minimal impacts to aquatic resources.

Water withdrawal volume would be similar to that of Units 3 and 4 and therefore, the impacts of water withdrawals, namely impingement and entrainment, for an ALWR alternative would be bounded by that of the assessment for the proposed CPNPP Units 3 and 4. The NRC concluded that the impacts of impingement and entrainment would be minimal (NRC 2011, Section 5.3.2.1). The use of MDCTs and the BDTF evaporation ponds would increase water consumption of an ALWR alternative over that of the existing units, but would be bounded by the water consumption assessed for Units 3 and 4. The impact of water consumption from Units 3 and 4 operation was modelled cumulatively with the continued operation of Units 1 and 2. With Units 3 and 4 operating, Lake Granbury's average water level would be reduced by 0.6 feet and would be expected to be 2 feet or more below full pool an additional 15 percent of the time (NRC 2011, Section 5.3.2.1). Based on this modelling, the NRC concluded that adverse effects on aquatic biota and habitat may range from negligible to noticeable due to the potential for the lower water level during spawning season to allow desiccation of shallow habitats where fish nest or otherwise deposit their eggs. The potential for noticeable adverse effects would be less for a replacement alternative that would not have water consumption by the existing once-through units. Given that consumption by once-through plants is minimal and the potential for low water levels disrupting spawning, impacts to aquatic resources would be SMALL to MODERATE.

Special Status Species

As mentioned above, the loss of habitat could affect protected terrestrial species, including the golden-cheeked warbler. Section 3.7.8 discusses the protected species identified for Hood and Somervell counties. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR (see Section 3.7.8.2.3). Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity (see Section 3.7.8.3). The state-listed THL has the potential to occur onsite; however, none were observed during 2007 surveys (NRC 2011). The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to determine the presence or absence of protected species which would bring past surveys up to date. Suitable habitat for the species identified above also occurs elsewhere onsite and within the vicinity. Construction of the ALWR alternative would require permanent removal of about 13 percent of the Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler (see the golden-cheeked warbler predictive habitat model results included as an attachment to the TWPD response letter included in Attachment C). However, as stated above, the vegetation communities affected by construction are common throughout Somervell and Hood counties and are a small percentage of the total acreage of these cover types in the vicinity (less than 2 percent of any cover type in the vicinity). If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the ALWR alternative MAY AFFECT, but is NOT LIKELY to ADVERSELY AFFECT, federally listed species.

7.2.3.1.8 Historic and Cultural Resources

The NRC determined that the APE for CPNPP Units 3 and 4 was the area at the proposed CPNPP Units 3 and 4 site and the immediate environs that may be impacted by land-disturbing activities associated with building and operating the proposed CPNPP Units 3 and 4 (NRC 2011, Section 2.7). Therefore, the extent of the APE was the construction footprint and adjacent areas, the offsite water lines installation area, and the salt deposition area around the BDTF. The ALWR alternative would use a similar construction footprint as evaluated for CPNPP Units 3 and 4 and the area of salt deposition would also be similar. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1). Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area have been listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4, that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least 4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.1.9 Socioeconomics

<u>Socioeconomic Issues other than Transportation</u>

The NRC reviewed the socioeconomic impacts of construction and operating Units 3 and 4. The assessment was based on peak employment of 4,953 workers during construction (NRC 2011, Section 4.4.2) and 494 operations workers (NRC 2011, Section 5.4.2). Construction of CPNPP Units 3 and 4 would have economic impacts in the area by creating direct and indirect jobs and incomes, increasing purchases of goods and services, and generating tax revenues. The NRC's assessment of the economic and tax revenue impact of construction was a LARGE impact for Somervell and Hood counties (NRC 2011, Section 4.4.3). The NRC's assessment was that in terms of employment and income, the long-term economic benefits of operating CPNPP Units 3 and 4 are likely to be MODERATE to LARGE in Somervell and Hood counties. With regard to tax revenues, the long-term economic benefits of operating CPNPP Units 3 and 4 are likely to be LARGE in Somervell County. (NRC 2011, Section 5.4.3.3) The scale of the ALWR alternative project would be similar and would be expected to have similar beneficial impacts as those of Units 3 and 4.

The large workforce would also result in additional pressure on local housing, community services, and infrastructure. Not all of the construction workforce would relocate with families, and the in-migrating workforce is anticipated to reside in Somervell and Hood counties as well as other surrounding counties. Based on assumptions for population increases and residence patterns, the NRC assessed the adverse impacts to housing, community services, and infrastructure from construction of CPNPP Units 3 and 4 to generally be SMALL. Similar impacts would be expected from construction of the ALWR plant. The operations workforce would be offset by the loss of the existing Units 1 and 2 operational workforce and any adverse impacts to housing, community services, and infrastructure would be SMALL.

Transportation

The NRC considered the traffic impact of the large construction workforce projected for CPNPP Units 3 and 4 to be SMALL to MODERATE (NRC 2011, Section 4.4.4.1). The operations workforce would be much smaller and would have a SMALL impact (NRC 2011, Section 5.4.4.1). The size of the construction and operational workforces for the ALWR alternative would be similar and would be expected to have similar traffic impacts.

7.2.3.1.10 Human Health

Impacts on human health from construction of an ALWR plant would be similar to those associated with a large industrial facility construction project. Compliance with OSHA worker protection rules would minimize occupational injuries. The NRC evaluated impacts on public and construction worker health from fugitive dust, occupational injuries, noise, and transport of materials and personnel to and from the site for construction and operation of Units 3 and 4, concluding that impacts would be SMALL, with the exception of noise, which could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF (NRC 2011, Sections 4.8.4 and 5.8). The NRC also determined that public and occupational radiological exposure would be well within exposure limits (NRC 2011, Sections 4.9.4, 5.9.3, and 5.9.4). The scale of the ALWR nuclear alternative would be similar and would be expected to have similar impacts to Units 3 and 4. Overall, the human health impacts of construction and operation would be SMALL.

7.2.3.1.11 Environmental Justice

Section 3.11.2 presents the minority and low-income population in the region surrounding the CPNPP site.

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Section 3.11.2 of this ER presents that no block groups within a 6-mile radius meet the criteria for a minority population and the closest low-income block group that meets the guidance criteria for families is located 4.6 miles southeast of the CPNPP center point. Given the distance to the closest block group, onsite activities with impacts to soil, water, and air conducted under environmental permits that limit emissions and establish conditions that minimize impacts would not be expected to have disproportionate impacts. NRC also found the impacts of construction and pre-construction activities and operations of Units 3 and 4 on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Adverse socioeconomic impacts from additional pressure on local housing, community services, and infrastructure from a large workforce would be dispersed through the region rather than concentrated in specific locales. As discussed in Section 7.2.3.1.9, these adverse impacts would be small. Therefore, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of an ALWR alternative.

7.2.3.1.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the ALWR plant would be handled according to county, state, and federal regulations. and disposed at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the ALWR plant would result in nonhazardous, hazardous, SNF, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would continue the waste management, recycling, and waste minimization programs in place for the existing units. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in accordance with NRC regulations. The NRC-licensed design and operation of SNF storage either in spent fuel pools or an ISFSI ensures that onsite storage would have small environmental effects. Therefore, environmental impacts associated with radioactive waste for the ALWR alternative is anticipated to be SMALL. Likewise, the NRC's assessment of CPNPP Units 3 and 4 also found waste management impacts to be small (NRC 2011, Sections 4.10, 5.10, and 6.1.6)

7.2.3.2 Small Modular Reactors Nuclear Alternative

This alternative consists of 44 small modular reactor (SMR) units (four clusters of units under a single control room) based on the 60-MWe gross size of the NuScale design and a 95 percent capacity factor (NuScale 2019a). The SMR plant would be sited within the CPNPP site using the same construction footprint considered for CPNPP Units 3 and 4. Like CPNPP Units 3 and 4, the SMR plant would have a closed-cycle cooling system using MDCTs with blowdown treated at in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF is assumed to be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the SMR plant.

7.2.3.2.1 Land Use

As noted above, the SMR plant would be sited within the CPNPP site using the same construction footprint considered for CPNPP Units 3 and 4. The construction footprint for CPNPP Units 3 and 4 was 123 acres for the reactors west of the existing units, 152 acres for the MDCTs on the peninsula north of the existing units, and approximately 400 acres adjacent to the southern border for the BDTF with additional acreage for the discharge pipeline. This footprint is further described in Section 7.2.3.1.1 for the ALWR plant.

The land requirement for the SMR plant would be less than that of a conventional nuclear power plant (e.g., ALWR plant). One of the SMR design developers, NuScale, indicates that the land requirement of an SMR facility of 1,000 MWe is less than 20 percent of that required for a 1,000 MWe conventional nuclear plant (NuScale 2019b). The land required for the reactors would be expected to be less than that of the ALWR plant, potentially allowing some of the MDCTs to be located within the 123-acre area which was previously a large parking area supporting construction of the existing units. This would reduce the acreage that would be converted for industrial use. An SMR plant's reactors would not be assembled onsite, requiring a smaller construction workforce than that of a conventional nuclear power plant. A smaller workforce would have fewer offsite land use impacts for housing.

The land use impacts for an SMR plant would be similar to and bounded by those of the ALWR plant presented in Section 7.2.3.1.1, SMALL for construction and SMALL to MODERATE for operations.

7.2.3.2.2 Visual Resources

Containment structures for SMR units are not as tall as conventional nuclear containment structures. The NuScale design's containment structure is 76 feet in height (NuScale 2019a). The MDCTs would be constructed on the adjacent peninsula north of the existing plant in an area of Ashe juniper woodland-savanna and mixed hardwood forest (NRC 2011, Section 4.3.1.1), expanding the industrial appearance of the plant. The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The visual resources impact for the reactors and MDCTs would be similar to that of the existing generating units and SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area. However, the hilly topography of the area would reduce the visibility of the plant features. Overall, visual impact of this alternative would be SMALL.

7.2.3.2.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) which would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions.

As discussed in Section 7.2.3.1.3, the MDCTs would have air emission and atmospheric effects from drift and plumes. These emissions would be similar to those of the ALWR plant.

Air quality impacts would be similar to and bounded by those of the ALWR plant described in Section 7.2.3.1.3, SMALL.

7.2.3.2.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD. The sound would be attenuated by the surrounding buildings and structures and distance to the site border. Construction activities resulting in offsite sound levels above this range would be temporary. The level of onsite construction and the duration of construction activities would be less for an SMR plant than a conventional nuclear power plant. The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise sources associated with operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. The operating SMR facility would have noise sources and levels not unlike those of the existing operating units and they would attenuate over the distance to the site boundary. Many of these noise sources are confined indoors or would be infrequent. Noise from a cooling tower is generally from motors, fans, and cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5). Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

7.2.3.2.5 Geology and Soils

The impacts to geology and soils from construction of a conventional nuclear power plant is described in the FEIS for CPNPP Units 3 and 4 (NRC 2011) and summarized in Section 7.2.3.1.5 for the ALWR plant. Site preparation and construction would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material. Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. Through compliance with permit conditions, adherence to stormwater regulations, and application of erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the SMR units would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.2.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of an SMR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction would require minimal dewatering of excavations. The water demand for construction of an SMR plant would be bounded by that of the ALWR plant given that the SMR plant would require less onsite construction. Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be meet by municipal supply. The excavations would be expected to require minimal dewatering based on the construction of the existing units and no other groundwater withdrawals are expected for construction. Groundwater and surface water use impacts from construction would be SMALL.

Operations water use would primarily be for cooling water makeup. Cooling water would be drawn from the SCR with the reservoir's intake being on Lake Granbury as for the existing units. The cooling water withdrawals as well as the makeup water demand would be similar to that of the ALWR plant. Like during construction, potable water demand would be met by municipal supply. Cooling water withdrawals and water consumption impacts would be similar to the ALWR plant and impacts would be similar to that presented in Section 7.2.3.1.6, SMALL to MODERATE. No groundwater use is expected.

Construction of the SMR nuclear plant, cooling towers, and connections with existing infrastructure could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and application of SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

The SMR plant would treat blowdown from the MDCTs in the BDTF and discharge would be routed to Lake Granbury. The effluent would comply with Texas surface water quality standards. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in Lake Granbury, resulting in a small net increase in the total dissolved solids concentration in the reservoir and downstream. Under low-flow conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses.

The SMR plant would operate in compliance with a TPDES permit, an industrial stormwater permit, and have spill prevention and response procedures in place, minimizing impacts to groundwater and surface water quality. The potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low-flow conditions would be noticeable. The overall impact to surface water would be SMALL to MODERATE.

7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The ecological setting at CPNPP is presented in Section 3.7 and the NRC's previous assessment of ecological impacts from construction and operation of CPNPP Units 3 and 4 is summarized in Section 7.2.3.1.7. The SMR alternative would require less acreage for the reactor units, which could result in less clearing of Ashe juniper woodland-savanna on the peninsula for the MDCTs if one or two banks of cooling towers could be located next to the reactors. Therefore, the terrestrial ecology impact of the SMR could be less than that of the ALWR plant, but nevertheless bounded by the ALWR plant's impacts. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to develop any mitigation plans, with a focus on threatened and endangered species. The impact of the SMR alternative to terrestrial ecology would be SMALL to MODERATE for construction. The SMR plant would be supported with the BDTF, which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts of the SMR alternative attributable to operations would be SMALL.

Aquatic

Like for the ALWR plant, a new intake structure for the SMR plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the SMR plant. For discharge from the BDTF, new piping would be installed including along the Lake Granbury shore and construction of a new discharge structure in Lake Granbury. As mentioned above, in Section 7.2.3.2.6, the surface water demand and consumption would be similar to the ALWR plant. Given the use of the same source water and use of the BDTF for both the ALWR and SMR plants, the discharge effluent characteristics would be similar as well. Therefore, the aquatic resource impacts would be similar for both alternatives, SMALL for construction and SMALL to MODERATE for operations, and are described in Section 7.2.3.1.7.

Special Status Species

As presented in Section 3.7.8, no protected aquatic species are found in SCR. Protected terrestrial species have been observed onsite at the SCR. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR. Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity. The federally and state-listed golden-cheeked warbler and the state-listed THL have the potential to occur onsite; however, none were observed during previous surveys undertaken for Units 3 and

4. The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to determine the presence or absence of protected species. Construction of the SMR alternative would require permanent removal of Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler and the THL. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the SMR alternative MAY AFFECT, but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

7.2.3.2.8 Historic and Cultural Resources

The SMR plant would be located within the same construction footprint evaluated for CPNPP Units 3 and 4. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1) Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area were subsequently listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded, and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4 that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least 4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.2.9 Socioeconomics

Socioeconomic Issues other than Transportation

As discussed in Section 7.2.3.1.9, the NRC reviewed the socioeconomic impacts of construction and operating CPNPP Units 3 and 4 and the impacts for construction and operating an SMR alternative would be similar. The construction workforce for a SMR plant would be smaller because the reactors are modular units and not constructed onsite. The operations workforce would be similar to the ALWR plant. Therefore, the socioeconomic impacts would be similar to those of the ALWR plant described in Section 7.2.3.1.9, MODERATE to LARGE in Somervell and Hood counties and beneficial with adverse socioeconomic impacts from increased use and demand for community services and infrastructure being SMALL.

Transportation

The construction workforce for an SMR plant would be smaller than that for an ALWR plant and the operations workforce would be similar. Therefore, the socioeconomic impacts would be bounded by those of the ALWR plant described in Section 7.2.3.1.9, SMALL to MODERATE for construction and SMALL for operations.

7.2.3.2.10 Human Health

Impacts on human health from construction of an SMR plant would be similar to those associated with a large industrial facility construction project, including an ALWR plant. Worker safety would be addressed by following the OSHA worker protection standards. Operation of a SMR plant would also have similar impacts to that of an ALWR plant. Therefore, the human health impacts described for the ALWR plant in Section 7.2.3.1.10, SMALL, are applicable to the SMR alternative.

7.2.3.2.11 Environmental Justice

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Similarly, the impacts of construction and pre-construction activities and operations on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Likewise, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a SMR plant.

Impacts on minority or low-income populations from construction and operation of a SMR plant would be similar to and bounded by those of the ALWR alternative as discussed in Section 7.2.3.1.11. No disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a SMR plant.

7.2.3.2.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the SMR plant would be handled according to county, state, and federal regulations, and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the SMR plant would result in nonhazardous, hazardous, SNF, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in accordance with NRC regulations. Therefore, environmental impacts for the SMR alternative associated with radioactive waste would be SMALL.

7.2.3.3 Natural Gas-Fired Generation

A NGCC plant would consist of multiple combustion turbines, a heat recovery steam generator, and a steam turbine generator. Based on a capacity factor of 87 percent (EIA 2021a), the NGCC plant would have a design capacity of 2,828 MWe (gross) of generation to replace the current 2,460 MWe provided by CPNPP. The NGCC plant would use the same construction footprint considered for CPNPP Units 3 and 4. Like CPNPP Units 3 and 4 and the ALWR and SMR alternatives, the NGCC plant would have a closed-cycle cooling system using MDCTs with blowdown treated in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF would be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the NGCC plant. An existing natural gas transmission line transverses north-south on the CPNPP site and is located along the transmission corridor along CPNPP's EAB (USDOT 2021). Another natural gas pipeline transverses the CPNPP site east-west in Hood County (USDOT 2021). This east-west natural gas pipeline potentially could also supply the NGCC alternative and utilize the existing north-south corridor to connect to the NGCC alternative plant. Therefore, it is assumed that a short natural gas pipeline would have to be installed utilizing existing pipelines and/or corridors to supply the NGCC alternative plant.

7.2.3.3.1 Land Use

As mentioned above, the NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. The CPNPP Units 3 and 4 construction footprint was 123 acres for the reactors west of the existing units, 152 acres for the MDCTs on the peninsula north of the existing units, and approximately 400 acres adjacent to the southern border for the BDTF with additional acreage for the discharge pipeline. The footprint is further described in Section 7.2.3.1.1 for the ALWR plant.

The land requirement for the NGCC plant would be less than that of a conventional nuclear power plant (e.g., ALWR plant). Based on a land need factor of 0.02 m2/MWh (NETL 2010a), the NGCC plant would require approximately 122 acres, potentially allowing the MDCTs to be located within the 123-acre area which was previously a large parking area supporting construction of the existing units. This would reduce the acreage that would be converted for industrial use. The NGCC would also require land for a BDTF, but the cooling water demand for a NGCC plant would be less than a nuclear power plant; thus, the acreage needed for the BDTF's evaporation ponds would be less. The workforce required to construct the NGCC would be less than that required for a nuclear power plant and the construction duration would be shorter as well. Thus, the offsite land use impacts for housing would be less.

As discussed in Section 7.2.3.1.1, the use of this land would not be affected by zoning regulations. The development of the BDTF would convert land including prime farmland to industrial use. Given the land needed for the NGCC would be less than an ALWR plant, the land use impact would be bounded by the ALWR presented in Section 7.2.3.1.1, SMALL for construction. The BDTF would deposit salt on the surrounding acreage, but because less cooling water would be needed for a NGCC than a nuclear power plant, it is assumed that the equipment and location of sprayers and evaporation could be optimized to eliminate deposition on the adjacent residential property, allowing the overall impact to land use for operations to be SMALL.

7.2.3.3.2 Visual Resources

The NGCC plant would alter the visual landscape. The tallest structures would be the 150-foot-high auxiliary boiler and two heat recovery steam generator stacks, as well as the 100-foot-high steam turbine building. Some portion of these structures would likely be visible for 1 mile or more. There would be more lighting visible across the night landscape. The gas pipeline compressors also would be visible. (NRC 2011, Section 9.2.3.2.3.2). The MDCTs would also have a lower profile than a natural draft parabolic cooling tower. The visual resources impact for the NGCC units and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area. However, the hilly topography of the area would reduce the visibility of the plant features. Overall, visual impact of this alternative would be SMALL.

7.2.3.3.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

The operational NGCC plant would be equipped with air pollution controls to ensure compliance with air quality regulations. Emission estimates for the NGCC plant based on EPA AP-42 10 emission factors are shown in Table 7.2-1.

The NGCC plant would qualify as a new major source of criteria pollutants and would be subject to the CAA prevention of significant deterioration air quality review. Therefore, the plant would have to comply with the new source performance standard for NGCC plants set forth in 40 CFR Part 60 Subpart KKKK and 40 CFR Part 60 Subpart TTTT. The plant would also qualify as a major source because of its potential to emit more than 100 tons per year of criteria pollutants. The plant would be required to obtain a Title V operating permit.

The NGCC plant would be subject to the national emission standards for HAPs for stationary combustion turbines if the plant was a major source of HAPs, having the potential to emit 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAPs [40 CFR 63.6085(b)].

A new NGCC plant would also have to comply with Title IV of CAA [42 USC 7651] reduction requirements for SO_2 and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility. As discussed in Section 7.2.3.1.3, the MDCTs would have air emission and atmospheric effects from drift and plumes. These emissions would be similar to those of the ALWR plant. A new NGCC plant would be a major source of criteria pollutants and GHGs. Compliance with existing air quality regulations would ensure air quality impacts are minimized. Therefore, the operations-related impacts on air quality under the NGCC plant alternative would be MODERATE.

7.2.3.3.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. As mentioned above, the NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. For CPNPP Units 3 and 4, the NRC projected noise levels from most construction activities at the site boundary below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD, and the sound would be attenuated by the surrounding buildings and structures and distance to the site border. Construction activities resulting in offsite sound levels above this range would be temporary. The noise sources would be similar for construction of a NGCC plant, but the duration of construction activities would be shorter and, as presented in Section 7.2.3.3.1, the acreage that would need to be cleared for the NGCC alternative would also be less. The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise impacts associated with plant operations would include noise from transformers, turbines, pumps, compressors, exhaust stack, combustion inlet filter house, condenser fans, the mechanical draft cooling towers, high-pressure steam piping, and loudspeakers. The sound would attenuate over the distance to the site border. Noise from a cooling tower is generally from motors, fans, and cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5). Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

7.2.3.3.5 Geology and Soils

The impacts to geology and soils from construction of a conventional nuclear power plant is described in the FEIS for CPNPP Units 3 and 4 (NRC 2011) and summarized in Section 7.2.3.1.5 for the ALWR plant. Site preparation and construction of NGCC plant would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material. Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. Through compliance with permit conditions, adherence to stormwater regulations, and application of erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the NGCC plant would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.3.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of NGCC plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction would require minimal dewatering of excavations. The water demand for construction of a NGCC plant would be bounded by that of the ALWR plant given that the NGCC plant would require less onsite construction, have a shorter construction duration, and require less land clearing. Potable water needs for human consumption, sanitary needs, fire protection, and other construction activities would be met by municipal supply. The excavations would be expected to require minimal dewatering based on the construction of the existing units, and no other groundwater withdrawals are expected for construction. Groundwater and surface water use impacts from construction would be SMALL.

Operations water use would be primarily for cooling water makeup. Cooling water would be drawn from the SCR with the reservoir's intake being on Lake Granbury as for the existing units. The cooling water withdrawals as well as the makeup water demand would be bounded by that of the ALWR plant. Cooling water demand for NGCC plants is lower than for conventional nuclear power plants. The NGCC plant would have water withdrawals of approximately 7,100 gpm and consume approximately 6,100 gpm based on the water use factors developed by the National Energy Technology Laboratory (NETL) of 0.15 gallons per kilowatt hour (gal/kWh) for withdrawals and 0.13 gal/kWh for consumption (NETL 2010b, Appendix D). Withdrawals for Units 3 and 4 were estimated at approximately 63,000 gpm and consumption was estimated at approximately 38,200 gpm (NRC 2011) and concluded by the NRC to be a moderate impact. The NETL set water usage factors for conventional recirculating nuclear power plants at 1.101 gal/kWh and 0.624 gal/kWh for withdrawals and consumption, respectively (NETL 2010b). As during construction, potable water demand during operation would be met by municipal supply. Given the much lower estimated water consumption for the NGCC alternative, the surface water impact would be SMALL. No groundwater use is expected.

Construction of the NGCC plant, cooling towers, and connections with existing infrastructure could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

The NGCC plant would treat blowdown from the MDCTs in the BDTF and would be routed to Lake Granbury. The effluent would comply with Texas surface water quality standards. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in Lake Granbury, resulting in a small net increase in the total dissolved solids concentration in the reservoir and downstream. Under low-flow conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses.

The NGCC plant would operate in compliance with a TPDES permit, an industrial stormwater permit, and have spill prevention and response procedures in place, minimizing impacts to groundwater and surface water quality. The potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low-flow conditions was determined to be moderate for Units 3 and 4 (NRC 2011); given the NGCC would require less cooling water, the amount of dissolved solids discharged would be less, but the concentration could be similar and thus the impact could still be noticeable. The overall impact to surface water would be SMALL to MODERATE.

7.2.3.3.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The ecological setting at CPNPP is presented in Section 3.7 and the NRC's previous assessment of ecological impacts from construction and operation of CPNPP Units 3 and 4 is summarized in Section 7.2.3.1.7 regarding the ALWR plant. The NGCC plant would require less acreage, resulting in less clearing of Ashe juniper woodland-savanna. Therefore, the terrestrial ecology impact of the NGCC could be less than that of the ALWR plant, but nevertheless bounded by the ALWR plant's impacts. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to develop any mitigation plans, with a focus on threatened and endangered species. The impact to terrestrial ecology would be SMALL to MODERATE for construction. The NGCC plant would be supported with the BDTF, which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts attributable to operations would be SMALL.

Aquatic

Like for the ALWR plant, a new intake structure for the NGCC plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the NGCC plant. Discharge from the BDTF would be to Lake Granbury. As noted in Section 7.2.3.3.6, the surface water demand and consumption would be much less than a conventional nuclear power plant. Given the use of the same source water and use of the BDTF for both the ALWR and NGCC plants, the discharge effluent characteristics would be similar as well, but with overall less flow. Therefore, the aquatic resource impacts would be similar for both alternatives, SMALL for construction and SMALL to MODERATE for operations, and are bounded by those described in Section 7.2.3.1.7 for the ALWR alternative.

Special Status Species

As presented in Section 3.7.8, no protected aquatic species are found in SCR. Protected terrestrial species have been observed onsite at the SCR. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR. Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity. The federally and state-listed golden-cheeked warbler and the state-listed THL have the potential to occur onsite; however, none were observed during previous surveys undertaken for Units 3 and 4. The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species. Construction of the NGCC alternative would require permanent removal of Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler and the THL. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the NGCC alternative MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

7.2.3.3.8 Historic and Cultural Resources

The NGCC plant would be located within the same construction footprint as evaluated for CPNPP Units 3 and 4. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1). Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area were subsequently listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4 that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least

4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.3.9 Socioeconomics

Socioeconomic Issues other than Transportation

As discussed in Section 7.2.3.1.9, the NRC reviewed the socioeconomic impacts of construction and operating CPNPP Units 3 and 4 and concluded that the impacts for construction and operating would be MODERATE to LARGE in Somervell and Hood counties and beneficial with adverse socioeconomic impacts from increased use and demand for community services and infrastructure being SMALL. The impact of construction of a NGCC plant would be less because the construction workforce and construction duration would be less. The beneficial socioeconomic impact of construction is likely to be noticeable (i.e., MODERATE) in Somervell and Hood counties with impacts on community services and infrastructure being SMALL. The operating NGCC plant would have similar beneficial socioeconomic impacts to Somervell and Hood counties from tax payments as the current units and projected for CPNPP Units 3 and 4 MODERATE to LARGE.

Transportation

The construction and operations workforce for an NGCC plant would be smaller than an ALWR plant. Therefore, the socioeconomic impacts of the NGCC alternative would be bounded by those of the ALWR plant described in Section 7.2.3.1.9, SMALL to MODERATE for construction and SMALL for operations.

7.2.3.3.10 Human Health

Impacts on human health from construction of an NGCC plant would be similar to those associated with a large industrial facility construction project, including an ALWR plant. Worker safety would be addressed by following the OSHA worker protection standards. Operation of an NGCC plant would also have similar impacts to that of an ALWR plant. Therefore, the human health impacts described for the ALWR plant in Section 7.2.3.1.10, SMALL, are applicable to the NGCC alternative.

Impacts resulting from the operation of the NGCC plant would primarily be from air pollutant emissions. The NGCC plant would emit criteria air pollutants (Table 7.2-1). Some pollutants, such as NO_x, contribute to ozone formation, which can create health problems. These criteria pollutants are regulated, and technology will be installed in the plant to limit the criteria air pollutant releases. Plant operation human health impacts would also be avoided and minimized from adherence to safety standards. The NGCC plant required to replace CPNPP would be larger than the typical NGCC plant (Leidos 2016); therefore, with application of pollutant controls and compliance with air quality standards, operations-related impacts to human health under the NGCC alternative would be SMALL to MODERATE.

7.2.3.3.11 Environmental Justice

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Similarly, the impacts of construction and pre-construction activities and operations on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Likewise, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a NGCC plant. The activities associated with an operating NGCC plant would be similar to those occurring at CPNPP with the exception of air emissions, which would be subject to permit and regulatory restrictions.

7.2.3.3.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the NGCC plant would be handled according to county, state, and federal regulations. and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

Operation of the NGCC plant would result in waste from spent catalytic reduction catalysts used to control nitrous oxide emissions. This waste stream is considered hazardous and would be disposed of at a facility that handles hazardous materials. Other waste generated at the site would be characterized as hazardous or nonhazardous. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization.

7.2.3.4 Combination Alternative

The combination alternative relies on renewables for approximately one-third of the generation with the remaining generation coming from natural gas. Renewables in current use by utilities (wind, solar, hydropower, biomass) require vast amounts of land for generation or fuel sources (Section 7.2.2). To replace the full 2,460 MWs provided by CPNPP with just renewables would require acreages far beyond that of a nuclear or natural gas alternative. The land use requirement of an all renewables alternative would make it an inappropriate comparative alternative to the proposed action, detracting from the purpose of this chapter of the ER as providing input to support NEPA decision-making Including natural gas generation in the combination minimizes land use conversion because: (1) the plant can be located at the CPNPP site, (2) existing natural gas pipelines in the proximity minimizes land conversion for pipelines, and (3) the abundant natural gas supply in Texas eliminates the need for more acreage to be converted for new natural gas wells. Continuing to use the CPNPP site for natural gas-fired generation continues to provide tax revenue and employment for Somervell County. Further, natural gas is a cleaner burning fuel than biomass fuels and would operate under strict emission regulations in an attainment area (Section 3.3.3.1). The balanced combination alternative includes an NGCC plant at the CPNPP site, solar photovoltaic (PV) installations, and onshore wind installations. This combination of alternatives would provide the following generation:

- Configuration of NGCC units to provide approximately 1,600 MWe net (1,839 MWe gross) with MDCTs located at the CPNPP site.
- Three approximately 200-MWe solar installations located offsite in the ERCOT region with battery storage to make it baseload.
- Approximately 600 MWe supplied by wind development within the ERCOT region or imported into the ERCOT region.

To yield approximately 1,600 MWe net, the size of the NGCC plant component would be 1,839 MWe based on an EIA capacity factor of 0.87 (EIA 2021a). Like the NGCC in the discrete alternative, the combination alternative's NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. Like the ALWR, SMR, and NGCC alternatives, the combination alternative's NGCC plant would have a closed-cycle cooling system using MDCTs with blowdown treated at in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF is assumed to be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the NGCC plant. A short natural gas pipeline would have to be installed to connect to the existing natural gas pipeline located along the CPNPP's EAB.

Each offsite solar installation would be supported with onsite lithium-ion battery storage to provide a firm 200 MWe. Each of the three installations would be located within the ERCOT region. The installations would require transmission connections to the regional grid.

The wind component would be in west Texas, where seasonal wind capacity factors exceed 80 percent (ERCOT 2018). An annual capacity factor of 50 percent is assumed based on annual wind capacity factors for 2018 (ERCOT 2018). No power storage would be provided. The wind installations would require transmission connections to the regional grid.

The approximately 900 MWe to be provided to the grid by wind and solar installations located offsite would require transmission connections to the regional grid and could require additional transmission lines in new corridors. Without identifying exact site locations for the solar and wind installations, the need for and potential alignment of transmission lines cannot be determined. The CPNPP Units 3 and 4 FEIS (NRC 2011, Section 4.1.2) considered an offsite transmission system of five 345-kV circuits, three using vacant circuit positions on existing lines, not requiring any additional ROW or tower construction, and development of two new transmission lines. The new transmission lines would require clearing and development of 160-foot-wide corridors, 17 and 45 miles in length. One of the new transmission lines considered was to be located in close proximity to Dinosaur Valley State Park and cross the Fossil Rim Wildlife Center. Given that the CPNPP Units 3 and 4 FEIS considered the development of 62 miles of new high voltage transmission lines and one with development that could impact conservation resources, for purposes of assessing impacts of the combination alterative, the transmission line impacts determined for CPNPP Units 3 and 4 are assumed to be bounding.

7.2.3.4.1 Land Use

The NGCC component of the combination alternative yielding approximately 1,600 MWe would require a NGCC plant about 60 percent the size of the NGCC alternative. The combination alternative NGCC plant and the supporting MDCTs and BDTF would be sited within the same footprint, requiring less overall acreage. The plant would require clearing of a smaller acreage, reducing the impact of terrestrial habitat removal and less acreage of prime farmland. Therefore, the land use impacts for the NGCC plant component would be bounded that of the NGCC alternative described in Section 7.2.3.3.1 and would be SMALL for construction and operation.

Utility-scale solar facilities use relatively large areas of land to generate electricity. Luminant developed a 180-MWe solar installation with battery storage, Upton 2, on nearly 1,900 acres in Upton County, Texas (Luminant 2018b). Based on Upton 2, it is assumed that each of three 200-MWe solar installations would require approximately 2,000 acres. The solar installation would result in land use conversion to power generation. Vistra OpCo would avoid prime and unique farmland.

The DOE developed land use metrics for wind generation of 2.47 acres per MW for disturbed area. A further breakdown of this disturbed area is 0.74 acres per MW hosting permanent structures and supporting facilities such as transformers and access roads and 1.73 acres per MW for temporary land use to support construction. (DOE 2015). Based on these metrics, development of 600 MWe of wind power would have a construction footprint of 1,482 acres and a permanent footprint of 444 acres. Wind turbines are spaced for operation, so the wind installation encompasses many acres between the linked turbines. The acreage between the linked turbines typically continues to be used for farmland and other compatible purposes and therefore, would not necessarily result in land use conversion to power generation. To minimize impacts, Vistra OpCo would avoid disturbing prime and unique farmland.

The total acreage needed for development of 600 MWe of wind generation would require multiple installations. The DOE also considered the overall acreage of wind farm boundaries. Based on a 2009 study, wind farm boundaries encompassed approximately 85 acres per MW (DOE 2015). Using this metric, the 600 MWe of wind development would encompass 51,144 acres. Depending on the selected location, a wind installation may impact existing land use; however, as stated above, wind turbines are compatible with many land use categories and can be co-located and not require a conversion of land use other than the turbine's footprint. However, the number of land parcels and landowners that are often required to site a wind installation provides uncertainty with impacts to land use.

As discussed in Section 7.2.3.4, the impacts of developing transmission lines to support the solar and wind installations are assumed to be bounded by that of CPNPP Units 3 and 4. The NRC concluded the land use impact of the transmission lines would be MODERATE. This conclusion is based primarily on the fact that one of the proposed transmission line corridors may pass through or close to the edge of Dinosaur Valley State Park and because development of pipelines and transmission lines could sever tracts of public and private property, including Fossil Rim Wildlife Center, and permanently interfere with land uses on some of those tracts. Overall, the land use impacts from the construction and operation of the combination alternative at multiple locations, avoiding prime and unique farmland would be MODERATE.

7.2.3.4.2 Visual Resources

Visual impacts from the NGCC plant component of the combination alternative would be essentially the same as those described for the discrete NGCC alternative in Section 7.2.3.3.2.

The solar installations would require large land areas. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening. The solar installations would be sited to comply with land zoning and any required buffers or screening.

The wind turbines of each wind installation would be visible from all directions and could be a large impact on the viewshed depending on the site selected. In addition, the rotating blades of wind turbines cast moving shadows on the ground or on structures, causing the phenomenon of shadow flicker. Shadow flicker is considered a nuisance rather than a human health hazard and the potential impact of shadow flicker can be mitigated by setback distances from structures, vegetative buffers, or the curtailment of the turbine during times of highest impact (DOE 2015).

Site selection would seek to minimize visual impacts and would avoid impacting scenic areas such as U.S. Congress-designated areas for protection of unique natural, cultural, and recreational values (e.g., national scenic and historic trails, national historic landmarks, scenic areas, recreation areas, preserves, and monuments). Avoiding impacts on the most scenic viewsheds would reduce the most significant visual impacts, allowing the impact to be noticeable but not destabilizing.

The turbines would be marked and lighted according to Federal Aviation Administration (FAA) guidelines, which call for painting the turbines and towers white or light gray, while making them highly visible to pilots from the air. Aviation red flashing, strobe, or pulsed obstruction lights would be mounted atop selected turbines and at the end of each turbine string or within and around the perimeter such that the gap between lights is no greater than 0.5 miles, allowing the entire facility to be perceived as a single unit by pilots flying at night. The specific location of aviation lighting and the operation of the lighting system would be determined in consultation with FAA. (FAA 2018)

The visible impact of the transmission lines for the solar and wind installations would not appear any different than existing transmission lines. Site selection would avoid scenic views and impacts to cultural resources. Mitigation measures to reduce impacts of shadow flicker would be implemented as appropriate. Overall, the visual impacts from the construction and operation of the combination alternative would range from SMALL to MODERATE.

7.2.3.4.3 Air Quality

The impacts on air quality due to construction and operation of the NGCC plant would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.3 and would be SMALL for construction related impacts and MODERATE for operational impacts. The estimated criteria air pollutant and CO_2 emissions are presented in Table 7.2-1.

Construction activities associated with the solar PV and wind installations would generate fugitive dust. Mitigation would be implemented via wetting of cleared areas and dirt roads to minimize the fugitive dust. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions associated with the solar and wind components of the combination alternative would be SMALL. The solar and wind components of the combination alternative would not release any air emissions during operation.

Overall, the air quality impacts from the construction of the combination alternative would be SMALL and operations would be MODERATE for the NGCC component.

7.2.3.4.4 Noise

The construction and operation of the NGCC plant component of the combination alternative would have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section 7.2.3.3.4 and would be SMALL.

Construction of each solar and wind installation would likewise have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section 7.2.3.3.4 with a shorter duration. No noise impacts would occur from operation of a solar installation.

However, given the acreage of the solar installations and the potential need for land clearing and the number of turbines that would need to be installed, noise impacts would range from SMALL to MODERATE and be temporary for the duration of construction of each facility.

During operations, the wind turbines would emit sound. Turbine sound is typically one of the greatest nuisance impacts associated with wind power. The DOE addressed this concern with a review of the available data and research on impacts to human health, concluding that as of 2013, global peer-reviewed scientific data and independent studies consistently concluded that sound from wind plants has no direct impact on physical human health. (DOE 2015)

Overall, construction-related noise impacts associated with combination alternative is dependent on the site selected and proximity to residents and other sensitive receptors and would range from SMALL to MODERATE. Operations-related noise impacts associated with the combination alternative would be SMALL.

7.2.3.4.5 Geology and Soils

The impact on geology and soils due to construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.5 and would be SMALL.

Construction impacts to geology and soils resulting from the construction of the solar and wind installations and supporting transmission lines would primarily be impacts to soils from clearing and grubbing. These temporary soil impacts would be minimized by implementation of BMPs. Geological impacts would be minor, as any gravel or stone used in the construction of roads and infrastructure would be sourced from local businesses that sell materials sourced from local quarries. During operations, the solar and wind installations would be required to have a TPDES construction stormwater permit and comply with TCEQ regulations to control stormwater runoff.

Overall, the geology and soil impacts from the construction and operation of the combination alternative would be SMALL.

7.2.3.4.6 Hydrology (Surface Water and Groundwater)

The impact on surface water and groundwater use and quality due to constructing and operating the NGCC plant component would be similar to that associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.6 and would be SMALL for construction and SMALL to MODERATE for operation due to the BDTF discharge.

Construction of the solar and wind installations and their supporting transmission lines would require water for dust suppression, equipment washing, and sanitary systems. The solar and wind installation would not have process water needs for operation, but water would be needed for periodically washing the solar panels. The water demand could be meet by municipal supply available at the site, trucked in portable water, or onsite or nearby surface or groundwater resources. Vistra OpCo would utilize the most practical supply and comply with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar and wind installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Groundwater would be protected through the implementation of SWPPP and spill prevention measures. Once in operation, Vistra OpCo would operate the installations in compliance with stormwater regulations. The use and water quality impacts for both surface water and groundwater resources associated with the construction and operation of the solar and wind installations would be SMALL.

Overall, the impacts to surface water resources from the construction of the combination alternative would be SMALL and operations would be SMALL to MODERATE primarily for the potential for impacts from the NGCC component. Overall, the impacts to groundwater resources for the combination alternative would be SMALL.

7.2.3.4.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The NGCC plant component of the combination alternative would be constructed within the same footprint as the discrete NGCC alternative, requiring clearing of terrestrial habitat. The impact on terrestrial resources due to construction and operation of the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.7 and would be SMALL to MODERATE for construction and SMALL for operations.

Terrestrial ecology impacts resulting from the construction of three solar installations would result from the approximately 2,000 acres of land development required for each. This development could occur at three separate sites and by applying siting criteria would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. Therefore, terrestrial ecology impacts associated with the solar component of the combination alternative would be SMALL to MODERATE given the large land requirement. No operational impacts to terrestrial ecological resources would occur from the solar component of the combination alternative.

The site selection process that would be used to select sites for the wind installations would have criteria to avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. Vistra OpCo would also follow USFWS guidance for land-based wind energy development and eagle conservation (USFWS 2012; USFWS 2013). The guidance focuses on "species of concern" and addresses loss and degradation/fragmentation of habitat.

The operation of the wind turbines could affect avian and bat species. Following USFWS guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species. Mortality rates for birds at land-based wind plants average between three and five birds per MW per year, and no plant has reported an average greater than 14 birds per MW per year, with common songbirds accounting for approximately 60 percent of all bird collision mortality (DOE 2015). Those mortality levels for the 61 gigawatt of wind capacity installed in 2013 at the time of DOE's study constitute a very small percentage, typically <0.02 percent, of the total populations of those songbird species. (DOE 2015) Using the annual average of five bird deaths per MW, operation of the wind component of the combination alternative would result in an estimated 3,000 bird deaths per year of operation.

The NRC assessed terrestrial ecology impacts from development of new transmission lines for CPNPP Units 3 and 4 (NRC 2011, Section 4.3.1.2) and determined the impacts to be minor given the actual area of disturbance and land types. As discussed in Section 7.2.3.4, the CPNPP Units 3 and 4 assessment is assumed to be bounding for purposes of considering the impacts for the solar and wind installations.

Overall, the ecological impacts to terrestrial species from the construction and operation of the combination alternative would be SMALL to MODERATE.

Aquatic

The NGCC component would use the same cooling water intake and discharge configuration as the discrete NGCC alternative. The combination alternative NGCC plant would be about 60 percent the size of the discrete alternative and therefore use less cooling water. The impact on aquatic resources due to constructing and operating the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.1.7. Given the about 40 percent less intake and discharge volume to impact aquatic resources, both construction and operations impacts would be SMALL.

No impacts to aquatic resources would result from the construction of the solar and wind components of the combination alternative due to the implementation of BMPs to control erosion and run-off. No operations-related impacts are associated with the solar and wind components of the combination alternative.

Therefore, the ecological impacts to aquatic species from the construction and operation of the combination alternative would be SMALL.

Special Status Species

The NGCC plant component of the combination alternative would be constructed within the same footprint as the discrete NGCC alternative, requiring clearing of terrestrial habitat that is suitable for the federally listed golden-cheeked warbler and state-listed THL. The impact on special status species due to constructing the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.7 and would be, MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT.

The site selection process that would be used to select sites for the solar and wind installations would have criteria to avoid locations whose development would impact special status species. As discussed above, Vistra OpCo would also follow USFWS guidance for land-based wind energy development focused on "species of concern" and eagle conservation.

Given avoidance, minimization, and mitigation measures, and compliance with applicable permits, each solar and wind installation MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT special status species.

7.2.3.4.8 Historic and Cultural Resources

The impact on historic and cultural resources due to constructing the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.8 and would be NO EFFECT.

Development of solar and wind installations and supporting transmission lines could impact cultural resources, depending on the siting location. Impacts to historic and cultural resources could range from NO EFFECT to ADVERSE EFFECT, depending on the site.

7.2.3.4.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The construction and operation of the NGCC component of combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.9 and would be MODERATE for construction and MODERATE to LARGE beneficial for operation in Somervell and Hood counties.

The construction and operation of the solar and wind components and supporting transmission lines of the combination alternative would create fewer construction jobs than the NGCC plant. Any boost to the local economies would be short in duration, and socioeconomic impacts related to the construction of combination alternative would be SMALL.

The number of workers required to maintain each solar and wind installation would be small, and it would not result in a quantifiable impact on the local economy. If Vistra OpCo leased the property for the solar and wind installations, lease payments would be made the to property owners. The solar installations and the property occupied by the wind turbines could be taxed at a higher industrial rate than agricultural land, providing a tax benefit. The beneficial impact would be dependent on the tax base of the county, but the impact would likely be small. Therefore, the operations-related socioeconomic impacts under the solar and wind components of combination alternative would be SMALL.

Overall, the socioeconomic impacts from the construction and operation of the combination alternative would be SMALL for all counties except Somervell and Hood counties, where the impact would range from MODERATE to LARGE.

Transportation

Transportation impacts during the construction and operation of the NGCC plant would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.9 and would be SMALL to MODERATE during construction and SMALL during operation.

Transportation impacts during the construction of the solar and wind components of the combination alternative would be less than the impacts for any of the other alternatives presented. The construction workforce and equipment transported to the individual sites would be less than the amount required for the other alternatives. Traffic impacts associated with the operation of each solar and wind facility would not be quantifiable. Once the facility is in operation, very few employees would be required for facility operations. Therefore, transportation impacts for construction and operation under the solar and wind components of the combination alternative would be SMALL.

Overall, the transportation impacts associated with construction of the combination alternative would be SMALL for the solar and wind components and range from SMALL to MODERATE for the NGCC component. The impacts during operation would be expected to be SMALL for all the components of the combination alternative.

7.2.3.4.10 Human Health

Impacts on human health from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.10 and would be SMALL for construction and SMALL to MODERATE for operations.

During construction of the solar and wind installations, worker safety would be addressed by following the OSHA worker protection standards. Therefore, construction-related impacts on human health under the solar and wind components of the combination alternative would be SMALL. As mentioned in Section 7.2.3.3.4, regarding wind turbine noise, the DOE concluded that sound from wind plants has no direct impact on physical human health. (DOE 2015) The transmission lines for solar and wind installations would be designed in compliance with NESC clearance requirements to protect the public from electric shock.

Therefore, the human health impacts associated with the construction of the combination alternative would be SMALL and range from SMALL to MODERATE for operations.

7.2.3.4.11 Environmental Justice

Potential impacts on minority and low-income populations from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.12.

Potential impacts on minority and low-income populations from the construction of solar and wind components of the combination alternative would primarily result from socioeconomic effects. Some minor environmental impacts would result during construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under the combination alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects. The temporary increase in traffic on roads would likely result in some small impacts to traffic that could affect local minority and low-income populations.

Overall, the construction and operation of the combination alternative would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

7.2.3.4.12 Waste Management

Impacts on waste management from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.12 and would be SMALL.

The construction of the solar and wind installations would create sanitary, construction, and industrial waste, although it would be in smaller quantities compared to the NGCC plant. This waste would be recycled, disposed of onsite, or shipped to an offsite waste disposal facility. The operation of each solar and wind installation is expected to generate very minimal waste from daily operations. The battery storage system at each solar installation would have to be replaced after several years of operation; however, much of the components are recyclable, minimizing the waste generation. Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL 2020). Wind turbine manufacturers are generally indicating that current designs have a 30-year lifespan (LBNL 2019). There would be significant waste generation upon decommissioning as there would be for decommissioning of a nuclear power plant. As a good environmental steward, Vistra OpCo would implement waste management practices to recycle or dispose of at an offsite waste disposal facility all waste generated at the installations. Therefore, waste management impacts from daily operations of the solar and wind installations would be SMALL.

Overall, the waste management impacts from the construction and operation of the combination alternative would be SMALL.

Table 7.2-1 Air Emissions Estimated for NGCC and Combination Alternatives

Emission	NGCC Alternative (estimated tons/year)[(b)]	Combination Alternative NGCC plant (estimated tons/year)[(b)]
Sulfur dioxide	258	168
NO_x [(a)]	985	641
Carbon monoxide	2,273	1,479
Particulate matter 10 microns	500	325
Nitrous oxide	227	148
Volatile organic compounds	159	104
Carbon dioxide	8,336,104	5,421,856

a. Assumes 90 percent reduction in emissions due to operation of air pollution control equipment (selective catalytic reduction).

b. Estimates based on EPA AP-42 emission factors. See formulas below.

Formulas and Sources

Annual gas consumption (ft^3)	Plant size in MWe x heat rate x 1,000 x (1/ heat content) x hours in a year						
Heat rate = 6,119 Btu/kWh (FPL 2020) Heat content of natural gas 2020 = 1,033 Btu/ft^3 (EIA 2021b)							
Annual MMBtu = (annual gas consumption x heat content)/1,000,000							
Emission factor for processed natural gas (lbs/MMBtu)	CO_2	NO_X	CO	PM	SO_2	VOC	N_2O
	110	0.13	0.03	0.0066	0.0034	.0.0021	0.003
Annual emissions (tons) = (emission factor) x (annual MMBtu)/2000							
Air emission factors (EPA 2000, Tables 3.1-1 and 3.1-2a)							

7.3 Alternatives for Reducing Adverse Impacts

7.3.1 Alternatives Considered

As noted in 10 CFR 51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." A review of the environmental impacts associated with the Category 2 issues in Chapter 4 identified no significant adverse effects that would require consideration of additional alternatives. Therefore, Vistra OpCo concludes that the impacts associated with renewal of the CPNPP OLs would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC 2013a, Section 7.2). This determination assumes the existing mitigation measures discussed in Section 6.2 adequately minimize and avoid environmental impacts associated with operating CPNPP.

7.3.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

As determined in Chapter 4, no additional alternatives were considered by Vistra OpCo to reduce impacts.

8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form . . . . [10 CFR 51.45(b)(3)]

The proposed action is renewal of the CPNPP Units 1 and 2 OLs, which would preserve the option to continue to operate CPNPP to provide reliable baseload power and meet Texas's future system generating needs throughout the proposed 20-year LR operating term. Chapter 4 provides analyses of the environmental impacts for the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of CPNPP and reasonably foreseeable replacement of its baseload generating capacity. The termination of operations and decommissioning impacts are presented in the GEIS (NRC 2013a), Section 14.2.2, and decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC 2002). The energy alternatives component of the no-action alternative is described, and its impacts analyzed in Chapter 7.

Table 8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Tables 8.0-2 and 8.0-3 provide a more detailed comparison. The environmental impacts compared in Tables 8.0-1, 8.0-2, and 8.0-3 are Category 1 and 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

In conclusion, there is no reasonable alternative that is environmentally preferable to the continued operation of CPNPP. All alternatives capable of meeting the needs currently served by CPNPP entail impacts greater than or equal to the proposed action of CPNPP LR. The continued operation of CPNPP would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of CPNPP will have a superior positive economic impact on Somervell County through tax revenues paid by Vistra OpCo for CPNPP. Continued employment of plant workers will continue to provide economic benefits to the surrounding communities This positive economic impact to Somervell County from the proposed action would be greater than the other generation alternatives.

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 1 of 3)

Impact Area[(a)]	Proposed Action	No-Action Alternative				
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Land Use	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL	MODERATE
Visual Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	SMALL	SMALL	SMALL (construction) MODERATE (operations)	SMALL (construction) MODERATE (operations)
Noise	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)
Geology and Soils	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 2 of 3)

Impact Area[(a)]	Proposed Action	No-Action Alternative				
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Terrestrial	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE
Aquatic	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL
Special Status Species	NO EFFECT	(b)	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO EFFECT	NO EFFECT	NO EFFECT	NO ADVERSE EFFECT
Socioeconomics	SMALL	MODERATE to LARGE (termination) SMALL (decommissioning)	MODERATE to LARGE beneficial	MODERATE to LARGE beneficial	MODERATE to LARGE beneficial	SMALL beneficial for all counties except Somervell and Hood counties where the impact would range from MODERATE to LARGE beneficial

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 3 of 3)

Impact Area[(a)]	Proposed Action	No-Action Alternative					
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Transportation	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL (construction) SMALL to MODERATE (operations)
Environmental Justice	No disproportionately high and adverse effects	(b)	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects
Waste Management	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NUREG-0586 Supplement 1 (NRC 2002), the decommissioning GEIS, identifies this resource area as requiring a site-specific analysis based on site conditions at the time of decommissioning, as well as the proposed decommissioning method and activities. Decommissioning CPNPP would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time and analysis of special status species and/or their habitat(s), a consideration of their presence or their habitats' presence, and an environmental justice analysis of the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations as determined by the most recent USCB decennial census data when the alternative is implemented. Thus, Vistra OpCo cannot forecast a level of impact for this resource area without unreasonable speculation.

Table 8.0-2 Alternatives Features Comparison Summary (Sheet 1 of 2)

	ALWR	SMR	NGCC Plant	Combination
Summary of Alternative	Two-unit nuclear plant to yield 2,460 MWe (net) (Section 7.2.3.1).	Four clusters of SMR units (total 44 units) with generation capacity comparable to CPNPP generation (Section 7.2.3.2).	Multiple combustion turbines assembled in appropriate power train configurations for a total of 2,828 MWe (gross) (Section 7.2.3.3).	Multiple combustion turbines assembled in appropriate power train configurations for a total of 1,839 MWe (gross).; three 200 MWe solar installations with battery storage; 600 MWe supplied by wind turbines (Section 7.2.3.4).
Location	CPNPP site plus 400 acres along the southern site boundary (Section 7.2.3.1.1).	CPNPP site plus 400 acres along the southern site boundary (Section 7.2.3.2.1).	CPNPP site plus <400 acres along the southern site boundary (Section 7.2.3.3.1).	NGCC: CPNPP site plus <400 acres along the southern site boundary. Solar: offsite within ERCOT region. Wind: offsite in west Texas (Section 7.2.3.4).
Cooling System	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	NGCC: closed-cycle cooling with mechanical draft cooling towers) (Section 7.2.3.4). Solar and Wind: no cooling system required.
Land Requirements	275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the southern boundary for the BDTF (Section 7.2.3.1.1).	Bounded by that of the ALWR (Section 7.2.3.2.1).	122 acres on existing CPNPP site plus acreage adjacent to the southern boundary for the BDTF. (Section 7.2.3.3.1).	NGCC: bounded by NGCC alternative. Solar: three sites of 2,000 acres each. Wind: construction footprint of 1,482 acres and a permanent footprint of 444 acres. New transmission: assumed bounded by that considered for CPNPP Units 3 and 4 of two 160-feet wide corridors, 17 and 45 miles in length (Section 7.2.3.4.1).

Table 8.0-2 Alternatives Features Comparison Summary (Sheet 2 of 2)

	ALWR	SMR	NGCC Plant	Combination
Workforce	Peak employment of 4,953 workers during construction and 494 operations workers (Section 7.2.3.1.9).	Bounded by that of the ALWR (Section 7.2.3.2.9).	Bounded by that of the ALWR; smaller peak construction workforce and shorter construction duration; smaller workforce during operations (Section 7.2.3.3.9).	NGCC: bounded by that of the NGCC alternative (Section 7.2.3.4.9) Solar and Wind: construction workforce small for a short duration; operational workforce would not have a quantifiable impact on the local economy (Section 7.2.3.4.9).

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 1 of 22)

Land Use	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Onsite land use Offsite land use
Termination of Operations and Decommissioning	**SMALL:** Temporary onsite land use changes during decommissioning are anticipated to be comparable to changes that occur during construction and operations and would not require additional land. Temporary changes in onsite land use would not change the fundamental use of the reactor site. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL (construction):** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. Expansion converts 400 acres including 154 acres of prime farmland (a small fraction of the prime farmland in the surrounding area). **SMALL to MODERATE (operations):** BDTF would deposit salt to the surrounding area, potentially affecting offsite residential properties.
SMR	**SMALL (construction):** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. Conversion BDTF acreage including up to 154 acres of prime farmland (a small fraction of the prime farmland in the surrounding area). **SMALL to MODERATE (operations):** BDTF would deposit salt to the surrounding area, potentially affecting offsite residential properties.
NGCC Plant	**SMALL:** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. The land requirement for the NGCC plant would be less than potentially allowing the plant and MDCTs to be located within the 123-acre area supporting construction of the existing units. A short natural gas pipeline would have to be installed onsite to connect to the existing natural gas transmission line located along the CPNPP's EAB. The development of the BDTF (smaller than for the ALWR alternative) would convert land including prime farmland to industrial use.
Combination	**MODERATE:** NGCC component bounded by NGCC plant alternative above. Solar land use would be approximately three 2,000-acre sites converted to power generation and wind would be a permanent footprint of 444 acres. Transmission connections would be additional acreage.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 2 of 22)

Visual Resources	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for aesthetic impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized and reduced with implementation of BMPs. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Development of the BDTF along the southern boundary would be adjacent to an existing residential area; the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
SMR	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Development of the BDTF along the southern boundary would be adjacent to an existing residential area; the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
NGCC Plant	**SMALL (plant):** The visual resources impact for the NGCC units and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area, the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
Combination	**SMALL to MODERATE:** NGCC component same as for NGCC plant alternative above**.** Site selection would seek to minimize visual impacts and site selection would avoid impacting scenic areas for the solar and wind installations. PV panels could be visible to the public. The turbines would have obstruction lighting.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 3 of 22)

Air Quality	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Air quality impacts (all plants) Air quality effects of transmission lines
Termination of Operations and Decommissioning	**SMALL:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction impacts would be temporary; operational impacts and emissions being maintained within federal and state regulatory limits.
SMR	**SMALL:** Construction impacts would be temporary; operational impacts would be minor, and emissions being maintained within federal and state regulatory limits.
NGCC Plant	**SMALL** (construction): Construction impacts would be temporary. Emissions being maintained within state regulatory limits. **MODERATE** (operations): The NGCC plant would be a major source of criteria pollutants and GHGs. Annual emission estimates during the operations period based on EPA emission factors are presented in Table 7.2-1.
Combination	**SMALL** (construction): Construction impacts would be temporary. Emissions being maintained within state regulatory limits. **MODERATE** (operations): The NGCC plant would be a major source of criteria pollutants and GHGs. Annual emission estimates during the operations period based on EPA emission factors are presented in Table 7.2-1. The solar and wind installations would not release any air emissions during operation.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 4 of 22)

Noise	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for noise impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** During decommissioning, noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning to reduce noise. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
SMR	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
NGCC Plant	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
Combination	**SMALL to MODERATE (construction):** NGCC component same as for NGCC plant alternative above. Noise impacts from land clearing for solar and the number of turbines that would need to be installed, would range from SMALL to MODERATE dependent on proximity to sensitive receptors. **SMALL (operations):** NGCC component same as for NGCC plant alternative above. During operations, the wind turbines would emit sound. No health impacts from the sound would occur from operation of the solar installations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 5 of 22)

Geology and Soils	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for geology and soils in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
SMR	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
NGCC Plant	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Combination	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 6 of 22)

Surface Water	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Surface water use and quality (non-cooling system impacts) Altered current patterns at intake and discharge structures Scouring caused by discharged cooling water Discharge of metals in cooling system effluent Discharge of biocides, sanitary waste, and minor chemical spills Surface water use conflicts (plants with once-through cooling systems) Temperature effects on sediment transport capacity
Termination of Operations and Decommissioning	**SMALL:** The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. Modeling indicates decreases in the time that both Lake Granbury and Possum Kingdom Lake is at full pool and changes to flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable. The ALWR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 7 of 22)

Surface Water	
SMR	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. Modeling indicates decreases the time that both Lake Granbury and Possum Kingdom Lake is at full pool and changes to flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable. The SMR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality.
NGCC Plant	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. The NGCC plant would consume approximately 6,100 gpm. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable.
Combination	**SMALL (construction) and SMALL to MODERATE (operations) (NGCC):** NGCC component same as for NGCC plant alternative above**.** **SMALL (solar and wind)**: Water needs would be met in compliance with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar and wind installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 8 of 22)

Groundwater	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for groundwater contamination and use (non-cooling system impacts); groundwater use conflicts (plants that withdraw less than 100 gpm); and groundwater quality degradation resulting from water withdrawals in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. **SMALL** (radionuclides released to groundwater): Tritium has been detected in the groundwater monitoring wells with current measurements being well below the safe drinking water standard. No unplanned liquid or gaseous radioactive releases have occurred at CPNPP 2016–2020.
Termination of Operations and Decommissioning	**SMALL:** Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC 2013a)
ALWR	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
SMR	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
NGCC Plant	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
Combination	**SMALL:** NGCC component same as for NGCC plant alternative above**.** Water needs for the solar and wind installations would be met in compliance with any required water withdrawal permits and applicable regulations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 22)

Terrestrial	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Exposure of terrestrial organisms to radionuclides Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) Bird collisions with plant structures and transmission lines Transmission line ROW management impacts on terrestrial resources Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) **SMALL** (effects on terrestrial resources, non-cooling system impacts): Adequate management programs and regulatory controls in place to protect onsite important terrestrial ecosystems.
Termination of Operations and Decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the protected area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL to MODERATE:** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of 445 acres of natural terrestrial habitat, approximately 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on developed land.
SMR	**SMALL to MODERATE:** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of natural terrestrial habitat, less than 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 10 of 22)

Terrestrial	
NGCC Plant	**SMALL to MODERATE (construction):** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of natural terrestrial habitat, less than 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat.
Combination	**SMALL to MODERATE:** NGCC component bounded by the NGCC plant alternative above. The large land requirement for offsite solar and wind installations could impact terrestrial habitats; however, site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species. Following USFWS and guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 11 of 22)

Aquatic	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Entrainment of phytoplankton and zooplankton (all plants) Infrequently reported thermal impacts (all plants) Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication Effects of nonradiological contaminants on aquatic organisms Exposure of aquatic organisms to radionuclides Effects on aquatic resources (non-cooling system impacts) Impacts of transmission line ROW management on aquatic resources Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses **SMALL** (impingement and entrainment of aquatic organisms, plants with once-through cooling systems or cooling ponds): SCR was designated as a CCRS and considered the BTA for impingement determined by TCEQ. **SMALL** (thermal impacts on aquatic organisms, plants with once-through cooling systems or cooling ponds): The species present in the SCR are adapted to warmer water and continued stocking of sport fishes maintains the aquatic community near CPNPP. The thermal discharge likely has little long-term impact on the aquatic community of SCR. CPNPP is operating in conformance with its TPDES permit.
Termination of Operations and Decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC 2013a, Section 4.12.2.1)

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 22)

Aquatic	
ALWR	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
SMR	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
NGCC Plant	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
Combination	**SMALL:** NGCC plant component of the combination alternative would be similar to those associated with the NGCC plant alternative but requiring about 40 percent less intake and discharge volume. No impacts to aquatic resources would result from the construction of the solar and wind components of the combination alternative due to the implementation of BMPs to control erosion and run-off. No operations-related impacts are associated with the solar and wind components of the combination alternative.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 22)

Special Status Species	
Proposed Action	**NO EFFECT:** No LR-related refurbishment or other LR-related construction activities have been identified. Administrative controls are in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. The proposed LR would have no effect on protected species.
Termination of Operations and Decommissioning	**Site Specific:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning and the presence or absence of special status species and habitats when the alternative is implemented. (NRC 2013a, Section 4.12.2.1)
ALWR	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of approximately 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site, which is potentially suitable habitat for the federally listed golden-cheeked warbler. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.
SMR	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of Ashe juniper woodland-savanna terrestrial habitat which is potentially suitable habitat for the federally listed golden-cheeked warbler. Clearing would be less than 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.
NGCC Plant	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of Ashe juniper woodland-savanna terrestrial habitat which is potentially suitable habitat for the federally listed golden-cheeked warbler. Clearing would be less than 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 14 of 22)

Special Status Species	
Combination	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** NGCC component bounded by that of the NGCC plant alternative above; the site selection process that would be used to select sites for the solar and wind installations would have criteria to avoid locations whose development would adversely impact special status species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 15 of 22)

Historic and Cultural Resources	
Proposed Action	**NO ADVERSE EFFECT:** No LR-related refurbishment or construction activities identified; administrative controls ensure protection of cultural resources in the event of excavation activities.
Termination of Operations and Decommissioning	**NO ADVERSE EFFECT:** The termination of nuclear plant operations would not affect historic or cultural resources. The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC 2013a, Section 4.12.2.1)
ALWR	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
SMR	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
NGCC Plant	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
Combination	**NO EFFECT to ADVERSE EFFECT:** NGCC component same as for NGCC plant alternative above. Historic and archeological resources could be impacted by offsite solar and wind installations, depending on the site selected.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 16 of 22)

Socioeconomics	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Employment and income, recreation and tourism Tax revenues Community services and education Population and housing Transportation
Termination of Operations and Decommissioning	When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC 2002, Section 4.3.12). **MODERATE to LARGE:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of tax revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC 2013a, Section 4.12.2.1) The tax payments attributable to CPNPP provide a significant beneficial economic impact to Somervell County and its taxing jurisdictions. Therefore, the loss of jobs would affect a small percentage of the population, but the tax revenue loss would have a noticeable and potentially destabilizing impact on Somervell County. **SMALL**: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC 2002, Section 4.3.12.3 and 4.3.12.4)
ALWR	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). Economic impact of construction and operations employment would be MODERATE to LARGE in Somervell and Hood counties with the tax revenue impact to Somervell County being LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 17 of 22)

Socioeconomics	
SMR	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). The size of the construction workforce and duration of construction could be less than that of the ALWR option. Economic impact of construction and operations employment would be MODERATE to LARGE in Somervell and Hood counties with the tax revenue impact to Somervell County being LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
NGCC Plant	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). The size of the construction workforce and duration of construction could be less than that of the ALWR option. Economic impact of construction and operations employment would be MODERATE in Somervell and Hood counties with the tax revenue impact to Somervell County being MODERATE to LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
Combination	**SMALL (other counties); MODERATE to LARGE (Somervell and Hood Counties):** NGCC component bounded by the NGCC plant alternative above. The jobs created to complete the construction of solar and wind installations would less than those needed for the NGCC plant. Construction could increase traffic on the roads but would be less than other alternatives. Very few employees are required for maintenance and operation of solar and wind installations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 18 of 22)

Human Health	
Proposed Action	**SMALL**: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Radiation exposures to the public Radiation exposures to plant workers Human health impact from chemicals Microbiological hazards to plant workers Physical occupational hazards **SMALL** (microbiological hazards to the public [plants with cooling ponds or canals or cooling towers that discharge to a river]): SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri* and lake conditions along with restricting access to the discharge area and not allowing swimming would further reduce the risk of *N. fowleri* infection. These conditions would also reduce the risk of infection from other human pathogens. **SMALL** (electric shock hazards): In-scope transmission lines are located entirely within CPNPP's OCA and comply with current NESC clearance standards. Vistra OpCo also has procedures in place to review and control proposed structural changes to maintain compliance with the NESC clearance standards. Procedures govern the use of equipment near transmission lines to maintain adequate distance to prevent electrical shock.
Termination of Operations and Decommissioning	**SMALL:** The human health impacts from physical, chemical, and microbiological hazards during the termination of plant operations and decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.
SMR	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 19 of 22)

Human Health	
NGCC Plant	**SMALL (construction); SMALL to MODERATE (operations):** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact on construction workers due to working in proximity to CPNPP would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants that can create health problems. Technology will be installed to limit the criteria air pollutant releases.
Combination	**SMALL (construction); SMALL to MODERATE (operations):** Compliance with OSHA worker protection rules would control impacts on workers from construction activities. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF and wind turbines sound is considered a nuisance rather than harmful to human health. The radiological human health impact on construction workers due to working in proximity to CPNPP would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants that can create health problems. Technology will be installed to limit the criteria air pollutant releases. The transmission lines for solar and wind installations would be designed in compliance with NESC clearance requirements to protect the public from electric shock.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 20 of 22)

Environmental Justice	
Proposed Action	**No disproportionately high and adverse impacts to minority and low-income populations:** The closest low-income and minority populations are 4.6 and 12 miles, respectively, from the CPNPP center point (Section 3.11.2). Based on known pathways, there are no expected disproportionately high and adverse impacts on minority or low-income populations from the proposed action (Section 4.10.1).
Termination of Operations and Decommissioning	Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC 2013a, Section 4.12.2). **Site Specific:** The determination of whether the minority or low-income populations are disproportionately highly and adversely impacted by facility decommissioning activities needs to be made on a site-by-site basis because their presence and their socioeconomic circumstances will be site specific (NRC 2002, Section 4.3.13.3).
ALWR	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations.
SMR	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations.
NGCC Plant	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations. The activities associated with an operating NGCC plant would be similar to those occurring at CPNPP with the exception of air emissions, which would be subject to permit and regulatory restrictions.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 21 of 22)

Environmental Justice	
Combination	**No disproportionately high and adverse impacts to minority and low-income populations:** NGCC component same as for NGCC plant alternative above. Impacts during construction of and wind installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Potential impacts on minority and low-income populations from the construction of solar and wind components of the combination alternative would primarily result from socioeconomic effects. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under the combination alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 22 of 22)

Waste Management	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Low-level waste storage and disposal Onsite storage of spent nuclear fuel Offsite radiological impacts of spent nuclear fuel and high-level waste disposal Mixed waste storage and disposal Nonradioactive waste storage and disposal
Termination of Operations and Decommissioning	**SMALL:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of low-level radioactive waste (LLRW), hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
SMR	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
NGCC Plant	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; spent selective catalytic reduction catalysts would make up the majority of the waste during operations; operations-related waste would be managed and recycled or disposed of at permitted offsite facilities.
Combination	**SMALL:** NGCC component same as for NGCC plant alternative above. Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.

9.0 STATUS OF COMPLIANCE

The environmental report shall list all federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by federal, state, regional, and local agencies having responsibilities for environmental protection [10 CFR 51.45 (d)].

9.1 CPNPP Authorizations

Table 9.1-1 provides a summary of the authorizations held by CPNPP for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, through the proposed LR operating term given their respective renewal schedules. Table 9.1-2 lists additional environmental authorizations and consultations related to the renewal of CPNPP Units 1 and 2 OLs.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 1 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
NRC	Atomic Energy Act [10 CFR Part 50]	CPNPP License to Operate Unit 1	NPF-87	Issued: 4/17/1990 Expires: 2/8/2030	Operation of CPNPP Unit 1.
NRC	Atomic Energy Act [10 CFR Part 50]	CPNPP License to Operate Unit 2	NPF-89	Issued: 4/6/1993 Expires: 2/2/2033	Operation of CPNPP Unit 2.
NRC	Atomic Energy Act [10 CFR Part 72]	General license for storage of spent fuel at power reactor sites	General Permit	N/A	Storage of power reactor spent fuel and other associated radioactive materials in an ISFSI.
DOT	[49 CFR Part 107, Subpart G]; 49 USC 5108	Registration	060921550098D	Issued: 7/1/2021 Expires: 6/30/2022 (Renewed annually)	Hazardous material shipments.
EPA	Federal Resource Conservation and Recovery Act [42 USC 6912]	Hazardous waste generator number	TXD020332078	N/A	Hazardous waste generator registration is managed under TCEQ Permit 33306.
EPA/TCEQ	Clean Water Act, Section 401	Certification of water quality standards	N/A	N/A (Valid through the extended licensing period)	Discharge into waters of the U.S.
Texas General Land Office (TGLO)	Coastal Management Zone Act [16 USC 1456 Section 307(c)3(A)]	Consistency determination with the TX Coastal Management Program	N/A	N/A	CPNPP is not located in the TX coastal zone.
TCEQ	30 TAC 335	Industrial and hazardous solid waste generators registration	33306	Initial Registration: 2/14/1986 Last Amendment: 9/25/2019	Industrial waste and hazardous waste generators state registration.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 2 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
TCEQ	30 TAC 116	Air quality permit/Stationary Source permit to operate	19225	Issued: 9/26/2014 Expires: 9/26/2024	Operation of emergency diesel generators, auxiliary boiler, and diesel fire water pumps.
TCEQ	Section 402 CWA; Texas Water Code Chapter 26; 40 CFR Part 423	Industrial wastewater facility permit (TPDES)	WQ0001854000	Issued: 10/7/2019 Expires: 10/7/2024	Wastewater treatment and effluent disposal. State implementation of NPDES.
TCEQ	Texas Water Code Chapter 26	Industrial stormwater permit	TXR05DA67	Issued: 11/10/2016 Expires: 8/14/2026	Permit for stormwater discharge associated with industrial activity.
TCEQ	Section 402 CWA; Texas Water Code Chapter 26	TPDES general permit	TXR050000	Effective: 8/14/2021 Expires: 8/14/2026	Multi-sector industrial general permit for stormwater
TCEQ	Section 402 CWA; Texas Water Code Section 26.050	Construction stormwater general permit	TXR150000	Effective: 3/5/2018 Expires: 3/5/2023	General permit under the TPDES for stormwater discharges associated with construction.
TCEQ	40 CFR 280; 30 TAC 334	Underground storage tank registration	No registration numbers required	N/A – Exempt under TAC 334.3(a)(9)	Operation of underground storage tanks.
TCEQ	30 TAC 334	Aboveground storage tank registration	No registration numbers required	N/A – Exempt under TAC 334.123(a)(9)	Operation of aboveground storage tanks.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 3 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
TCEQ	Texas Health and Safety Code Chapter 361; Texas Water Code Chapter 26	Industrial and hazardous waste permit	50356	Originally issued: 2/14/1997 Renewal/Minor Amendment: 9/25/2019 10-year permit renewal date: 9/25/2029	Post-closure care of onsite hazardous or industrial waste landfills.
Texas Water Commission (TWC)	Water rights in the Brazos II River segment of the Brazos River	Certificate of adjudication of water rights	12-4097	Issued: 2/28/1986	Authority to appropriate waters of the State of Texas in the Brazos II River basin.
BRA	Contract water	Contract	-	Renewal Agreement 08-26-2016 (Term 9-1-2016 through 8-31-2066)	BRA Renewal Agreement

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[(a)] (Sheet 1 of 3)

Agency	Authority	Requirement	Remarks
NRC	Atomic Energy Act [42 USC 2011 *et seq.*]	License renewal	Applicant for federal license must submit an ER in support of a license renewal application.
USFWS	Endangered Species Act, Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, regarding federally protected species.
TPWD	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Applicant may consult with state agency to support a timely and thorough review of potential impacts to threatened and endangered species and important habitats.
TCEQ	Clean Water Act, Section 401 [33 USC 1341]	Certification	Requires state certification that proposed action would comply with CWA standards.
TX Department of State Health Services	10 CFR 51, Subpart A; Regulatory Guide 4.2, Revision 1, Supplement 1, Section 3.9	Consultation	Applicant should consult the State agency responsible for environmental health regarding the potential existence and concentration of microorganisms in the receiving waters for plant cooling water discharge.
TX Historical Commission	National Historic Preservation Act, Section 106 [54 USC 306108]	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO.
Apache Tribe of Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with tribal historic preservation officer (THPO).
Comanche Nation, Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Coushatta Tribe of Louisiana	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Delaware Nation, Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[a] (Sheet 2 of 3)

Agency	Authority	Requirement	Remarks
Tonkawa Tribe of Indians of Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Wichita and Affiliated Tribes (Wichita, Keechi, Waco, and Tawakoni), Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Alabama-Coushatta Tribe of Texas[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Alabama-Quassarte Tribal Town	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Caddo Nation[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Cherokee Nation of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kialegee Tribal Town[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kickapoo Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kiowa Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Mescalero Apache Tribe[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Quapaw Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Seminole Nation of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[a] (Sheet 3 of 3)

Agency	Authority	Requirement	Remarks
Thlopthlocco Tribal Town[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Tunica-Biloxi Tribe[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
United Keetoowah Band of Cherokee Indians[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

a. Vistra OpCo also reached out to various local agencies not listed in this table.

b. THC notes that this list of tribes has known interests in Texas, but an area of interest map is not available at this time. The THC recommends contacting these tribes directly for areas of interest.

9.2 Status of Compliance

CPNPP has established control measures to ensure compliance with the authorizations listed in Table 9.1-1, including monitoring, reporting, and operating within specified limits. CPNPP environmental compliance coordinators are primarily responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with environmental programs are submitted to appropriate agencies as specified in the permits and/or governing regulations.

9.3 Notices of Violations

Based on a review of records of various environmental programs and permits that CPNPP is subject to and complies with over the 5-year period from 2016–2020, there have been two NOVs issued to the facility by federal (i.e., agencies other than the NRC), state, or local regulatory agencies. As discussed in Section 3.6.1.6, both NOVs were issued by the TCEQ and associated with CPNPP wastewater discharge to receiving surface waters.

The first NOV was for not running duplicate analysis each day an *Escherichia coli* (*E. coli*) sample was analyzed for Outfall 3 in October 2018 and July 2020 per 30 TAC 319.6. A revised *E. coli* analysis data sheet was provided that included duplicated analysis. The collected *E. coli* samples were not being diluted and therefore didn't require blank analysis at the time. The NOV was resolved in January 2021 and no further action was required.

The second NOV was for the failure to calibrate the Onsite Sanitary Wastewater Treatment Facility flow meter at least annually to ensure accuracy per 30 TAC 305.125(1). The flow meter was last calibrated on April 10, 2019. The violation was resolved by calibrating the flow meter on June 2, 2020. The NOV was resolved in January 2021 and no further action was required.

9.4 Remediation Activities

No unplanned radioactive liquid or gaseous releases were reported between 2016 and 2020. However, a courtesy notification was made to the TCEQ on November 29, 2021, for an inadvertent release of tritium which occurred November 6, 2021. As discussed in Section 3.6.4.2.1, over 100 gallons of a demineralized water/resin mixture containing tritium was released, but the amount of tritium within the mixture was established to be below reportable quantities. The released material was excavated and disposed via normal processes to a Class I landfill, and the resin/water mixture that was recoverable was collected and placed in the dewatering area that discharges to Outfall 004.

Prior to 2016, a tritium release occurred in 2013 from a leaking LVW line, and again in 2015 when treated SCR water containing tritium leaked through the FWST lining. As discussed in Section 3.6.4.2.1, these leaks were repaired in 2016 and 2017 respectively, and there was no requirement for notification to the NRC or local officials and no requirement for remediation.

CPNPP Landfills 1 and 2 were used during construction and found to have contained RCRA-listed chemicals. Landfill 1 was closed on March 23, 1993, and Landfill 2 on December 22, 1992. In accordance with post-closure care and remediation procedures described in CPNPP's hazardous waste permit No. 50356, a post-closure detection monitoring program was put in place to assess the potential impact to groundwater from the landfills and wells were subsequently installed as part of the closure. CPNPP is in the 27th year of the 30-year post-closure care period for Landfill 1, and the 28th year for Landfill 2. Annual groundwater reports are submitted in accordance with the reporting requirements set forth in Provision II.B.10 and VI.G of the permit.

9.5 Federal, State, and Local Regulatory Standards: Discussion of Compliance

This section contains information regarding environmental programs identified in the 2013 GEIS that may or may not be applicable to the site, and current status of compliance with each program.

9.5.1 Atomic Energy Act

9.5.1.1 Radioactive Waste

As discussed in Section 2.2.6, CPNPP has radioactive waste stream handling and shipping procedures. As a generator of both LLRW and spent fuel, CPNPP is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendment Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

9.5.2 Clean Air Act

9.5.2.1 Air Permit

CPNPP has a permit to operate an auxiliary boiler, emergency diesel generators, and diesel fire water pumps (Table 9.1-1). Operation of these air emission sources is maintained within the emission, opacity, fuel sulfur content, volatile organic compounds, and fuel usage (as applicable) limits established in the station air permit issued by the TCEQ. As required by the air permit, records of compliance are kept and available to the TCEQ and EPA upon request and sampling is conducted as required. All other emission-generating equipment not detailed in the air permit comply with Permit by Rule (PBR) per 30 TAC 106. Based on review of the previous 5-year period (2016–2020), CPNPP has had no NOVs and is in compliance with this permit.

9.5.2.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

CPNPP is subject to the risk management plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals (chlorine and hydrogen) present onsite are equal to or exceed the threshold quantities specified in 40 CFR 68.130. CPNPP has a hazardous waste contingency and emergency procedures plan in place that supplements the existing SPCC plan and addresses required contingency planning and emergency procedures for hazardous waste.

9.5.2.3 Stratospheric Ozone [40 CFR Part 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Section 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. CPNPP is in compliance with Section 608 of the CAA as amended in 1990 and the implementing regulations codified in the regulations. Vistra OpCo tracks refrigerant usage to comply with 40 CFR 82.166. Because motor vehicle air conditioners are not serviced onsite, Section 609 of the CAA is not applicable.

9.5.3 Clean Water Act

9.5.3.1 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license to conduct an activity that might result in discharge into navigable waters to provide the licensing agency with either a waiver from the state or a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341]. The Texas Water Quality Board (TCEQ predecessor agency) issued a 401 certification to CPNPP on March 1, 1974. CPNPP initiated consultation with the TCEQ concerning the existing certification and received confirmation on March 12, 2021, that the 401 certification remains valid for the extended licensing period. (Attachment B)

9.5.3.2 TPDES Permit

CPNPP permit No. WQ0001854000 (Table 9.1-1), issued by the TCEQ, authorizes the discharge of once-through cooling water, process water, and stormwater into state waters. As discussed in Section 3.6.1.2, the TPDES permit authorizes discharge from five outfalls (three internal and two external) and requires monitoring of water quality and effluent limits. Plant effluent is discharged to the SCR.

9.5.3.3 Industrial Stormwater Discharge

As discussed in Section 3.6.1.3, stormwater discharges associated with CPNPP industrial activities are regulated and controlled through the terms and conditions imposed by TPDES stormwater multi-sector general permit No. TXR050000, authorization number TXR05DA67. CPNPP implements and maintains a SWPPP. The SWPPP identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharge. CPNPP is in compliance with the terms and conditions of the TPDES permit as it relates to the stormwater program. (TCEQ 2021c)

9.5.3.4 Sanitary Wastewater

As presented in Section 3.6.1.4, sanitary waste is managed at an onsite sanitary wastewater treatment facility prior to discharging to the SCR through Outfall 003. Discharge of treated wastewater from CPNPP is regulated by TPDES permit No. WQ0001854000. CPNPP operates in compliance with the permit's requirements (TCEQ 2021c).

9.5.3.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement a SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. CPNPP is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities utilized at the station to minimize the frequency and severity of oil spills to meet the requirements of this rule. CPNPP also has nonradioactive spill response procedures as part of the station instruction and station administration manuals that identifies site personnel responsibilities and response protocols for spills or releases of regulated materials.

9.5.3.6 Reportable Spills [40 CFR Part 110]

CPNPP is subject to the reporting provision of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the federal Water Pollution and Control Act. Any discharge of oil in such quantities that may be harmful to the public health or welfare, or the environment must be reported to the EPA's national response center. Based on a review of site records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

9.5.3.7 Reportable Spills [30 TAC 327]

CPNPP is subject to the reporting provision of Texas Administrative Code 30 TAC 327. This reporting provision requires that any release of oil, petroleum product, used oil, hazardous substances, industrial solid waste, or other substances into the environment in a quantity equal to or greater than reportable quantity listed in Section 327.4 is to be reported within 24 hours to the TCEQ regional office, the state emergency response center, and the State of Texas 24-hour spill reporting hotline, followed by cleanup and remediation. (TCEQ 2021d) Based on review of records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

As discussed in Section 3.6.4.2.2, there was a courtesy notification made to the TCEQ for a mineral oil release from a Unit 2 transformer fire on June 7, 2021. The spill cleanup was completed by June 11, 2021. The TCEQ confirmed that the amount of oil spilled was below reportable limits and noted appreciation for CPNPP's notification and compliance efforts to ensure protection of the State's environment.

9.5.3.8 Facility Response Plan

CPNPP is not subject to the facility response plan risk requirements described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than 1 MG.

9.5.3.9 Section 404 Permit

Currently, CPNPP does not have any Section 404 permits in place because, as discussed in Section 3.6.1.5, CPNPP does not have any dredge and fill activities, and none are anticipated. However, CPNPP would comply with regulatory requirements imposed by the USACE under Section 404 of the CWA as it relates to performing future activities in federal jurisdictional waters when appropriate.

9.5.4 Safe Drinking Water Act

As discussed in Section 2.2.3.4, potable water for the plant and associated support structures and buildings for Units 1 and 2 is supplied by the SCWD PWS. CPNPP had one active groundwater well registered with the TCEQ that was used for potable and sanitary purposes at the recreation training facility (TCEQ 2021e). However, as discussed in Section 3.6.3.2, that well was deactivated on August 24, 2021. CPNPP no longer operates a non-transient non-community waterworks and is therefore no longer subject to the requirements of the Safe Drinking Water Act.

9.5.5 Endangered Species Act

Potential impacts on federally and state-listed species were considered in CPNPP's review and analysis in Section 4.6, and it was concluded that none would be affected as a result of LR.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered, or threatened. Depending on the action involved, the ESA requires consultation with the USFWS and with the NOAA Fisheries if marine or anadromous species could be affected. CPNPP has invited comment from the USFWS during the development of this ER, and the consultation letter submitted to the USFWS, and their response is provided in Attachment C. A more structured process with this agency may be initiated by the NRC per Section 7 of the ESA.

9.5.6 Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. CPNPP adheres to the MBTA but does not currently hold any MBTA-related permits.

9.5.7 Bald and Golden Eagle Protection Act

The BGEPA prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. As discussed in Section 3.7.8.3, bald eagles are not known to nest on the CPNPP site; however, activities on the CPNPP site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted. There are currently no BGEPA permitting requirements associated with CPNPP operation.

9.5.8 Magnuson-Stevens Fishery Conservation and Management Act

As discussed in Section 3.7.8.5, there was no EFH identified during the review of NOAA's EFH data. Though CPNPP sits on the SCR, enclosed freshwater habitats are not considered EFH areas by NOAA. Subsequently, no HAPC or EFH areas protected from fishing are located on or adjacent to CPNPP. Therefore, there are no Magnuson-Stevenson Fishery Conservation and Management Act restrictions applicable to CPNPP operations.

9.5.9 Marine Mammal Protection Act

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens in high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with CPNPP.

9.5.10 Coastal Zone Management Act

The federal Coastal Zone Management Act (CZMA) [16 USC 1451 et seq.] imposes requirements on an applicant for a federal license to conduct an activity that could affect a state's coastal zone. The act requires an applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal management program [16 USC 1456(c)(3)(A)] and provide a copy to the state for concurrence. NOAA has promulgated implementation regulations indicating the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.541(b)(1)]. The regulation requires that the license applicant provides its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's Office of Nuclear Reactor Regulation has issued guidance to staff regarding compliance with the CZMA. This guidance acknowledges that Texas has an approved coastal zone management program. The Texas coastal zone is composed of all or portions of 18 coastal counties and does not include Hood or Somervell counties. (NRC 2013g) CPNPP received a letter from the TGLO confirming that the facility is located outside of the Texas zone and is not required to provide a Coastal Management Program consistency certification. (Attachment F).

9.5.11 National Historic Preservation Act

Section 106 of the NHPA [54 USC 300101 et seq.] requires federal agencies having the authority to license any undertaking, prior to issuing the license, to consider the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any SHPO to substitute state review for council review [35 CFR 800.7]. Although not required of an applicant by federal law or NRC regulation, to provide early consultation for the Section 106 process, Vistra OpCo contacted the THC for informal consultation concerning CPNPP LR and potential effects on cultural resources within the approximate 7,700-acre site and on historic properties within a 6-mile radius of CPNPP. The THC issued a letter on May 27, 2021, confirming that there are no historic resources present or affected by the proposed license renewal, and that there are no anticipated changes to use or construction plans that may alter these resources. Therefore, the THC's determination of "no historic properties affected" will continue to apply (Attachment D). Native American groups recognized as potential stakeholders were also consulted by Vistra OpCo with the opportunity for comment (Attachment D). Furthermore, as discussed in Section 4.7.4.2, although no license renewal-related ground-disturbing activities have been identified, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant.

9.5.12 Resource Conservation and Recovery Act

9.5.12.1 Nonradioactive Wastes

As a generator of hazardous wastes, CPNPP is subject to and complies with RCRA and specific TCEQ regulation contained in 30 TAC Chapter 335. CPNPP is classified as a small quantity generator of hazardous waste; therefore, hazardous waste routinely makes up only a small percentage of the total waste generated. As a generator of hazardous waste, CPNPP also maintains a hazardous waste generator identification number (Table 9.1-1).

As described in Section 9.4, there is a 30-year post closure care permit (#50356) and associated programs in place to monitor for potential impacts to groundwater from two landfills that were closed in 1992 and 1993. CPNPP received two notices of deficiency (NODs) from the TCEQ for the years 2016 through 2020. The first NOD was received June 28, 2017, for reporting deficiencies in the annual groundwater report, and the second was received October 17, 2018, for administrative deficiencies found in the permit renewal/minor amendment application. CPNPP provided responses to the TCEQ for both NODs, which satisfactorily resolved the deficiencies.

9.5.12.2 Reportable Spills [40 CFR Part 262]

CPNPP is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(c) as it relates to a fire, explosion, or other release of hazardous waste which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the EPA's national response center. Based on a review of records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

9.5.12.3 Mixed Wastes

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. Management of radioactive waste at CPNPP is discussed in Section 2.2.6. CPNPP's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any NOVs for the 2016–2020 timeframe. CPNPP will continue to store and dispose of hazardous and non-hazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed LR operating term.

9.5.12.4 Underground and Aboveground Storage Tanks [30 TAC Chapter 334]

CPNPP has four 102,000-gallon diesel storage tanks. The tanks do not meet the requirement to be registered as aboveground or underground storage tanks and are exempt from registration with the TCEQ based on 30 TAC 334.3. However, CPNPP does perform inspections and testing of USTs and ASTs as required by 40 CFR Part 112 to comply with SPCC requirements.

9.5.13 Pollution Prevention Act

In accordance with RCRA Section 2002(b) and 40 CFR 262.27, a small or large quantity generator must certify that there is a waste minimization program in place to reduce the volume and toxicity of the waste generated to the degree determined to be economically practical. CPNPP, per the Waste Reduction Policy Act of 1991, complies with 30 TAC 335.473 requirement to have a current P2 plan and has a P2 plan in place to minimize hazardous waste generated to specified parameters detailed.

9.5.14 Federal Insecticide, Fungicide, and Rodenticide Act

Commercially approved herbicides may be applied by a licensed contractor on an as-needed basis to control vegetation. Pesticides may also be applied inside buildings by a licensed contractor. Because only contractors who have obtained a license as specified in Texas statute 76.105 and Texas Administrative Code 4 TAC Chapter 7, Section 7.22 can conduct herbicide/pesticide applications onsite, CPNPP is in compliance with the requirements of these regulations.

9.5.15 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which may be present at CPNPP. CPNPP has been PCB-free since 1999 and is no longer required to maintain a PCB inventory or procedures. CPNPP's procedure STI-211.02 provides guidance for asbestos removal to ensure compliance with state and federal regulations. CPNPP is in compliance with the PCB and asbestos regulations applicable to the facility.

9.5.16 Hazardous Materials Transportation Act

Because CPNPP ships hazardous materials regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current hazardous materials certificate of registration (Table 9.1-1).

9.5.17 Emergency Planning and Community Right-to-Know Act

CPNPP is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act, which requires the submission of an emergency and hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response commission, and the local fire department. This report, which typically includes, but is not limited to, chemicals such as argon, ammonium molybdate, caustic soda, diesel fuel, battery fluid, liquid nitrogen, phosphoric acid, hydrazine, sodium hypochlorite, sulfuric acid, sodium hydroxide, and unleaded gasoline, is submitted to these agencies annually. CPNPP is in compliance with this regulation.

9.5.18 Comprehensive Environmental Response, Compensation, and Liability Act

CPNPP is subject to the hazardous substance release reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the EPA's national response center, TCEQ, and the state emergency response center as appropriate and subsequent written follow-up. Based on a review of records over the 5-year period, 2016–2020, there have been no releases at CPNPP that have triggered this notification requirement.

9.5.19 Farmland Protection Policy Act

The FPPA only applies to federal programs. The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and CPNPP is located on non-federal lands, the FPPA is not applicable.

9.5.20 Federal Aviation Act

Coordination with the FAA is required when it becomes necessary to ensure that the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exits or recommending project changes and/or the installation of warning devices such as lighting.

As presented in Section 3.2.3, the CPNPP site elevation is dominated by the approximately 266-foot-high reactor containment buildings. No LR-related construction activities have been identified; therefore, no new notifications to the FAA are required.

9.5.21 Occupational Safety and Health Act

The Occupational Safety and Health Act governs the occupational safety and health of the construction workers and operations staff. CPNPP and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices and governed through site policies and procedures.

9.5.22 State Water Use Program

As shown in Table 9.1-1, CPNPP has a Certificate of Adjudication (12-4097) approved by the TCEQ for water rights in the Brazos II River segment of the Brazos River basin. The certificate authorizes CPNPP to appropriate waters of the State of Texas in the Brazos River basin for use in cooling and auxiliary water systems from impoundments on Squaw Creek and Panther Creek. As discussed in Section 3.6.3.1, CPNPP also has an agreement with the BRA to withdraw supplemental water from Lake Granbury and/or Possum Kingdom Lake which are impoundments on the Brazos River.

9.5.23 County Zoning Requirements

CPNPP is located in unincorporated portions of Hood and Somervell counties, Texas. As discussed in Section 3.2.2, counties do not have the authority to pass ordinances or zoning regulations as such authority is retained by municipalities. The cities of Glen Rose (Somervell County) and Granbury (Hood County) have zoning laws in place to govern existing and future land uses and development. There are no land use or development regulations in place for unincorporated areas of Hood and Somervell counties. CPNPP is located outside the municipal boundary of the two cities, and therefore is not subject to zoning or development regulations.

9.6 Environmental Reviews

CPNPP has procedural controls in place to ensure all environmentally sensitive areas at CPNPP, if present, are adequately protected during site operation and project planning. These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, and waste management and P2, consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified, as necessary.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species; BMPs are implemented to minimize impacts to these species.

- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impacts to this resource.

In summary, CPNPP's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed, as necessary.

9.7 Alternatives

The discussion of alternatives in the environmental report shall include a discussion of whether alternatives will comply with such applicable environmental quality standards and requirements [10 CFR 51.45(d)].

No-action alternatives are discussed in Chapter 7. If the NRC does not issue a license renewal for CPNPP and one of the no-action alternatives were implemented, the alternate generating facilities could be constructed and operated to comply with applicable environmental quality standards and regulations. Continued compliant operation of CPNPP would avert the additional impacts from these alternate generating facilities.

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10.1 Figure References

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3.1-2	CPNPP Area Topography	USCB 2020
3.1-3	CPNPP Site and 6-Mile Radius	USCB 2020; USDOT 2020; USGS 2021a
3.1-4	CPNPP Site and 50-Mile Radius	USCB 2020; USDOT 2020; USGS 2021a
3.1-5	Federal, State, and Local Lands within a 6-Mile Radius of CPNPP	TPWD 2021; USCB 2020; USDA 2020; USDOT 2020
3.1-6	Federal, State, and Local Lands within a 50-Mile Radius of CPNPP	TPWD 2021; USACE 2021; USCB 2020; USDA 2020; USDOT 2020
3.2-1	Land Use/Land Cover, CPNPP Site	TNRIS 2020; USCB 2020
3.2-2	Land Use/Land Cover, 6-Mile Radius	TNRIS 2020; USCB 2020; USGS 2021a
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No.	Title	References
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3.5-3d	Cross-Section C-C'	
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3.7-2	NWI Wetlands on the CPNPP Site	USCB 2020; USDA 2020; USFWS 2020
3.8-1	USGS 1889 Granbury, Texas, Map	USGS 2020c

No.	Title	References
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3.11-16 through 3.11-18	EJ Figures (Low Income)	USCB 2020; USCB 2021; USCB 2022; USGS 2021

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Attachment A: NRC NEPA Issues for License Renewal

NRC NEPA Issues for License Renewal of Nuclear Power Plants

Comanche Peak Nuclear Power Plant Units 1 and 2 Environmental Report

NRC NEPA Issues for License Renewal of Nuclear Power Plants

Vistra Operations Company (Vistra OpCo) has prepared this environmental report (ER) for the license renewal of Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. The NRC included in the regulation the list of 78 National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR Part 51, Table B-1).

The following table lists the 78 issues from 10 CFR Part 51, Appendix B, Table B-1, and identifies the section in this ER in which Vistra OpCo addresses each issue.

Table A-1 CPNPP ER Cross-Reference of License Renewal NEPA Issues

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Land Use			
1	Onsite land use	1	4.1	4.2.1.1/4-6
2	Offsite land use	1	4.1	4.2.1.1/4-7
3	Offsite land use in transmission line rights-of-way	1	4.0.1	4.2.1.1/4-6
	Visual Resources			
4	Aesthetic impacts	1	4.1	4.2.1.2/4-9
	Air Quality			
5	Air quality (all plants)	1	4.2	4.3.1.1/4-14
6	Air quality effects of transmission lines	1	4.2	4.3.1.1/4-14
	Noise			
7	Noise impacts	1	4.3	4.3.1.2/4-19
	Geologic Impacts			
8	Geology and soils	1	4.4	4.4/4-29
	Surface Water Resources			
9	Surface water use and quality (non-cooling system impacts)	1	4.5	4.5.1.1/4-30
10	Altered current patterns at intake and discharge structures	1	4.5	4.5.1.1/4-36
11	Altered salinity gradients	1	4.0.1	4.5.1.1/4-36
12	Altered thermal stratification of lakes	1	4.5	4.5.1.1/4-37
13	Scouring caused by discharged cooling water	1	4.5	4.5.1.1/4-38
14	Discharge of metals in cooling system effluent	1	4.5	4.5.1.1/4-38
15	Discharge of biocides, sanitary wastes, and minor chemical spills	1	4.5	4.5.1.1/4-39
16	Surface water use conflicts (plants with once-through cooling systems)	1	4.5	4.5.1.1/4-40
17	Surface water use conflicts (plants with cooling ponds, or cooling towers using makeup water from a river)	2	4.5.1	4.5.1.1/4-41
18	Effects of dredging on surface water quality	1	4.5	4.5.1.1/4-42
19	Temperature effects on sediment transport capacity	1	4.5	4.5.1.1/4-43
	Groundwater Resources			
20	Groundwater contamination and use (non-cooling system impacts)	1	4.5	4.5.1.2/4-45
21	Groundwater use conflicts (plants that withdraw <100 gpm)	1	4.5	4.5.1.2/4-47

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
22	Groundwater use conflicts (plants that withdraw >100 gpm)	2	4.5.3	4.5.1.2/4-48
23	Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	2	4.5.2	4.5.1.2/4-48
24	Groundwater quality degradation resulting from water withdrawals	1	4.5	4.5.1.2/4-49
25	Groundwater quality degradation (plants with cooling ponds in salt marshes)	1	4.0.1	4.5.1.2/4-50
26	Groundwater quality degradation (plants with cooling ponds at inland sites)	2	4.5.4	4.5.1.2/4-51
27	Radionuclides released to groundwater	2	4.5.5	4.5.1.2/4-51
	Terrestrial Resources			
28	Effects on terrestrial resources (non-cooling system impacts)	2	4.6.5	4.6.1.1/4-59
29	Exposure of terrestrial organism to radionuclides	1	4.6	4.6.1.1/4-61
30	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	1	4.6	4.6.1.1/4-64
31	Cooling tower impacts on vegetation (plants with cooling towers)	1	4.0.1	4.6.1.1/4-69
32	Bird collisions with plant structures and transmission lines	1	4.6	4.6.1.1/4-70
33	Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	2	4.6.4	4.6.1.1/4-75
34	Transmission line ROW management impacts on terrestrial resources	1	4.6	4.6.1.1/4-75
35	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.6	4.6.1.1/4-80
	Aquatic Resources			
36	Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	4.6.1	4.6.1.2/4-87
37	Impingement and entrainment of aquatic organisms (plants with cooling towers)	1	4.0.1	4.6.1.2/4-92
38	Entrainment of phytoplankton and zooplankton (all plants)	1	4.6	4.6.1.2/4-93
39	Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	4.6.2	4.6.1.2/4-94

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
40	Thermal impacts on aquatic organisms (plants with cooling towers)	1	4.0.1	4.6.1.2/4-96
41	Infrequently reported thermal impacts (all plants)	1	4.6	4.6.1.2/4-97
42	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication	1	4.6	4.6.1.2/4-100
43	Effects of non-radiological contaminants on aquatic organisms	1	4.6	4.6.1.2/4-103
44	Exposure of aquatic organisms to radionuclides	1	4.6	4.6.1.2/4-105
45	Effect of dredging on aquatic organisms	1	4.6	4.6.1.2/4-107
46	Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	2	4.6.3	4.6.1.2/4-109
47	Effects on aquatic resources (non-cooling system impacts)	1	4.6	4.6.1.2/4-110
48	Impacts of transmission line ROW management on aquatic resources	1	4.6	4.6.1.2/4-112
49	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses	1	4.6	4.6.1.2/4-110
	Special Status Species and Habitats			
50	Threatened, endangered, and protected species and essential fish habitat	2	4.6.6	4.6.1.3/4-115
	Historic and Cultural Resources			
51	Historic and cultural resources	2	4.7	4.7.1/4-122
	Socioeconomics			
52	Employment and income, recreation and tourism	1	4.8	4.8.1.1/4-127
53	Tax revenues	1	4.8	4.8.1.1/4-128
54	Community services and education	1	4.8	4.8.1.1/4-129
55	Population and housing	1	4.8	4.8.1.1/4-130
56	Transportation	1	4.8	4.8.1.1/4-131
	Human Health			
57	Radiation exposures to the public	1	4.9	4.9.1.1.1/4-140
58	Radiation exposures to plant workers	1	4.9	4.9.1.1.1/4-136
59	Human health impacts from chemicals	1	4.9	4.9.1.1.2/4-147
60	Microbiological hazards to the public (plants that use cooling ponds, lake, or canals or that discharge to a river)[c]	2	4.9.1	4.9.1.1.3/4-149
61	Microbiological hazards to plant workers	1	4.9	4.9.1.1.3/4-149
62	Chronic effects of electromagnetic fields	UC	4.0.3	4.9.1.1.4/4-150
63	Physical occupational hazards	1	4.9	4.9.1.1.5/4-156
64	Electric shock hazards	2	4.9.2	4.9.1.1.5/4-156

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Postulated Accidents			
65	Design-basis accidents	1	4.15.1	4.9.1.2/4-158
66	Severe accidents	2	4.15.2	4.9.1.2/4-158
	Environmental Justice			
67	Minority and low-income populations	2	4.10.1	4.10.1/4-167
	Waste Management			
68	Low-level waste storage and disposal	1	4.11	4.11.1.1/4-171
69	Onsite storage of spent nuclear fuel	1	4.11	4.11.1.2/4-172
70	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	1	4.11	4.11.1.3/4-175
71	Mixed waste storage and disposal	1	4.11	4.11.1.4/4-178
72	Non-radioactive waste storage and disposal	1	4.11	4.11.1.5/4-179
	Cumulative Impacts			
73	Cumulative impacts	2	4.12	4.13/4-243
	Uranium Fuel Cycle			
74	Offsite radiological impacts–individual impacts from other than the disposal of spent fuel and high-level waste	1[d]	4.13	4.12.1.1/4-193
75	Offsite radiological impacts–collective impacts from other than the disposal of spent fuel and high-level waste	1	4.13	4.12.1.1/4-194
76	Non-radiological Impacts of the uranium fuel cycle	1	4.13	4.12.1.1/4-194
77	Transportation	1	4.13	4.12.1.1/4-196
	Termination of Nuclear Power Plant Operations and Decommissioning			
78	Termination of plant operations and decommissioning	1	4.14	4.12.2.1/4-201

a) 10 CFR 51, Subpart A, Appendix A, Table B-1 (issue numbers added to facilitate discussion).

b) Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Rev 1).

c) Wording from [10 CFR 51.53(c)(3)(ii)(G)].

d) SECY-14-0072 (July 21, 2014).

UC = uncategorized (categorization and impact finding definitions do not apply to the issue).

Attachment B: TPDES Permit

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100007
TXX-21001
February 2, 2021

Earl Lott, Director, Office of Water, MC-158
Texas Commission on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Lott:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is preparing an application for renewing the operating licenses for the two power generation units at our Comanche Peak Nuclear Power Plant (CPNPP) for an additional 20 years (see Table 1). Vistra OpCo is contacting the Texas Commission on Environmental Quality (TCEQ) because assistance is needed in assessing the impacts from continued operation during this renewed license period.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal applicant provide a certification or waiver pursuant to Clean Water Act Section 401. The license renewal application also includes an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The environmental report addresses the potential impact on air quality, water resources, terrestrial and aquatic ecology resources, and socioeconomics. To facilitate Vistra OpCo's preparation of the license renewal environmental report and an efficient and effective consultation process by the NRC, Vistra OpCo is contacting TCEQ early in the application process. The NRC may consult TCEQ regarding the license renewal and, in particular, the 401 certification.

CPNPP operates under its Texas Commission on Environmental Quality (TCEQ)-issued Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ000185400. CPNPP also operates under a general permit for industrial stormwater and TPDES General Permit No. TXR050000. The Atomic Energy Commission prepared Final Environmental Statement for CPNPP states that the Texas Water Quality Board (TCEQ predecessor agency) issued a water quality certification pursuant to Section 401 on March 1, 1974. This letter seeks TCEQ confirmation that CPNPP's 1974 certification remains valid for the extended license period.

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. Other than normal activities to maintain existing structures and operations, Vistra OpCo does not anticipate any ground-disturbing activities during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment activities in conjunction with license renewal, nor is the continued operation of CPNPP anticipated to adversely affect the environment or any cultural or historic resources.

Vistra OpCo is requesting TCEQ response to this letter confirming the authorization mentioned under Section 401. TCEQ input is requested by March 18, 2021. Vistra OpCo plans to contact TCEQ in a few weeks to request the scheduling of a virtual meeting to go over our request and answer any questions the TCEQ staff may have. Vistra OpCo plans to include this letter and any TCEQ response in the environmental report.

Vistra OpCo requests that TCEQ send their letter response to Randy Harding (see contact information below). Please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com) if you have any questions or comments.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

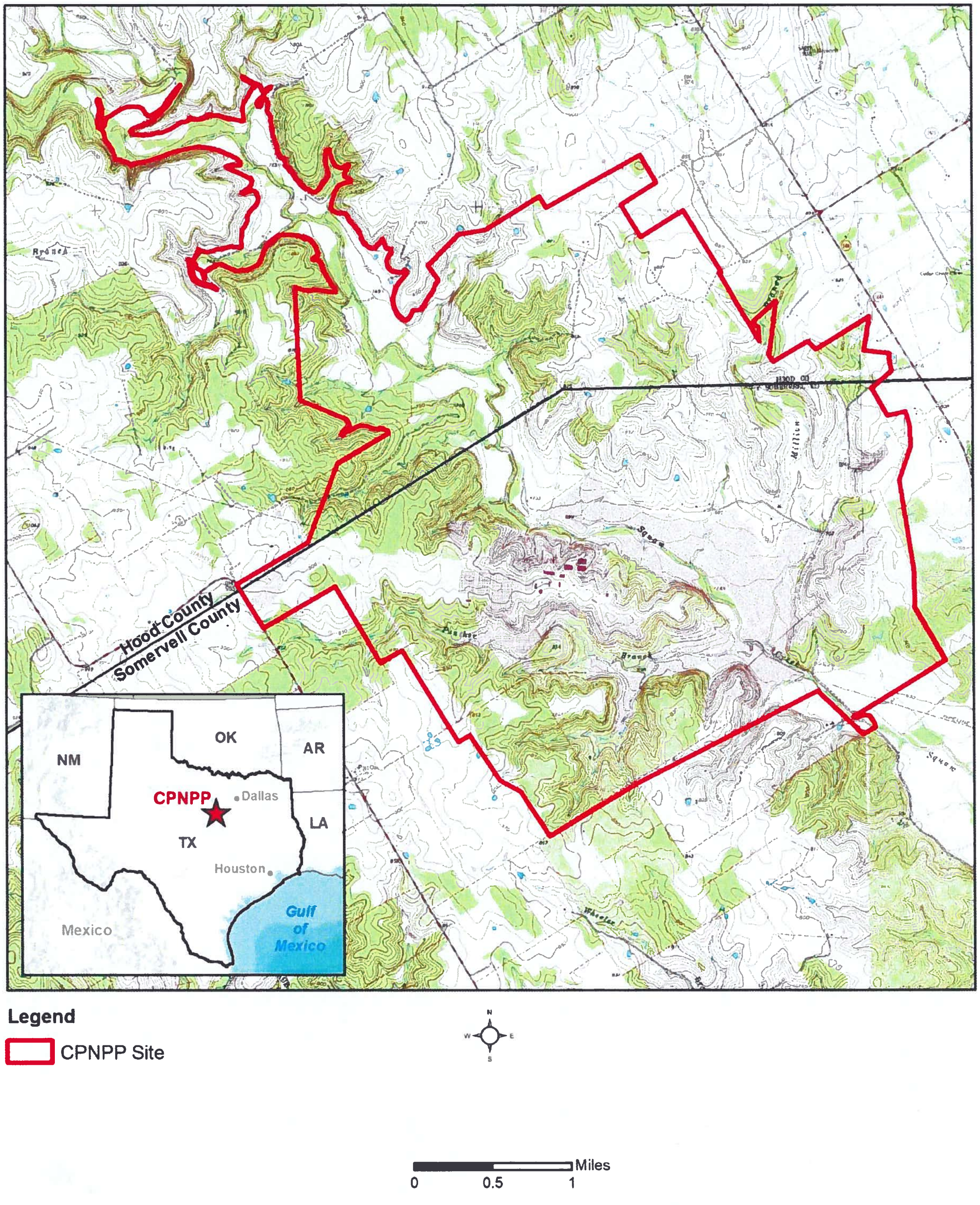
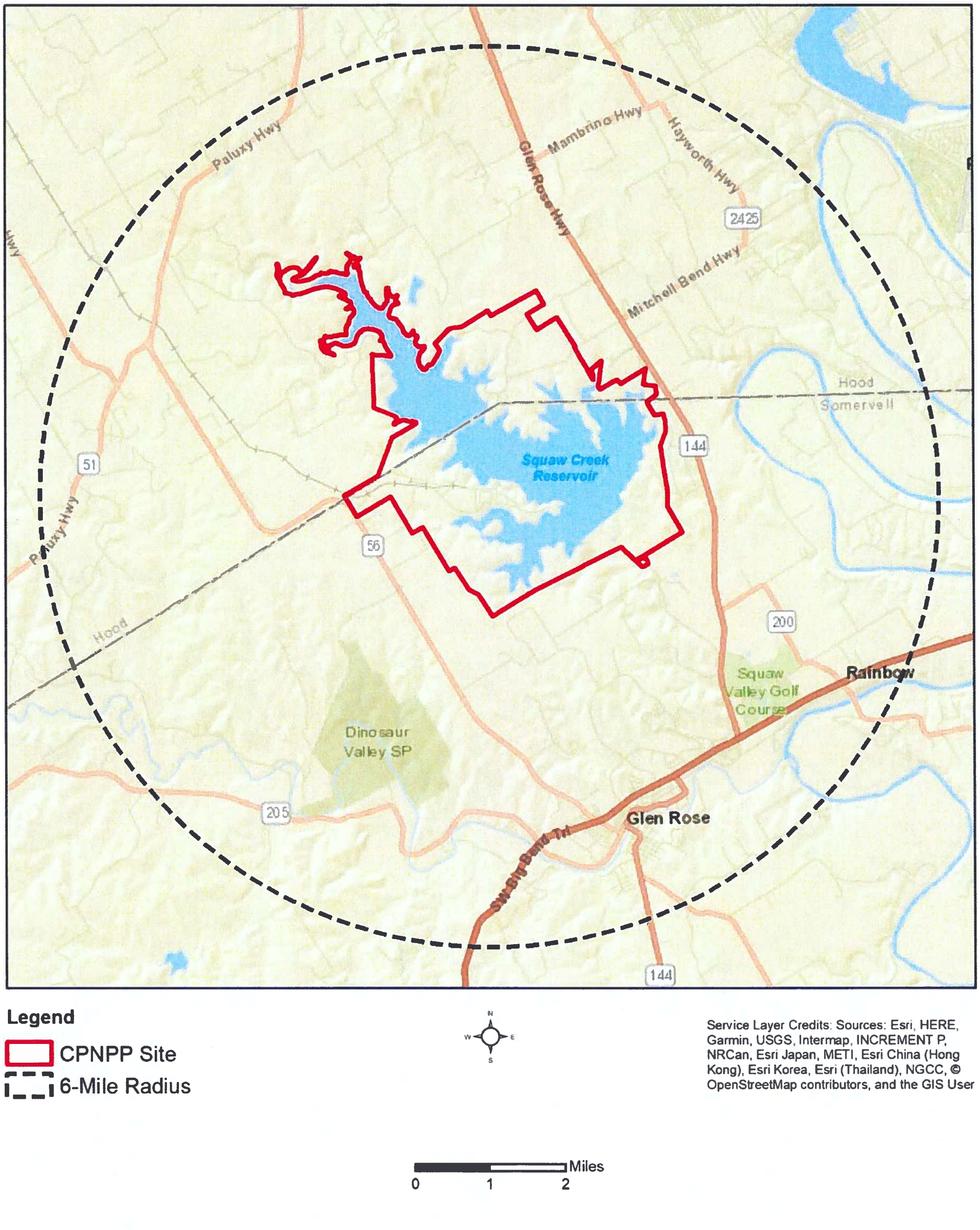


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



RECEIVED

MAR 17 2021

REGULATORY AFFAIRS

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

CP-202100146
MISC 21-028

February 26, 2021

Mr. Randy Harding, Environmental Consultant
Comanche Peak Nuclear Power Plant
6322 North FM 56 / E30
Glen Rose, Texas 76043

Re: 401 Certification of the Comanche Peak Nuclear Power Plant License Renewal

Dear Mr. Harding:

Thank you for your letter informing us of your preparations to renew the Comanche Peak Nuclear Power Plant (CPNPP) operating license with the U.S. Nuclear Regulatory Commission (NRC). The Water Quality Division of the Office of Water is responsible for conducting Section 401 water quality certification reviews of federal permits and licenses, and division staff are available to discuss with you and the NRC the 401 certification needs of the CPNPP license renewal.

Please contact Mr. Peter Schaefer, leader of the Standards Implementation Team in the Water Quality Division, to initiate the discussion and to schedule coordination meetings. Peter may be reached at 512-239-4372 or peter.schaefer@tceq.texas.gov.

Sincerely,

Earl Lott

Earl Lott, Director
Office of Water

GE/sea

CP-202100147
MISC 21-029

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 12, 2021

Mr. Randy Harding, Environmental Consultant
Comanche Peak Nuclear Power Plant
6322 North FM 56 / E30
Glen Rose, Texas 76043

Re: 401 Certification of the Comanche Peak Nuclear Power Plant License Renewal

Dear Mr. Harding:

Thank you for your letter informing us of your preparations to renew the Comanche Peak Nuclear Power Plant (CPNPP) operating license with the U.S. Nuclear Regulatory Commission (NRC). Your letter states that the Final Environmental Statement for CPNPP prepared by the Atomic Energy Commission states that the Texas Water Quality Board (TCEQ predecessor agency) issued a water quality certification pursuant to Section 401 of the Clean Water Act on March 1, 1974. Your letter seeks TCEQ confirmation that CPNPP's 1974 certification remains valid for the extended license period. The Water Quality Division of the Office of Water is responsible for conducting Section 401 water quality certification reviews of federal permits and confirms that the previous 401 water quality certification issued on March 1, 1974 remains valid.

If you have any questions or need further assistance, please contact Mr. Peter Schaefer, leader of the Standards Implementation Team in the Water Quality Division. Mr. Schaefer may be reached at 512-239-4372 or peter.schaefer@tceq.texas.gov.

Sincerely,

David W Galindo

David W. Galindo, Deputy Director
Water Quality Division
Texas Commission on Environmental Quality

DWG/PS

ccs: Mr. Gary Spicer, Luminant, via e-mail at gary.spicer@luminant.com
Mr. Steven Sewell, Luminant, via e-mail at steven.sewell@luminant.com
Mr. Todd Evans, Luminant, via e-mail at todd.evans@luminant.com

REC'D OCT 17 2019

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 14, 2019

Mr. James Burke, COO
Vistra Energy
1601 Bryan Street
Dallas, Texas 75201

Re: Comanche Peak Power Company LLC, TPDES Permit No. WQ0001854000 (CN605255884; RN103044053)

Dear Mr. Burke:

Enclosed is a copy of the above referenced water quality permit issued on behalf of the Executive Director pursuant to Chapter 26 of the Texas Water Code.

Self-reporting or Discharge Monitoring Forms and instructions will be forwarded to you from the Water Quality Management Information Systems Team so that you may comply with monitoring requirements. For existing facilities, revised forms will be forwarded if monitoring requirements have changed.

Enclosed is a "Notification of Completion of Wastewater Treatment Facilities" form. Use this form (if needed) when the facility begins to operate or goes into a new phase. The form notifies the agency when the proposed facility is completed or when it is placed in operation. This notification complies with the special provision incorporated into the permit, as applicable.

Should you have any questions, please contact Ms. Sarah A. Johnson, Ph.D. of the Texas Commission on Environmental Quality's (TCEQ) Wastewater Permitting Section at (512) 239-4671 or if by correspondence, include MC 148 in the letterhead address below.

Sincerely,

David W. Galindo, Director
Water Quality Division

DWG/SAJ/kb

cc: Mr. Ryan Bayle, P.G., Water Resources Coordinator, Luminant Generation Company LLC
6555 Sierra Drive, Irving, Texas 75039
Mr. Gary Spicer, Water and Waste Compliance Manager, Luminant Generation Company LLC
6555 Sierra Drive, Irving, Texas 75039

TPDES PERMIT NO.
WQ0001854000
[For TCEQ office use only - EPA I.D. No. TX0065854]

This renewal replaces TPDES Permit No. WQ0001854000, issued on December 21, 2015.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. Box 13087
Austin, Texas 78711-3087

PERMIT TO DISCHARGE WASTES
under provisions of
Section 402 of the Clean Water Act,
Chapter 26 of the Texas Water Code,
and 40 CFR Part 423

Comanche Peak Power Company LLC

whose mailing address is

1601 Bryan Street
Dallas, Texas 75201

is authorized to treat and discharge wastes from Comanche Peak Nuclear Power Plant, an electric generating station (SIC 4911)

located at 6322 North Farm-to-Market Road 56, northwest of the City of Glen Rose, in Somervell County, Texas 76043

via Outfalls 001, 002, 003, and 004 to Squaw Creek Reservoir, thence to Squaw Creek, thence to Paluxy River/North Paluxy River in Segment No. 1229 of the Brazos River Basin

only according to effluent limitations, monitoring requirements, and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this permit does not grant to the permittee the right to use private or public property for conveyance of wastewater along the discharge route described in this permit. This includes, but is not limited to, property belonging to any individual, partnership, corporation, or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit shall expire at midnight, five years from the date of permit issuance.

ISSUED DATE: **October 7, 2019**

For the Commission

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Outfall Number 001

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge once-through and auxiliary cooling waters and previously monitored effluent [1] subject to the following effluent limitations:

The daily average flow of effluent shall not exceed 3,168 million gallons per day (MGD). The daily maximum flow shall not exceed 3,168 MGD.

Effluent Characteristics	Discharge Limitations					Minimum Self-Monitoring Requirements	
	Daily Average		Daily Maximum		Single Grab	Report Daily Average and Daily Maximum	
	lbs/day	mg/L	lbs/day	mg/L	mg/L	Measurement Frequency	Sample Type
Flow	3,168 MGD		3,168 MGD		N/A	Continuous [2]	Record
Temperature [3]	113°F		116°F		N/A	Continuous	Record
Free Available Chlorine [4]	440	0.2	1,101	0.5	0.5	1/week [6]	Grab
Total Residual Chlorine [5]	N/A	N/A	880	0.2	0.2	1/week [6]	Grab

2. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

3. Effluent monitoring samples shall be taken at the following location: At Outfall 001, where once-through and auxiliary cooling water and previously monitored effluent [1] are discharged from the discharge structure to Squaw Creek Reservoir.

[1] Effluent previously monitored at Outfall 004 may be discharged through Outfall 001.
[2] Flow rates must be obtained from pump curve data.
[3] See Other Requirements No. 6 and No. 9.
[4] See Other Requirement No. 7.
[5] See Other Requirement No. 8.
[6] Samples must be representative of periods of chlorination.

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge cooling water, low-volume waste sources [1] (auxiliary cooling water from the Service Water System), and stormwater runoff from the Safe Shutdown Impoundment (SSI) subject to the following effluent limitations:

   Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Total Suspended Solids	30	100	100	1/week [2]	Grab
Oil and Grease	15	20	20	1/week [2]	Grab

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 1/week [2] by grab sample.

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 002, where SSI effluents are discharged to Squaw Creek Reservoir.

[1] See Other Requirement No. 10.
[2] When discharge occurs.

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge treated domestic wastewater subject to the following effluent limitations:

Volume: Flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [1]	Estimate
Total Suspended Solids	20	45	45	2/month	Grab
Biochemical Oxygen Demand, 5-day	20	45	45	2/month	Grab
Escherichia coli [2]	126 [2 and 3]	399 [2]	399 [2]	1/week	Grab

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 2/month by grab sample.

3. Disinfection for the effluent is normally provided by ultraviolet (UV) radiation. In the event that the UV system is taken out of service, an alternative disinfection system must be used. If chlorination is used for disinfection, the effluent must contain a chlorine residual of at least 1.0 mg/L and a maximum chlorine residual of 4.0 mg/L after a detention time of at least 20 minutes (based on peak flow) and must be monitored five times per week by grab sample.

4. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

5. Effluent monitoring samples must be taken at the following location: At Outfall 003, where treated domestic wastewater is discharged from the sewage treatment plant prior to entering Squaw Creek Reservoir.

1 Flow monitoring may be suspended on weekends and holidays. Flow rates for weekends and holidays must be averaged from the flow totalizer readings taken the next working day.
2 Colony-forming units (CFU) or most probable number (MPN) per 100 mL.
3 Daily average *E. coli* must be reported as the geometric mean for the effluent samples collected during the calendar month.

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS — Outfall Number 004

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge stormwater runoff, low-volume waste sources [1] and previously monitored effluent (metal cleaning waste) subject to the following effluent limitations:

Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Total Suspended Solids	30	100	100	1/week [2]	Grab [3]
Oil and Grease	15	20	20	1/week [2]	Grab [3]

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 1/week [3] by grab sample.

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 004, where low volume waste sources and previously monitored effluent are discharged either (a) prior to mixing with the once-through and auxiliary cooling waters that discharge via Outfall 001 or (b) to Squaw Creek Reservoir.

[1] See Other Requirement No. 10.
[2] When discharge occurs.
[3] See Other Requirement No. 13.

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Outfall Number 104

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge metal cleaning waste [1] subject to the following effluent limitations:

Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Iron, Total	1.0	1.0	1.0	1/week [2]	Grab
Copper, Total	0.5	1.0	1.0	1/week [2]	Grab

2. Effluent limitations for pH, total suspended solids, and oil and grease apply at Outfall 004 and must be monitored at Outfall 004 by grab sample [2].

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 104, where metal cleaning waste is discharged from the retention ponds or temporary treatment facilities prior to mixing with the low-volume waste sources to discharge via Outfall 004.

1 See Other Requirement No. 11.
2 When discharge occurs.

DEFINITIONS AND STANDARD PERMIT CONDITIONS

As required by Title 30 Texas Administrative Code (TAC) Chapter 305, certain regulations appear as standard conditions in waste discharge permits. 30 TAC §§305.121 - 305.129 (relating to Permit Characteristics and Conditions) as promulgated under the Texas Water Code (TWC) §§5.103 and 5.105, and the Texas Health and Safety Code (THSC) §§361.017 and 361.024(a), establish the characteristics and standards for waste discharge permits, including sewage sludge, and those sections of 40 Code of Federal Regulations (CFR) Part 122 adopted by reference by the Commission. The following text includes these conditions and incorporates them into this permit. All definitions in Texas Water Code §26.001 and 30 TAC Chapter 305 shall apply to this permit and are incorporated by reference. Some specific definitions of words or phrases used in this permit are as follows:

1. Flow Measurements

   a. Annual average flow - the arithmetic average of all daily flow determinations taken within the preceding 12 consecutive calendar months. The annual average flow determination shall consist of daily flow volume determinations made by a totalizing meter, charted on a chart recorder, and limited to major domestic wastewater discharge facilities with a one million gallons per day or greater permitted flow.

   b. Daily average flow - the arithmetic average of all determinations of the daily flow within a period of one calendar month. The daily average flow determination shall consist of determinations made on at least four separate days. If instantaneous measurements are used to determine the daily flow, the determination shall be the arithmetic average of all instantaneous measurements taken during that month. Daily average flow determination for intermittent discharges shall consist of a minimum of three flow determinations on days of discharge.

   c. Daily maximum flow - the highest total flow for any 24-hour period in a calendar month.

   d. Instantaneous flow - the measured flow during the minimum time required to interpret the flow measuring device.

   e. 2-hour peak flow (domestic wastewater treatment plants) - the maximum flow sustained for a two-hour period during the period of daily discharge. The average of multiple measurements of instantaneous maximum flow within a two-hour period may be used to calculate the 2-hour peak flow.

   f. Maximum 2-hour peak flow (domestic wastewater treatment plants) - the highest 2-hour peak flow for any 24-hour period in a calendar month.

2. Concentration Measurements

   a. Daily average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar month, consisting of at least four separate representative measurements.

      i. For domestic wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values in the previous four consecutive month period consisting of at least four measurements shall be utilized as the daily average concentration.

      ii. For all other wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values taken during the month shall be utilized as the daily average concentration.

   b. 7-day average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar week, Sunday through Saturday.

   c. Daily maximum concentration - the maximum concentration measured on a single day, by the sample type specified in the permit, within a period of one calendar month.

   d. Daily discharge - the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the sampling day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the sampling day.

The "daily discharge" determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all samples collected during that day.

e. Bacteria concentration (Fecal coliform, *E. coli*, or Enterococci) – the number of colonies of bacteria per 100 milliliters effluent. The daily average bacteria concentration is a geometric mean of the values for the effluent samples collected in a calendar month. The geometric mean shall be determined by calculating the nth root of the product of all measurements made in a calendar month, where n equals the number of measurements made; or computed as the antilogarithm of the arithmetic mean of the logarithms of all measurements made in a calendar month. For any measurement of bacteria equaling zero, a substitute value of one shall be made for input into either computation method. If specified, the 7-day average for bacteria is the geometric mean of the values for all effluent samples collected during a calendar week.

f. Daily average loading (lbs/day) - the arithmetic average of all daily discharge loading calculations during a period of one calendar month. These calculations must be made for each day of the month that a parameter is analyzed. The daily discharge, in terms of mass (lbs/day), is calculated as (Flow, MGD × Concentration, mg/L × 8.34).

g. Daily maximum loading (lbs/day) - the highest daily discharge, in terms of mass (lbs/day), within a period of one calendar month.

3. Sample Type

a. Composite sample - For domestic wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(a). For industrial wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(c).

b. Grab sample - an individual sample collected in less than 15 minutes.

4. Treatment Facility (facility) - wastewater facilities used in the conveyance, storage, treatment, recycling, reclamation or disposal of domestic sewage, industrial wastes, agricultural wastes, recreational wastes, or other wastes including sludge handling or disposal facilities under the jurisdiction of the Commission.

5. The term "sewage sludge" is defined as solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in 30 TAC Chapter 312. This includes the solids that have not been classified as hazardous waste separated from wastewater by unit processes.

6. Bypass - the intentional diversion of a waste stream from any portion of a treatment facility.

MONITORING AND REPORTING REQUIREMENTS

1. Self-Reporting

Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§319.4 - 319.12. Unless otherwise specified, effluent monitoring data shall be submitted each month, to the Enforcement Division (MC 224), by the 20th day of the following month for each discharge that is described by this permit whether or not a discharge is made for that month. Monitoring results must be submitted online using the NetDMR reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. Monitoring results must be signed and certified as required by Monitoring and Reporting Requirements No. 10.

As provided by state law, the permittee is subject to administrative, civil and criminal penalties, as applicable, for negligently or knowingly violating the Clean Water Act; TWC Chapters 26, 27, and 28; and THSC Chapter 361, including but not limited to knowingly making any false statement, representation, or certification on any report, record, or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, or falsifying, tampering with or knowingly rendering inaccurate any monitoring device or method required by this permit or violating any other requirement imposed by state or federal regulations.

2. Test Procedures

   a. Unless otherwise specified in this permit, test procedures for the analysis of pollutants shall comply with procedures specified in 30 TAC §§319.11 - 319.12. Measurements, tests, and calculations shall be accurately accomplished in a representative manner.

   b. All laboratory tests submitted to demonstrate compliance with this permit must meet the requirements of 30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.

3. Records of Results

   a. Monitoring samples and measurements shall be taken at times and in a manner so as to be representative of the monitored activity.

   b. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), monitoring and reporting records, including strip charts and records of calibration and maintenance, copies of all records required by this permit, records of all data used to complete the application for this permit, and the certification required by 40 CFR §264.73(b)(9) shall be retained at the facility site, or shall be readily available for review by a TCEQ representative for a period of three years from the date of the record or sample, measurement, report, application or certification. This period shall be extended at the request of the Executive Director.

   c. Records of monitoring activities shall include the following:

      i. date, time, and place of sample or measurement;
      ii. identity of individual who collected the sample or made the measurement;
      iii. date and time of analysis;
      iv. identity of the individual and laboratory who performed the analysis;
      v. the technique or method of analysis; and
      vi. the results of the analysis or measurement and quality assurance/quality control records.

   The period during which records are required to be kept shall be automatically extended to the date of the final disposition of any administrative or judicial enforcement action that may be instituted against the permittee.

4. Additional Monitoring by Permittee

   If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit using approved analytical methods as specified above, all results of such monitoring shall be included in the calculation and reporting of the values submitted on the approved self-report form. Increased frequency of sampling shall be indicated on the self-report form.

5. Calibration of Instruments

   All automatic flow measuring or recording devices and all totalizing meters for measuring flows shall be accurately calibrated by a trained person at plant start-up and as often thereafter as necessary to ensure accuracy, but not less often than annually unless authorized by the Executive Director for a longer period. Such person shall verify in writing that the device is operating properly and giving accurate results. Copies of the verification shall be retained at the facility site or shall be readily available for review by a TCEQ representative for a period of three years.

6. Compliance Schedule Reports

   Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date to the regional office and the Enforcement Division (MC 224).

7. Noncompliance Notification

   a. In accordance with 30 TAC §305.125(9) any noncompliance that may endanger human health or safety, or the environment shall be reported by the permittee to the TCEQ. Report of such information shall be provided orally or by facsimile transmission (FAX) to the regional office within 24 hours of becoming aware of the noncompliance. A written submission of such information shall also be provided by the permittee to the regional office and the Enforcement Division (MC 224) within five working days of becoming aware of the noncompliance. For Publicly Owned Treatment Works (POTWs), effective September 1, 2020, the permittee must submit the written report for unauthorized discharges and unanticipated bypasses that exceed any effluent limit in the permit using the online electronic reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. The written submission shall contain a description of the noncompliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

   b. The following violations shall be reported under Monitoring and Reporting Requirement 7.a.:

      i. unauthorized discharges as defined in Permit Condition 2(g).
      ii. any unanticipated bypass that exceeds any effluent limitation in the permit.
      iii. violation of a permitted maximum daily discharge limitation for pollutants listed specifically in the Other Requirements section of an Industrial TPDES permit.

   c. In addition to the above, any effluent violation that deviates from the permitted effluent limitation by more than 40% shall be reported by the permittee in writing to the regional office and the Enforcement Division (MC 224) within 5 working days of becoming aware of the noncompliance.

   d. Any noncompliance other than that specified in this section, or any required information not submitted or submitted incorrectly, shall be reported to the Enforcement Division (MC 224) as promptly as possible. For effluent limitation violations, noncompliances shall be reported on the approved self-report form.

8. In accordance with the procedures described in 30 TAC §§35.301 - 35.303 (relating to Water Quality Emergency and Temporary Orders) if the permittee knows in advance of the need for a bypass, it shall submit prior notice by applying for such authorization.

9. Changes in Discharges of Toxic Substances

   All existing manufacturing, commercial, mining, and silvicultural permittees shall notify the regional office, orally or by facsimile transmission within 24 hours, and both the regional office and the Enforcement Division (MC 224) in writing within five (5) working days, after becoming aware of or having reason to believe:

   a. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant listed at 40 CFR Part 122, Appendix D, Tables II and III (excluding Total Phenols) that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

      i. one hundred micrograms per liter (100 μg/L);
      ii. two hundred micrograms per liter (200 μg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
      iii. five (5) times the maximum concentration value reported for that pollutant in the permit application; or
      iv. the level established by the TCEQ.

b. That any activity has occurred or will occur that would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i. five hundred micrograms per liter (500 μg/L);
ii. one milligram per liter (1 mg/L) for antimony;
iii. ten (10) times the maximum concentration value reported for that pollutant in the permit application; or
iv. the level established by the TCEQ.

10. Signatories to Reports

All reports and other information requested by the Executive Director shall be signed by the person and in the manner required by 30 TAC §305.128 (relating to Signatories to Reports).

11. All POTWs must provide adequate notice to the Executive Director of the following:

a. any new introduction of pollutants into the POTW from an indirect discharger that would be subject to CWA §301 or §306 if it were directly discharging those pollutants;

b. any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

c. for the purpose of this paragraph, adequate notice shall include information on:

i. the quality and quantity of effluent introduced into the POTW; and
ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

PERMIT CONDITIONS

1. General

a. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in an application or in any report to the Executive Director, it shall promptly submit such facts or information.

b. This permit is granted on the basis of the information supplied and representations made by the permittee during action on an application, and relying upon the accuracy and completeness of that information and those representations. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked, in whole or in part, in accordance with 30 TAC Chapter 305, Subchapter D, during its term for good cause including, but not limited to, the following:

i. violation of any terms or conditions of this permit;
ii. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
iii. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

c. The permittee shall furnish to the Executive Director, upon request and within a reasonable time, any information to determine whether cause exists for amending, revoking, suspending, or terminating the permit. The permittee shall also furnish to the Executive Director, upon request, copies of records required to be kept by the permit.

2. Compliance

a. Acceptance of the permit by the person to whom it is issued constitutes acknowledgment and agreement that such person will comply with all the terms and conditions embodied in the permit, and the rules and other orders of the Commission.

b. The permittee has a duty to comply with all conditions of the permit. Failure to comply with any permit condition constitutes a violation of the permit and the Texas Water Code or the Texas Health and Safety Code, and is grounds for enforcement action, for permit amendment, revocation, or suspension, or for denial of a permit renewal application or an application for a permit for another facility.

c. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

d. The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal or other permit violation that has a reasonable likelihood of adversely affecting human health or the environment.

e. Authorization from the Commission is required before beginning any change in the permitted facility or activity that may result in noncompliance with any permit requirements.

f. A permit may be amended, suspended and reissued, or revoked for cause in accordance with 30 TAC §§305.62 and 305.66 and TWC §7.302. The filing of a request by the permittee for a permit amendment, suspension and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

g. There shall be no unauthorized discharge of wastewater or any other waste. For the purpose of this permit, an unauthorized discharge is considered to be any discharge of wastewater into or adjacent to water in the state at any location not permitted as an outfall or otherwise defined in the Other Requirements section of this permit.

h. In accordance with 30 TAC §305.535(a), the permittee may allow any bypass to occur from a TPDES permitted facility that does not cause permitted effluent limitations to be exceeded or an unauthorized discharge to occur, but only if the bypass is also for essential maintenance to assure efficient operation.

i. The permittee is subject to administrative, civil, and criminal penalties, as applicable, under Texas Water Code §§7.051 - 7.075 (relating to Administrative Penalties), 7.101 - 7.111 (relating to Civil Penalties), and 7.141 - 7.202 (relating to Criminal Offenses and Penalties) for violations including, but not limited to, negligently or knowingly violating the federal CWA §§301, 302, 306, 307, 308, 318, or 405, or any condition or limitation implementing any sections in a permit issued under the CWA §402, or any requirement imposed in a pretreatment program approved under the CWA §§402(a)(3) or 402(b)(8).

3. Inspections and Entry

a. Inspection and entry shall be allowed as prescribed in the TWC Chapters 26, 27, and 28, and THSC Chapter 361.

b. The members of the Commission and employees and agents of the Commission are entitled to enter any public or private property at any reasonable time for the purpose of inspecting and investigating conditions relating to the quality of water in the state or the compliance with any rule, regulation, permit, or other order of the Commission. Members, employees, or agents of the Commission and Commission contractors are entitled to enter public or private property at any reasonable time to investigate or monitor or, if the responsible party is not responsive or there is an immediate danger to public health or the environment, to remove or remediate a condition related to the quality of water in the state. Members, employees, Commission contractors, or agents acting under this authority who enter private property shall observe the establishment's rules and regulations concerning safety, internal security, and fire protection, and if the property has management in residence, shall notify management or the person then in charge of his presence and shall exhibit proper credentials. If any member, employee, Commission contractor, or agent is refused the right to enter in or on public or private property under this authority, the Executive Director may invoke the remedies authorized in TWC §7.002. The statement above, that Commission entry shall occur in accordance with an establishment's rules and regulations concerning safety, internal security, and fire protection, is not grounds for denial or restriction of entry to any part of the facility, but merely describes the Commission's duty to observe appropriate rules and regulations during an inspection.

4. Permit Amendment or Renewal

   a. The permittee shall give notice to the Executive Director as soon as possible of any planned physical alterations or additions to the permitted facility if such alterations or additions would require a permit amendment or result in a violation of permit requirements. Notice shall also be required under this paragraph when:

      i. the alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in accordance with 30 TAC §305.534 (relating to New Sources and New Dischargers); or

      ii. the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in the permit, nor to notification requirements in Monitoring and Reporting Requirements No. 9; or

      iii. the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   b. Prior to any facility modifications, additions, or expansions that will increase the plant capacity beyond the permitted flow, the permittee must apply for and obtain proper authorization from the Commission before commencing construction.

   c. The permittee must apply for an amendment or renewal at least 180 days prior to expiration of the existing permit in order to continue a permitted activity after the expiration date of the permit. If an application is submitted prior to the expiration date of the permit, the existing permit shall remain in effect until the application is approved, denied, or returned. If the application is returned or denied, authorization to continue such activity shall terminate upon the effective date of the action. If an application is not submitted prior to the expiration date of the permit, the permit shall expire and authorization to continue such activity shall terminate.

   d. Prior to accepting or generating wastes that are not described in the permit application or that would result in a significant change in the quantity or quality of the existing discharge, the permittee must report the proposed changes to the Commission. The permittee must apply for a permit amendment reflecting any necessary changes in permit conditions, including effluent limitations for pollutants not identified and limited by this permit.

   e. In accordance with the TWC §26.029(b), after a public hearing, notice of which shall be given to the permittee, the Commission may require the permittee, from time to time, for good cause, in accordance with applicable laws, to conform to new or additional conditions.

   f. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under CWA §307(a) for a toxic pollutant that is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition. The permittee shall comply with effluent standards or prohibitions established under CWA §307(a) for toxic pollutants within the time provided in the regulations that established those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. Permit Transfer

   a. Prior to any transfer of this permit, Commission approval must be obtained. The Commission shall be notified in writing of any change in control or ownership of facilities authorized by this permit. Such notification should be sent to the Applications Review and Processing Team (MC 148) of the Water Quality Division.

   b. A permit may be transferred only according to the provisions of 30 TAC §305.64 (relating to Transfer of Permits) and 30 TAC §50.133 (relating to Executive Director Action on Application or WQMP update).

6. Relationship to Hazardous Waste Activities

   This permit does not authorize any activity of hazardous waste storage, processing, or disposal that requires a permit or other authorization pursuant to the Texas Health and Safety Code.

7. Relationship to Water Rights

   Disposal of treated effluent by any means other than discharge directly to water in the state must be specifically authorized in this permit and may require a permit pursuant to Texas Water Code Chapter 11.

8. Property Rights

   A permit does not convey any property rights of any sort, or any exclusive privilege.

9. Permit Enforceability

   The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. Relationship to Permit Application

    The application pursuant to which the permit has been issued is incorporated herein; provided, however, that in the event of a conflict between the provisions of this permit and the application, the provisions of the permit shall control.

11. Notice of Bankruptcy.

    a. Each permittee shall notify the executive director, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of Title 11 (Bankruptcy) of the United States Code (11 USC) by or against:

       i. the permittee;
       ii. an entity (as that term is defined in 11 USC, §101(15)) controlling the permittee or listing the permit or permittee as property of the estate; or
       iii. an affiliate (as that term is defined in 11 USC, §101(2)) of the permittee.

    b. This notification must indicate:

       i. the name of the permittee;
       ii. the permit number(s);
       iii. the bankruptcy court in which the petition for bankruptcy was filed; and
       iv. the date of filing of the petition.

OPERATIONAL REQUIREMENTS

1. The permittee shall at all times ensure that the facility and all of its systems of collection, treatment, and disposal are properly operated and maintained. This includes, but is not limited to, the regular, periodic examination of wastewater solids within the treatment plant by the operator in order to maintain an appropriate quantity and quality of solids inventory as described in the various operator training manuals and according to accepted industry standards for process control. Process control, maintenance, and operations records shall be retained at the facility site, or shall be readily available for review by a TCEQ representative, for a period of three years.

2. Upon request by the Executive Director, the permittee shall take appropriate samples and provide proper analysis in order to demonstrate compliance with Commission rules. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall comply with all applicable provisions of 30 TAC Chapter 312 concerning sewage sludge use and disposal and 30 TAC §§319.21 - 319.29 concerning the discharge of certain hazardous metals.

3. Domestic wastewater treatment facilities shall comply with the following provisions:

   a. The permittee shall notify the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, in writing, of any facility expansion at least 90 days prior to conducting such activity.

   b. The permittee shall submit a closure plan for review and approval to the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, for any closure activity at least 90 days prior to conducting such activity. Closure is the act of permanently taking a waste management unit or treatment facility out of service and includes the permanent removal from service of any pit, tank, pond, lagoon, surface impoundment or other treatment unit regulated by this permit.

4. The permittee is responsible for installing prior to plant start-up, and subsequently maintaining, adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures by means of alternate power sources, standby generators, or retention of inadequately treated wastewater.

5. Unless otherwise specified, the permittee shall provide a readily accessible sampling point and, where applicable, an effluent flow measuring device or other acceptable means by which effluent flow may be determined.

6. The permittee shall remit an annual water quality fee to the Commission as required by 30 TAC Chapter 21. Failure to pay the fee may result in revocation of this permit under TWC §7.302(b)(6).

7. Documentation

   For all written notifications to the Commission required of the permittee by this permit, the permittee shall keep and make available a copy of each such notification under the same conditions as self-monitoring data are required to be kept and made available. Except for information required for TPDES permit applications, effluent data, including effluent data in permits, draft permits and permit applications, and other information specified as not confidential in 30 TAC §1.5(d), any information submitted pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted in the manner prescribed in the application form or by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, information may be made available to the public without further notice. If the Commission or Executive Director agrees with the designation of confidentiality, the TCEQ will not provide the information for public inspection unless required by the Texas Attorney General or a court pursuant to an open records request. If the Executive Director does not agree with the designation of confidentiality, the person submitting the information will be notified.

8. Facilities that generate domestic wastewater shall comply with the following provisions; domestic wastewater treatment facilities at permitted industrial sites are excluded.

   a. Whenever flow measurements for any domestic sewage treatment facility reach 75% of the permitted daily average or annual average flow for three consecutive months, the permittee must initiate engineering and financial planning for expansion or upgrading of the domestic wastewater treatment or collection facilities. Whenever the flow reaches 90% of the permitted daily average or annual average flow for three consecutive months, the permittee shall obtain necessary authorization from the Commission to commence construction of the necessary additional treatment or collection facilities. In the case of a domestic wastewater treatment facility that reaches 75% of the permitted daily average or annual average flow for three consecutive months, and the planned population to be served or the quantity of waste produced is not expected to exceed the design limitations of the treatment facility, the permittee shall submit an engineering report supporting this claim to the Executive Director of the Commission.

      If in the judgment of the Executive Director the population to be served will not cause permit noncompliance, then the requirement of this section may be waived. To be effective, any waiver must be in writing and signed by the Director of the Enforcement Division (MC 149) of the Commission, and such waiver of these requirements will be reviewed upon expiration of the existing permit; however, any such waiver shall not be interpreted as condoning or excusing any violation of any permit parameter.

b. The plans and specifications for domestic sewage collection and treatment works associated with any domestic permit must be approved by the Commission, and failure to secure approval before commencing construction of such works or making a discharge is a violation of this permit and each day is an additional violation until approval has been secured.

c. Permits for domestic wastewater treatment plants are granted subject to the policy of the Commission to encourage the development of area-wide waste collection, treatment, and disposal systems. The Commission reserves the right to amend any domestic wastewater permit in accordance with applicable procedural requirements to require the system covered by this permit to be integrated into an area-wide system, should such be developed; to require the delivery of the wastes authorized to be collected in, treated by or discharged from said system, to such area-wide system; or to amend this permit in any other particular to effectuate the Commission's policy. Such amendments may be made when the changes required are advisable for water quality control purposes and are feasible on the basis of waste treatment technology, engineering, financial, and related considerations existing at the time the changes are required, exclusive of the loss of investment in or revenues from any then existing or proposed waste collection, treatment or disposal system.

9. Domestic wastewater treatment plants shall be operated and maintained by sewage plant operators holding a valid certificate of competency at the required level as defined in 30 TAC Chapter 30.

10. For Publicly Owned Treatment Works (POTWs), the 30-day average (or monthly average) percent removal for BOD and TSS shall not be less than 85%, unless otherwise authorized by this permit.

11. Facilities that generate industrial solid waste as defined in 30 TAC §335.1 shall comply with these provisions:

a. Any solid waste, as defined in 30 TAC §335.1 (including but not limited to such wastes as garbage, refuse, sludge from a waste treatment, water supply treatment plant or air pollution control facility, discarded materials, discarded materials to be recycled, whether the waste is solid, liquid, or semisolid), generated by the permittee during the management and treatment of wastewater, must be managed in accordance with all applicable provisions of 30 TAC Chapter 335, relating to Industrial Solid Waste Management.

b. Industrial wastewater that is being collected, accumulated, stored, or processed before discharge through any final discharge outfall, specified by this permit, is considered to be industrial solid waste until the wastewater passes through the actual point source discharge and must be managed in accordance with all applicable provisions of 30 TAC Chapter 335.

c. The permittee shall provide written notification, pursuant to the requirements of 30 TAC §335.8(b)(1), to the Corrective Action Section (MC 127) of the Remediation Division informing the Commission of any closure activity involving an Industrial Solid Waste Management Unit, at least 90 days prior to conducting such an activity.

d. Construction of any industrial solid waste management unit requires the prior written notification of the proposed activity to the Registration and Reporting Section (MC 129) of the Permitting and Remediation Support Division. No person shall dispose of industrial solid waste, including sludge or other solids from wastewater treatment processes, prior to fulfilling the deed recordation requirements of 30 TAC §335.5.

e. The term "industrial solid waste management unit" means a landfill, surface impoundment, waste-pile, industrial furnace, incinerator, cement kiln, injection well, container, drum, salt dome waste containment cavern, or any other structure vessel, appurtenance, or other improvement on land used to manage industrial solid waste.

f. The permittee shall keep management records for all sludge (or other waste) removed from any wastewater treatment process. These records shall fulfill all applicable requirements of 30 TAC Chapter 335 and must include the following, as it pertains to wastewater treatment and discharge:

i. volume of waste and date(s) generated from treatment process;
ii. volume of waste disposed of on-site or shipped off-site;
iii. date(s) of disposal;

iv. identity of hauler or transporter;
v. location of disposal site; and
vi. method of final disposal.

The above records shall be maintained on a monthly basis. The records shall be retained at the facility site, or shall be readily available for review by authorized representatives of the TCEQ for at least five years.

12. For industrial facilities to which the requirements of 30 TAC Chapter 335 do not apply, sludge and solid wastes, including tank cleaning and contaminated solids for disposal, shall be disposed of in accordance with THSC Code Chapter 361.

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OTHER REQUIREMENTS

1. This provision supersedes and replaces Provision No. 1, Paragraph 1 of Monitoring and Reporting Requirements found on Page 4 of this permit.

   Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§319.4 - 319.12. Unless otherwise specified, effluent monitoring data shall be submitted each month, to the TCEQ Compliance Monitoring Team (MC-224), by the 25th day of the following month for each discharge that is described by this permit whether or not a discharge is made for that month. Monitoring results must be submitted online using the NetDMR reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. Monitoring results must be signed and certified as required by Monitoring and Reporting Requirements No. 10.

2. Violations of daily maximum limitations for the following pollutants shall be reported orally or by facsimile to TCEQ Region 4 within 24 hours from the time the permittee becomes aware of the violation, followed by a written report within five working days to TCEQ Compliance Monitoring Team (MC 224) and Region 4:

Pollutant	MAL [1] (mg/L)
Copper (Total)	0.002
Lead (Total)	0.0005

   Test methods used must be sensitive enough to demonstrate compliance with the permit effluent limitations. If an effluent limit for a pollutant is less than the minimum analytical level (MAL), then the test method for that pollutant must be sensitive enough to demonstrate compliance at the MAL. Permit compliance/noncompliance determinations will be based on the effluent limitations contained in this permit, with consideration given to the MAL for the pollutants specified above.

   When an analysis of an effluent sample for a pollutant listed above indicates no detectable levels above the MAL and the test method detection level is as sensitive as the specified MAL, a value of zero shall be used for that measurement when making calculations for the self-reporting form. This applies to determinations of daily maximum concentration, calculations of loading and daily averages, and other reportable results.

   When a reported value is zero based on this MAL provision, the permittee shall submit the following statement with the self-reporting form either as a separate attachment to the form or as a statement in the comments section of the form:

   > "The reported value(s) of zero for ____[list pollutant(s)]____ on the self-reporting form for [monitoring period date range]____ is based on the following conditions: (1) the analytical method used had a method detection level as sensitive as the MAL specified in the permit, and (2) the analytical results contained no detectable levels above the specified MAL."

   When an analysis of an effluent sample for a pollutant indicates no detectable levels and the test method detection level is not as sensitive as the MAL specified in the permit, or an MAL is not

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[1] Minimum analytical level (MAL)

specified in the permit for that pollutant, the level of detection achieved shall be used for that measurement when making calculations for the self-reporting form. A zero may not be used.

3. Wastewater discharged via Outfalls 002 and 004 must be sampled and analyzed as directed below for those parameters listed in Tables 1, 2, and 3 of Attachment A of this permit. Analytical testing for Outfalls 002 and 004 must be completed within 60 days of initial discharge. Results of the analytical testing must be submitted within 90 days of initial discharge to the TCEQ Compliance Monitoring Team (MC-224) and Industrial Wastewater Permits Team (MC-148). Based on a technical review of the submitted analytical results, an amendment may be initiated by TCEQ staff to include additional effluent limitations, monitoring requirements, or both.

Table 1: Analysis is required for all pollutants in Table 1. Wastewater must be sampled and analyzed for those parameters listed in Table 1 for a minimum of four sampling events that are each at least one week apart.

Table 2: Analysis is required for those pollutants in Table 2 that are used at the facility that could in any way contribute to contamination in the Outfall 002 or 004 discharge. Sampling and analysis must be conducted for a minimum of four sampling events that are each at least one week apart.

Table 3: For all pollutants listed in Table 3, the permittee shall indicate whether each pollutant is believed to be present or absent in the discharge. Sampling and analysis must be conducted for each pollutant believed present for a minimum of one sampling event.

The permittee shall report the flow at Outfalls 002 and 004 in MGD in Attachment A. The permittee shall indicate on each table whether the samples are composite (C) or grab (G) by checking the appropriate box.

In addition, the permittee shall sample for total organic carbon (TOC) at Outfall 004 for four sampling events. Each sampling event be at least one week apart from the others. Analytical testing for TOC at Outfall 004 must be completed within 60 days of permit issuance. Results of the analytical testing must be submitted to the TCEQ Compliance Monitoring Team (MC-224) and Industrial Wastewater Permits Team (MC-148). Based on a technical review of the submitted analytical results, an amendment may be initiated by TCEQ staff to include additional effluent limitations, monitoring requirements, or both.

Pollutant	**Effluent Concentration (µg/L)**				
	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**	**Average**
Total Organic Carbon					

4. <u>COOLING WATER INTAKE STRUCTURE REQUIREMENTS</u>

A. *Closed Cycle Recirculating System* (CCRS), as defined as 40 CFR §125.92(c), means a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a water of the United States to support contact or non-contact cooling uses within a facility, or a system designed to include certain impoundments. A closed-cycle recirculating system passes cooling water through the condenser and other components of the cooling system and reuses the water for cooling multiple times.

1) CCRS also includes a system with impoundments of waters of the United States (WOTUS). where the impoundment was constructed prior to October 14, 2014 and created for the

purpose of serving as part of the cooling water system as documented in the project purpose statement for any required Clean Water Act section 404 permit obtained to construct the impoundment. In the case of an impoundment whose construction pre-dated the CWA requirement to obtain a section 404 permit, documentation of the project's purpose must be demonstrated to the satisfaction of the Director. This documentation could be some other license or permit obtained to lawfully construct the impoundment for the purposes of a cooling water system, or other such evidence as the Director finds necessary. For impoundments constructed in uplands or not in WOTUS, no documentation of a section 404 or other permit is required. If WOTUS are withdrawn for purposes of replenishing losses to a CCRS other than those due to blowdown, drift, and evaporation from the cooling system, the Director may determine a cooling system is a CCRS if the facility demonstrates to the satisfaction of the Director that make-up water withdrawals attributed specifically to the cooling portion of the cooling system have been minimized.

B. Operation and Maintenance

The permittee shall adhere to the requirements of 40 CFR §125.96 when the CWIS is in operation. Specifically, the facility shall:

1) monitor actual intake flow, as defined at 40 CFR §125.92(a), withdrawn by CWIS for cooling purposes, including cooling water withdrawals; and

2) conduct visual or remote inspections, as required by 40 CFR §125.96(e).

Alternatives to the procedures described at 40 CFR §125.96(e) have not been approved by the TCEQ. Requests for alternative procedures must be submitted in writing to the TCEQ's Industrial Wastewater Permitting Team (MC-148) for review and approval and a copy sent to the TCEQ Compliance Monitoring Team (MC-224).

C. Record Keeping

Records (e.g. electronic logs, data acquisition system records, operating procedures, operator logs, etc.) documenting the operation and maintenance described above shall be kept on site until the subsequent permit is issued, per the requirements of 40 CFR §125.97(d), and made available to TCEQ personnel upon request.

D. Changes in the Cooling Water Intake Structure

The facility must notify the TCEQ Industrial Permits Team (MC 148), Compliance Monitoring Team (MC-224), and TCEQ Region 4 Office in writing at least 30 days prior to any changes or modifications of the design of the CWIS and copy the TCEQ Compliance Monitoring Team (MC-224).

If it is determined that the proposed CWIS configuration does not meet best technology available standards for impingement mortality and entrainment, the permit may be reopened to incorporate additional requirements.

5. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

6. <u>TEMPERATURE</u>

The flow-weighted average temperature (FWAT) must be computed and recorded on a daily basis. FWAT must be computed at equal time intervals not greater than two hours. The FWAT must be calculated as follows:

$$FWAT = \frac{\Sigma\ (\text{INSTANTANEOUS FLOW} \times \text{INSTANTANEOUS TEMPERATURE})}{\Sigma\ (\text{INSTANTANEOUS FLOW})}$$

The *daily average temperature* must be the arithmetic average of all FWATs calculated during the calendar month.

The *daily maximum temperature* must be the highest FWAT calculated during the calendar month.

7. FREE AVAILABLE CHLORINE

A. The term *free available chlorine* means the value obtained using any of the "chlorine—free available" methods in Table IB in 40 CFR §136.3(a) where the method has the capability of measuring free available chlorine, or other methods approved by the permitting authority.

B. Free available chlorine (FAC) may not be discharged from any unit for more than two hours in any one day, and not more than one unit in any plant may discharge free available chlorine at any one time unless the permittee can demonstrate to the permitting authority that the units in a particular location cannot operate at or below this level of chlorination.

C. Daily mass loading of FAC must be calculated using the following equation:

FAC (lbs/day) = FAC (mg/L) × flow (MGD) × 8.345 × (2 hours/24 hours)

where: FAC (mg/L) = concentration of FAC measured in the effluent during representative period of chlorination.

flow (MGD) = total actual flow of discharge via outfall during sampling day

8. TOTAL RESIDUAL CHLORINE

A. The term total residual chlorine (or total residual oxidants for intake water with bromides) means the value obtained using any of the "chlorine—total residual" methods in Table IB in 40 CFR §136.3(a), or other methods approved by the permitting authority.

B. Total residual chlorine (TRC) may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control.

C. Simultaneous multi-unit chlorination is permitted.

D. The daily maximum mass loading of TRC must be calculated using the following equation:

TRC (lbs/day) = TRC (mg/L) × flow (MGD) × 8.345 × (total hours of chlorination/24 hours) × (# of units)

where: TRC (mg/L) = maximum concentration of TRC measured in the effluent during representative period of chlorination

flow (MGD) = total actual flow of discharge via outfall during sampling day

9. The permittee has submitted, in a letter dated December 21, 2016, a plan to characterize the thermal plume in the receiving water through either the use of a model, mass balance, or via collected or existing in-stream temperature data. The permittee is required to implement the plan following its approval by the TCEQ on January 12, 2019.

The permittee is hereby placed on notice that the Executive Director of the TCEQ will be initiating changes to evaluation procedures and/or rulemaking that may affect thermal requirements for this facility.

10. The term *low volume waste sources* means, taken collectively as if from one source, wastewater from all sources except those for which specific limitations or standards are otherwise established in 40 CFR Part 423. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

11. The term *chemical metal cleaning waste* means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning.

    The term *metal cleaning waste* means any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

12. The mixing zone for Outfall 001 is defined as a volume within a radius of 100 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

    The mixing zone for Outfall 002 is defined as a volume within a radius of 37.5 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

    The mixing zone for Outfall 004 is defined as a volume within a radius of 100 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

13. If more than one source is associated with this particular waste category, the permittee may obtain grab samples from each source. The permittee may either analyze the samples individually and report the highest value for reporting purposes or follow the appropriate procedure below.

    A. Total Suspended Solids
    Grab samples obtained from each source may either be individually analyzed for reporting the arithmetic average and maximum values or physically combined into a single flow-weighted sample for analysis and reporting.

    B. Oil and Grease
    The permittee submitted a letter dated July 28, 1999 from Mr. Gerald Johnson to Mr. Chris Linendoll of the TCEQ which requested and described an alternate sampling procedure using EPA-approved method 1664A, hexane extractable material (HEM) method, in order to maintain the ability to composite samples by flow weighting from individual sources. This alternate sampling procedure has been approved by the Executive Director of the TCEQ and may be used to obtain oil and grease samples as described in the letter from multiple discharge locations for a single outfall.

    C. pH
    Samples must be obtained from each source and must be analyzed separately for pH. The highest and lowest value recorded for pH must be utilized for reporting purposes.

    The permittee may apply for consideration of alternate sampling and laboratory test methods by submitting a request to the TCEQ, in accordance with 40 CFR §136.5, for referral to the Regional ATP Coordinator.

14. ONCE-THROUGH COOLING WATER EXEMPTION

In accordance with 30 TAC §307.8(d) and based upon statistical analysis and source investigation, a once-through cooling water exemption for total dissolved solids (TDS), chloride, and sulfate has been approved by the Standards Implementation Team for Outfall 001. As a result of this analysis, the permit has been issued without effluent limitations based on water quality criteria for TDS, chloride, and sulfate; however, monitoring of these exempted pollutants is required as shown below:

Outfall	Pollutant	Daily Average (mg/L)	Daily Maximum (mg/L)	Measurement Frequency
001	TDS	Report	Report	1/quarter
	Chloride	Report	Report	1/quarter
	Sulfate	Report	Report	1/quarter

Monitoring results must be kept on site for a minimum of five years, made available to authorized representatives of the TCEQ upon request, and submitted with the application for the next permit renewal.

This monitoring requirement is effective upon the date of permit issuance and expires one day prior to the date of permit expiration. If it is determined that this monitoring requirement should be continued in subsequent permits, the TCEQ will include this provision in subsequent permits.

15. This permit does not authorize on-site disposal of sewage sludge. The permittee shall ensure that all sewage sludge which is not a hazardous waste (as defined in 30 TAC Chapter 335) is handled, transported, and disposed of in compliance with the applicable provisions of 30 TAC Chapter 312. The permittee shall ensure that all sewage sludge which is a hazardous waste (as defined in 30 TAC Chapter 335) is handled, transported, and disposed of in compliance with the applicable provisions of 30 TAC Chapter 335. The permittee shall keep records of all sludges removed from the wastewater treatment plant site. Such records will include the following information:

A. Volume (dry weight basis) of sludge disposed;

B. Date of disposal;

C. Identity and registration number of hauler;

D. Location and registration or permit number of disposal site; and

E. Method of final disposal.

The above records must be maintained on a monthly basis and be available at the plant site for inspection by authorized representatives of the TCEQ for at least five years.

16. POND REQUIREMENTS

A wastewater pond must comply with the following requirements. A wastewater pond (or lagoon) is an earthen structure used to evaporate, hold, store, or treat water that contains a *waste* or *pollutant* or that would cause *pollution* upon *discharge* as those terms are defined in Texas Water Code §26.001, but does not include a pond that contains only stormwater.

A. A wastewater pond **subject to 40 CFR Part 257, Subpart D** (related to coal combustion residuals) must comply with those requirements in lieu of the requirements in B through G of POND REQUIREMENTS.

B. An **existing** wastewater pond must be maintained to meet or exceed the original approved design and liner requirements; or, in the absence of original approved requirements, must be maintained to prevent unauthorized discharges of wastewater into or adjacent to water in the state. The permittee shall maintain copies of all liner construction and testing documents at the facility or in a reasonably accessible location and make the information available to the executive director upon request.

C. A **new** wastewater pond constructed after the issuance date of this permit must be lined in compliance with one of the following requirements if it will contain process wastewater as defined in 40 CFR §122.2. The executive director will review ponds that will contain only non-process wastewater on a case-by-case basis to determine whether the pond must be lined. If a pond will contain only non-process wastewater, the owner shall notify the Industrial Permits Team (MC-148) to obtain a written determination at least 90 days before the pond is placed into service and copy the TCEQ Compliance Monitoring Team (MC-224). The permittee must submit all information about the proposed pond contents that is reasonably necessary for the executive director to make a determination. If the executive director determines that a pond does not need to be lined, then the pond is exempt from C(1) through C(3) and D through G of POND REQUIREMENTS.

   A wastewater pond that only contains domestic wastewater must comply with the design requirements in 30 TAC Chapter 217 and 30 TAC §309.13(d) in lieu of items C(1) through C(3) of this subparagraph.

   (1) Soil liner: The soil liner must contain clay-rich soil material (at least 30% of the liner material passing through a #200 mesh sieve, liquid limit greater than or equal to 30, and plasticity index greater than or equal to 15) that completely covers the sides and bottom of the pond. The liner must be at least 3.0 feet thick. The liner material must be compacted in lifts of no more than 8 inches to 95% standard proctor density at the optimum moisture content in accordance with ASTM D698 to achieve a permeability less than or equal to 1×10^{-7} (≤ 0.0000001) cm/sec. For in-situ soil material that meets the permeability requirement, the material must be scarified at least 8 inches deep and then re-compacted to finished grade.

   (2) Synthetic membrane: The liner must be a synthetic membrane liner at least 40 mils in thickness that completely covers the sides and the bottom of the pond. The liner material used must be compatible with the wastewater and be resistant to degradation (e.g., from ultraviolet light, chemical reactions, wave action, erosion, etc.). The liner material must be installed and maintained in accordance with the manufacturer's guidelines. A wastewater pond with a synthetic membrane liner must include an underdrain with a leak detection and collection system.

   (3) Alternate liner: The permittee shall submit plans signed and sealed by a Texas-licensed professional engineer for any other equivalently protective pond lining method to the Industrial Permits Team (MC-148) and copy the Compliance Monitoring Team (MC-224).

D. For a pond that must be lined according to subparagraph C (including ponds with in-situ soil liners), the permittee shall provide certification, signed and sealed by a Texas-licensed professional engineer, stating that the completed pond lining and any required underdrain with leak detection and collection system for the pond meet the requirements in subparagraph C(1) – C(3) before using the pond. The certification shall include the following minimum details about the pond lining system: (1) pond liner type (in-situ soil, amended in-situ soil, imported soil, synthetic membrane, or alternative), (2) materials used, (3) thickness of materials, and (4) either permeability test results or a leak detection and collection system description, as applicable.

The certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Industrial Permits Team (MC-148), Compliance Monitoring Team (MC-224) and regional office. A copy of the liner certification and construction details (i.e., as-built drawings, construction QA/QC documentation, and post construction testing) must be kept on-site or in a reasonably accessible location (in either hardcopy or digital format) until the pond is closed.

E. Protection and maintenance requirements for a pond subject to subparagraph B or C (including ponds with in-situ soil liners).

(1) The permittee shall maintain a liner to prevent the unauthorized discharge of wastewater into or adjacent to water in the state.

(2) A liner must be protected from damage caused by animals. Fences or other protective devices or measures may be used to satisfy this requirement.

(3) The permittee shall maintain the structural integrity of the liner and shall keep the liner and embankment free of woody vegetation, animal burrows, and excessive erosion.

(4) The permittee shall inspect each pond liner and each leak detection system at least once per month. Evidence of damage or unauthorized discharge must be evaluated by a Texas-licensed professional engineer or Texas-licensed professional geoscientist within 30 days. The permittee is not required to drain an operating pond or to inspect below the waterline during these routine inspections.

a. A Texas-licensed professional engineer or Texas-licensed professional geoscientist must evaluate damage to a pond liner, including evidence of an unauthorized discharge without visible damage.

b. Pond liner damage must be repaired at the recommendation of a Texas-licensed professional engineer or Texas-licensed professional geoscientist. If the damage is significant or could result in an unauthorized discharge, then the repair must be documented and certified by a Texas-licensed professional engineer. Within 60 days after a repair is completed, the liner certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Compliance Monitoring Section (MC-224), and regional office. A copy of the liner certification must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

c. A release determination and subsequent corrective action will be based on 40 CFR Part 257 or the Texas Risk Reduction Program (30 TAC Chapter 350), as applicable. If evidence indicates that an unauthorized discharge occurred, including evidence that the actual permeability exceeds the design permeability, the matter may also be referred to the TCEQ Enforcement Division to ensure the protection of the public and the environment.

F. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall have a Texas-licensed professional engineer perform an evaluation of each pond that requires a liner at least once every five years. The evaluation must include: (1) a physical inspection of the pond liner to check for structural integrity, damage, and evidence of leaking; (2) a review of the liner documentation for the pond; and (3) a review of all documentation related to liner repair and maintenance performed since the last evaluation. For the purposes of this evaluation, evidence of leaking also includes evidence that the actual permeability exceeds the design permeability. The permittee is not required to drain an operating pond or to inspect below the waterline during the evaluation. A copy of the engineer's evaluation report must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

G. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall maintain at least 2.0 feet of freeboard in the pond except when:

(1) the freeboard requirement temporarily cannot be maintained due to a large storm event that requires the additional retention capacity to be used for a limited period of time;

(2) the freeboard requirement temporarily cannot be maintained due to upset plant conditions that require the additional retention capacity to be used for treatment for a limited period of time; or

(3) the pond was not required to have at least 2.0 feet of freeboard according to the requirements at the time of construction.

17. Prior to construction of any new domestic wastewater treatment facilities, the permittee shall submit to the TCEQ Enforcement Division (MC 224) and Wastewater Permitting Section (MC-148) a summary transmittal letter in accordance with the requirements in 30 TAC §217.6(d). If requested by the Wastewater Permitting Section, the permittee shall submit plans, specifications and a final engineering design report which comply with 30 TAC Chapter 217, Design Criteria for Domestic Wastewater Systems. The permittee shall clearly show how the treatment system will meet the effluent limitations required on page 2b of this permit.

18. The domestic wastewater treatment plant (Outfall 003) must be operated and maintained by a wastewater treatment plant operator holding a valid certificate of competency. The certificate of competency for the operator must be a Class D or higher certificate in accordance with 30 TAC §30.350.

Attachment A

Table 1:

Conventionals and Non-conventionals

Outfall No.:	☐C ☐G	**Effluent Concentration (mg/L)**				
Pollutant		**Samp.**	**Samp.**	**Samp.**	**Samp.**	**Average**
Flow (MGD)						
BOD (5-day)						
CBOD (5-day)						
Chemical Oxygen Demand						
Total Organic Carbon						
Dissolved Oxygen						
Ammonia Nitrogen						
Total Suspended Solids						
Nitrate Nitrogen						
Total Organic Nitrogen						
Total Phosphorus						
Oil and Grease						
Total Residual Chlorine						
Total Dissolved Solids						
Sulfate						
Chloride						
Fluoride						
Total Alkalinity (mg/L as $CaCO_3$)						
Temperature (°F)						
pH (Standard Units; min/max)						

Metals

Pollutant	**Effluent Concentration (µg/L)**[1]					**MAL**[2] **(µg/L)**
	Samp.	**Samp.**	**Samp.**	**Samp.**	**Average**	
Aluminum, Total						2.5
Antimony, Total						5
Arsenic, Total						0.5
Barium, Total						3
Beryllium, Total						0.5
Cadmium, Total						1
Chromium, Total						3
Chromium, Hexavalent						3
Chromium, Trivalent						N/A
Copper, Total						2
Cyanide, Free						10
Lead, Total						0.5

[1] Indicate units if different than µg/L.

[2] Minimum Analytical Level

Pollutant	Effluent Concentration (µg/L)[1]					MAL[2] (µg/L)
	Samp.	Samp.	Samp.	Samp.	Average	
Mercury, Total						0.005
Nickel, Total						2
Selenium, Total						5
Silver, Total						0.5
Thallium, Total						0.5
Zinc, Total						5.0

Table 2-

Toxic Pollutants with Water Quality Criteria

Outfall No.:	☐C ☐G	Samp. 1 (µg/L)[1]	Samp. 2 (µg/L)[1]	Samp. 3 (µg/L)[1]	Samp. 4 (µg/L)[1]	Avg. (µg/L)[1]	MAL[2] (µg/L)
Pollutant							
Acrolein							0.7
Acrylonitrile							50
Anthracene							10
Benzene							10
Benzidine							50
Benzo(*a*)anthracene							5
Benzo(*a*)pyrene							5
Bis(2-chloroethyl)ether							10
Bis(2-ethylhexyl) phthalate							10
Bromodichloromethane							10
Bromoform							10
Carbon Tetrachloride							2
Chlorobenzene							10
Chlorodibromomethane							10
Chloroform							10
Chrysene							5
Cresols							10
1,2-Dibromoethane							10
m-Dichlorobenzene							10
o-Dichlorobenzene							10
p-Dichlorobenzene							10
3,3'-Dichlorobenzidine							5
1,2-Dichloroethane							10
1,1-Dichloroethylene							10
Dichloromethane							20
1,2-Dichloropropane							10
1,3-Dichloropropylene							10
2,4-Dimethylphenol							10
Di-*n*-Butyl Phthalate							10
Epichlorohydrin							1,000

Outfall No.: ☐C ☐G Pollutant	Samp. 1 (µg/L)[1]	Samp. 2 (µg/L)[1]	Samp. 3 (µg/L)[1]	Samp. 4 (µg/L)[1]	Avg. (µg/L)[1]	MAL[2] (µg/L)
Ethylbenzene						10
Ethylene Glycol						—
Fluoride						500
Hexachlorobenzene						5
Hexachlorobutadiene						10
Hexachlorocyclopentadiene						10
Hexachloroethane						20
4,4′-Isopropylidenediphenol [bisphenol A]						—
Methyl Ethyl Ketone						50
Methyl *tert*-butyl ether [MTBE]						—
Nitrobenzene						10
N-Nitrosodiethylamine						20
N-Nitroso-di-*n*-Butylamine						20
Nonylphenol						333
Pentachlorobenzene						20
Pentachlorophenol						5
Phenanthrene						10
Polychlorinated Biphenyls (PCBs)[3]						0.2
Pyridine						20
1,2,4,5-Tetrachlorobenzene						20
1,1,2,2-Tetrachloroethane						10
Tetrachloroethylene						10
Toluene						10
1,1,1-Trichloroethane						10
1,1,2-Trichloroethane						10
Trichloroethylene						10
2,4,5-Trichlorophenol						50
TTHM (Total Trihalomethanes)						10
Vinyl Chloride						10

3 Total of detects for PCB-1242, PCB-1254, PCB-1221, PCB-1232, PCB-1248, PCB-1260, PCB-1016. If all values are non-detects, enter the highest non-detect preceded by a "<" symbol.

Table 3

Outfall No. ☐C ☐G **Pollutant**	**Believed Present**	**Believed Absent**	**Average Concentration (mg/L)**	**Maximum Concentration (mg/L)**	**No. of Samples**	**MAL (mg/L)**
Bromide						0.400
Color (PCU)						—
Nitrate-Nitrite (as N)						—
Sulfide (as S)						—
Sulfite (as SO_3)						—
Surfactants						—
Boron, total						0.020
Cobalt, total						0.0003
Iron, total						0.007
Magnesium, total						0.020
Manganese, total						0.0005
Molybdenum, total						0.001
Tin, total						0.005
Titanium, total						0.030

BIOMONITORING REQUIREMENTS

CHRONIC BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 for whole effluent toxicity (WET) testing.

1. Scope, Frequency, and Methodology

   a. The permittee shall test the effluent for toxicity in accordance with the provisions below. Such testing will determine if an appropriately dilute effluent sample adversely affects the survival, reproduction, or growth of the test organisms.

   b. The permittee shall conduct the following toxicity tests utilizing the test organisms, procedures, and quality assurance requirements specified in this part of this permit and in accordance with "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," fourth edition (EPA-821-R-02-013) or its most recent update:

      1) Chronic static renewal survival and reproduction test using the water flea (*Ceriodaphnia dubia*) (Method 1002.0). This test should be terminated when 60% of the surviving adults in the control produce three broods or at the end of eight days, whichever occurs first. This test shall be conducted once per quarter.

      2) Chronic static renewal 7-day larval survival and growth test using the fathead minnow (*Pimephales promelas*) (Method 1000.0). A minimum of five replicates with eight organisms per replicate shall be used in the control and in each dilution. This test shall be conducted once per quarter.

      The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit.

   c. The permittee shall use five effluent dilution concentrations and a control in each toxicity test. These effluent dilution concentrations are 32%, 42%, 56%, 75%, and 100% effluent. The critical dilution, defined as 100% effluent, is the effluent concentration representative of the proportion of effluent in the receiving water during critical low flow or critical mixing conditions.

   d. This permit may be amended to require a WET limit, a chemical-specific effluent limit, a best management practice, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

   e. Testing Frequency Reduction

      1) If none of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee may submit this information in writing and, upon approval, reduce the testing frequency to once per six months for the invertebrate test species and once per year for the vertebrate test species.

2) If one or more of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee shall continue quarterly testing for that species until this permit is reissued. If a testing frequency reduction had been previously granted and a subsequent test demonstrates significant toxicity, the permittee will resume a quarterly testing frequency for that species until this permit is reissued.

2. Required Toxicity Testing Conditions

a. Test Acceptance - The permittee shall repeat any toxicity test, including the control and all effluent dilutions, which fail to meet the following criteria:

1) a control mean survival of 80% or greater;

2) a control mean number of water flea neonates per surviving adult of 15 or greater;

3) a control mean dry weight of surviving fathead minnow larvae of 0.25 mg or greater;

4) a control coefficient of variation percent (CV%) of 40 or less between replicates for the young of surviving females in the water flea test; and the growth and survival endpoints in the fathead minnow test;

5) a critical dilution CV% of 40 or less for the young of surviving females in the water flea test; and the growth and survival endpoints for the fathead minnow test. However, if statistically significant lethal or nonlethal effects are exhibited at the critical dilution, a CV% greater than 40 shall not invalidate the test;

6) a percent minimum significant difference of 47 or less for water flea reproduction; and

7) a percent minimum significant difference of 30 or less for fathead minnow growth.

b. Statistical Interpretation

1) For the water flea survival test, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be the Fisher's exact test as described in the manual referenced in Part 1.b.

2) For the water flea reproduction test and the fathead minnow larval survival and growth tests, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be in accordance with the manual referenced in Part 1.b.

3) The permittee is responsible for reviewing test concentration-response relationships to ensure that calculated test-results are interpreted and reported correctly. The document entitled "Method Guidance and Recommendation for Whole Effluent Toxicity (WET) Testing (40 CFR Part 136)" (EPA 821-B-00-004) provides guidance on determining the validity of test results.

4) If significant lethality is demonstrated (that is, there is a statistically significant difference in survival at the critical dilution when compared to the survival in the control), the conditions of test acceptability are met, and the survival of the test organisms are equal to or greater than 80% in the critical dilution and all dilutions below that, then the permittee shall report a survival No Observed Effect Concentration (NOEC) of not less than the critical dilution for the reporting requirements.

5) The NOEC is defined as the greatest effluent dilution at which no significant effect is demonstrated. The Lowest Observed Effect Concentration (LOEC) is defined as the lowest effluent dilution at which a significant effect is demonstrated. A significant effect is herein defined as a statistically significant difference between the survival, reproduction, or growth of the test organism in a specified effluent dilution when compared to the survival, reproduction, or growth of the test organism in the control.

6) The use of NOECs and LOECs assumes either a monotonic (continuous) concentration-response relationship or a threshold model of the concentration-response relationship. For any test result that demonstrates a non-monotonic (non-continuous) response, the NOEC should be determined based on the guidance manual referenced in Item 3.

7) Pursuant to the responsibility assigned to the permittee in Part 2.b.3), test results that demonstrate a non-monotonic (non-continuous) concentration-response relationship may be submitted, prior to the due date, for technical review. The guidance manual referenced in Item 3 will be used when making a determination of test acceptability.

8) TCEQ staff will review test results for consistency with rules, procedures, and permit requirements.

c. Dilution Water

1) Dilution water used in the toxicity tests must be the receiving water collected as close to the point of discharge as possible but unaffected by the discharge.

2) Where the receiving water proves unsatisfactory as a result of pre-existing instream toxicity (i.e. fails to fulfill the test acceptance criteria of Part 2.a.), the permittee may substitute synthetic dilution water for the receiving water in all subsequent tests provided the unacceptable receiving water test met the following stipulations:

a) a synthetic lab water control was performed (in addition to the receiving water control) which fulfilled the test acceptance requirements of Part 2.a;

b) the test indicating receiving water toxicity was carried out to completion (i.e., 7 days);

c) the permittee submitted all test results indicating receiving water toxicity with the reports and information required in Part 3.

3) The synthetic dilution water shall consist of standard, moderately hard, reconstituted water. Upon approval, the permittee may substitute other appropriate dilution water with chemical and physical characteristics similar to that of the receiving water.

d. Samples and Composites

1) The permittee shall collect a minimum of three composite samples from Outfall 001. The second and third composite samples will be used for the renewal of the dilution concentrations for each toxicity test.

2) The permittee shall collect the composite samples such that the samples are representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance being discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the first composite sample. The holding time for any subsequent composite sample shall not exceed 72 hours. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of effluent samples, the requirements for the minimum number of effluent samples, the minimum number of effluent portions, and the sample holding time are waived during that sampling period. However, the permittee must have collected an effluent composite sample volume sufficient to complete the required toxicity tests with renewal of the effluent. When possible, the effluent samples used for the toxicity tests shall be collected on separate days if the discharge occurs over multiple days. The sample collection duration and the static renewal protocol associated with the abbreviated sample collection must be documented in the full report.

3. Reporting

All reports, tables, plans, summaries, and related correspondence required this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated whether carried to completion or not.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 1 forms provided with this permit.

1) Annual biomonitoring test results are due on or before January 20th for biomonitoring conducted during the previous 12-month period.

2) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

3) Quarterly biomonitoring test results are due on or before April 20th, July 20th, October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

4) Monthly biomonitoring test results are due on or before the 20th day of the month following sampling.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TLP3B, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For the water flea, Parameter TOP3B, report the NOEC for survival.

3) For the water flea, Parameter TXP3B, report the LOEC for survival.

4) For the water flea, Parameter TWP3B, enter a "1" if the NOEC for reproduction is less than the critical dilution; otherwise, enter a "0."

5) For the water flea, Parameter TPP3B, report the NOEC for reproduction.

6) For the water flea, Parameter TYP3B, report the LOEC for reproduction.

7) For the fathead minnow, Parameter TLP6C, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

8) For the fathead minnow, Parameter TOP6C, report the NOEC for survival.

9) For the fathead minnow, Parameter TXP6C, report the LOEC for survival.

10) For the fathead minnow, Parameter TWP6C, enter a "1" if the NOEC for growth is less than the critical dilution; otherwise, enter a "0."

11) For the fathead minnow, Parameter TPP6C, report the NOEC for growth.

12) For the fathead minnow, Parameter TYP6C, report the LOEC for growth.

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For retest number 2, Parameter 22416, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

4. <u>Persistent Toxicity</u>

The requirements of this Part apply only when a test demonstrates a significant effect at the critical dilution. Significant effect and significant lethality were defined in Part 2.b. Significant sublethality is defined as a statistically significant difference in growth/reproduction at the critical dilution when compared to the growth/reproduction of the test organism in the control.

a. The permittee shall conduct a total of 2 additional tests (retests) for any species that demonstrates a significant effect (lethal or sublethal) at the critical dilution. The two retests shall be conducted monthly during the next two consecutive months. The permittee shall not substitute either of the two retests in lieu of routine toxicity testing. All reports shall be submitted within 20 days of test completion. Test completion is defined as the last day of the test.

b. If the retests are performed due to a demonstration of significant lethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5. The provisions of Part 4.a. are suspended upon completion of the two retests and submittal of the TRE action plan and schedule defined in Part 5.

If neither test demonstrates significant lethality and the permittee is testing under the reduced testing frequency provision of Part 1.e., the permittee shall return to a quarterly testing frequency for that species.

c. If the two retests are performed due to a demonstration of significant sublethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall again perform two retests as stipulated in Part 4.a.

d. If the two retests are performed due to a demonstration of significant sublethality, and neither test demonstrates significant lethality, the permittee shall continue testing at the quarterly frequency.

e. Regardless of whether retesting for lethal or sublethal effects or a combination of the two, no more than one retest per month is required for a species.

5. Toxicity Reduction Evaluation

a. Within 45 days of the retest that demonstrates significant lethality, or within 45 days of being so instructed due to multiple toxic events, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, or within 90 days of being so instructed due to multiple toxic events, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall describe an approach for the reduction or elimination of lethality for both test species defined in Part 1.b. At a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the procedures specified in the document entitled "Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I" (EPA/600/6-91/005F) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled

"Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization, identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, project manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation which identifies the pollutant and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data which identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to meet no significant lethality at the critical dilution; and

6) any changes to the initial TRE plan and schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive months with at least monthly testing. At the end of the 12 months, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 28 months from the last test day of the retest that confirmed significant lethal effects at the critical dilution. The permittee may petition the Executive Director (in writing) for an extension of the 28-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall provide information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to no significant lethality at the critical dilution. The report will also provide a specific corrective action schedule for implementing the selected control mechanism.

h. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements, where necessary, require a compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical-specific limit.

i. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 1 (SHEET 1 OF 4)

BIOMONITORING REPORTING

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	______________	TO:	______________
	No. 2 FROM:	______________	TO:	______________
	No. 3 FROM:	______________	TO:	______________

Test initiated: ______________________am/pm ______________________date

Dilution water used: ________ Receiving Water ________ Synthetic Dilution Water

NUMBER OF YOUNG PRODUCED PER ADULT AT END OF TEST

	Percent effluent (%)					
REP	0%	32%	42%	56%	75%	100%
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
Survival Mean						
Total Mean						
CV%*						
PMSD						

*Coefficient of Variation = standard deviation x 100/mean (calculation based on young of the surviving adults) Designate males (M), and dead females (D), along with number of neonates (x) released prior to death.

TABLE 1 (SHEET 2 OF 4)

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

Is the mean number of young produced per adult significantly less than the number of young per adult in the control for the % effluent corresponding to significant nonlethal effects?

CRITICAL DILUTION (100%): _______ YES _______ NO

PERCENT SURVIVAL

	Percent effluent					
Time of Reading	0%	32%	42%	56%	75%	100%
24h						
48h						
End of Test						

2. Fisher's Exact Test:

Is the mean survival at test end significantly less than the control survival for the % effluent corresponding to lethality?

CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

a.) NOEC survival = ___________% effluent

b.) LOEC survival = ___________% effluent

c.) NOEC reproduction = ___________% effluent

d.) LOEC reproduction = ___________% effluent

TABLE 1 (SHEET 3 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	____________	TO:	____________
	No. 2 FROM:	____________	TO:	____________
	No. 3 FROM:	____________	TO:	____________

Test initiated: ____________________am/pm ____________________date

Dilution water used: ________ Receiving Water ________ Synthetic Dilution Water

FATHEAD MINNOW GROWTH DATA

Effluent Concentration	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight	CV%*
	A	B	C	D	E		
0%							
32%							
42%							
56%							
75%							
100%							
PMSD							

* Coefficient of Variation = standard deviation x 100/mean

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean dry weight (growth) at 7 days significantly less than the control's dry weight (growth) for the % effluent corresponding to significant nonlethal effects?

CRITICAL DILUTION (100%): _______ YES _______ NO

TABLE 1 (SHEET 4 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW GROWTH AND SURVIVAL TEST

FATHEAD MINNOW SURVIVAL DATA

Effluent Concentration	Percent Survival in replicate chambers					Mean percent survival			CV%*
	A	B	C	D	E	24h	48h	7 day	
0%									
32%									
42%									
56%									
75%									
100%									

* Coefficient of Variation = standard deviation x 100/mean

2. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean survival at 7 days significantly less (p=0.05) than the control survival for the % effluent corresponding to lethality?

   CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

   a.) NOEC survival = __________% effluent

   b.) LOEC survival = __________% effluent

   c.) NOEC growth = __________% effluent

   d.) LOEC growth = __________% effluent

24-HOUR ACUTE BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 for WET testing.

1. Scope, Frequency, and Methodology

a. The permittee shall test the effluent for lethality in accordance with the provisions in this section. Such testing will determine compliance with Texas Surface Water Quality Standard 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the appropriate test organisms in 100% effluent for a 24-hour period.

b. The toxicity tests specified shall be conducted once per six months. The permittee shall conduct the following toxicity tests using the test organisms, procedures, and quality assurance requirements specified in this section of the permit and in accordance with "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms," fifth edition (EPA-821-R-02-012) or its most recent update:

1) Acute 24-hour static toxicity test using the water flea (*Daphnia pulex* or *Ceriodaphnia dubia*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

2) Acute 24-hour static toxicity test using the fathead minnow (*Pimephales promelas*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below.

c. In addition to an appropriate control, a 100% effluent concentration shall be used in the toxicity tests. The control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

d. This permit may be amended to require a WET limit, a best management practice, a chemical-specific limit, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

e. As the dilution series specified in the Chronic Biomonitoring Requirements includes a 100% effluent concentration, the results from those tests may fulfill the requirements of this section; any tests performed in the proper time interval may be substituted. Compliance will be evaluated as specified in Part 1.a. The 50% survival in 100% effluent for a 24-hour period standard applies to all tests utilizing a 100% effluent dilution, regardless of whether the results are submitted to comply with the minimum testing frequency.

2. Required Toxicity Testing Conditions

a. Test Acceptance – The permittee shall repeat any toxicity test, including the control, if the control fails to meet a mean survival equal to or greater than 90%.

b. Dilution Water - In accordance with Part 1.c., the control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

c. Samples and Composites

1) The permittee shall collect one composite sample from Outfall 001.

2) The permittee shall collect the composite sample such that the sample is representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the composite sample. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of the effluent composite sample, the requirements for the minimum number of effluent portions are waived. However, the permittee must have collected a composite sample volume sufficient for completion of the required test. The abbreviated sample collection, duration, and methodology must be documented in the full report.

3. <u>Reporting</u>

All reports, tables, plans, summaries, and related correspondence required in this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted pursuant to this permit in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 2 forms provided with this permit.

1) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

2) Quarterly biomonitoring test results are due on or before April 20th, July 20th, and October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TIE3D, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For the fathead minnow, Parameter TIE6C, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For retest number 2, Parameter 22416, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

4. Persistent Mortality

The requirements of this part apply when a toxicity test demonstrates significant lethality, which is defined as a mean mortality of 50% or greater to organisms exposed to the 100% effluent concentration for 24 hours.

a. The permittee shall conduct 2 additional tests (retests) for each species that demonstrates significant lethality. The two retests shall be conducted once per week for 2 weeks. Five effluent dilution concentrations in addition to an appropriate control shall be used in the retests. These effluent concentrations are 6%, 13%, 25%, 50%, and 100% effluent. The first retest shall be conducted within 15 days of the laboratory determination of significant lethality. All test results shall be submitted within 20 days of test completion of the second retest. Test completion is defined as the 24th hour.

b. If one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5.

5. Toxicity Reduction Evaluation

a. Within 45 days of the retest that demonstrates significant lethality, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall lead to the successful elimination of significant lethality for both test species defined in item 1.b. As a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the procedures specified in the document entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures" (EPA/600/6-91/003) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic

Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization, identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly TRE activities reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation that identifies the pollutant(s) and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data that identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to eliminate significant lethality; and

6) any changes to the initial TRE Plan and Schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive weeks with at least weekly testing. At the end of the 12 weeks, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 18 months from the last test day of the retest that demonstrates significant lethality. The permittee may petition the Executive Director (in writing) for an extension of the 18-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall specify the control mechanism that will, when implemented, reduce effluent toxicity as specified in item 5.h. The report shall also specify a corrective action schedule for implementing the selected control mechanism.

h. Within 3 years of the last day of the test confirming toxicity, the permittee shall comply with 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the test organism in 100% effluent at the end of 24-hours. The permittee may petition the Executive Director (in writing) for an extension of the 3-year limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE.

The permittee may be exempted from complying with 30 TAC § 307.6(e)(2)(B) upon proving that toxicity is caused by an excess, imbalance, or deficiency of dissolved salts. This exemption excludes instances where individually toxic components (e.g., metals) form a salt compound. Following the exemption, this permit may be amended to include an ion-adjustment protocol, alternate species testing, or single species testing.

i. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements where necessary, require a compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical specific limit.

j. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 2 (SHEET 1 OF 2)

WATER FLEA SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN*						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = ______% effluent

TABLE 2 (SHEET 2 OF 2)

FATHEAD MINNOW SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = ______% effluent

Attachment C: Threatened and Endangered Species Consultation

Luminant

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Glen Rose, TX 76043

T 254.897.6113

CP-202100010
TXX-21005
March 9, 2021

Kevin Mote
Texas Parks and Wildlife Department
114 Center Avenue
Suite 300
Brownwood, Texas 76801

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Mote:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	February 8, 2030	February 8, 2050
Unit 2	February 2, 2033	February 2, 2053

The environmental report addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act. This letter seeks input from the Texas Parks and Wildlife Department (TPWD) regarding such impacts in the vicinity of the CPNPP.

As part of the renewal process, the NRC may request a consultation with the TPWD regarding the license renewal. To facilitate Vistra OpCo's assessment and to ensure an efficient and effective consultation process by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's surroundings, and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant and a table of listed species in the plant's vicinity are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The CPNPP property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those connecting CPNPP to the switchyard.

Species potentially occurring near the power plant site, or within Somervell and Hood counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed Table 2, *Protected Species Potentially Occurring in the CPNPP Vicinity*.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the species or habitats noted herein.

As stated earlier, this letter seeks TPWD input on Vistra OpCo's proposed continued operation of the CPNPP on listed species and important habitats within the environs of the plant. We would appreciate TPWD notifying us of your comments and any information TPWD believes we should consider in the preparation of the environmental report. Vistra OpCo requests that TPWD send a response by letter to Randy Harding (see contact information below) by April 21, 2021. Vistra OpCo plans to contact TPWD in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions the TPWD staff may have. We plan to include this letter and any response TPWD provides in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that TPWD send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity

Common Name	Scientific Name	Legal Status
Birds		
Golden-Cheeked Warbler	*Setophaga chrysoparia*	FE, SE
Least Tern	*Sterna antillarum*	SE
Piping Plover	*Charadrius melodus*	FT, ST
Red Knot	*Calidris canutus rufa*	FT
Whooping Crane	*Grus americana*	FE, SE
White-Faced Ibis	*Plegadis chihi*	ST
Black Rail	*Laterallus jamaicensis*	PT, ST
Reptiles		
Texas Horned Lizard	*Phrynosoma cornutum*	ST
Brazos Water Snake	*Nerodia harteri*	ST
Invertebrates		
Texas Fawnsfoot	*Truncilla macrodon*	FC, ST
Brazos Heelsplitter	*Potamilus streckersoni*	ST
FE= federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species; PT = federally proposed for threatened listing Sources: USFWS 2020; Texas Parks and Wildlife 2020		

Note: The area within a 6-mile radius surrounding CPNPP is considered the plant's vicinity. Somervell County, Texas and Hood County, Texas fall within the 6-mile vicinity and the protected species listings for these counties were used for preparing this table.

Figure 1. Comanche Peak Nuclear Power Plant Site

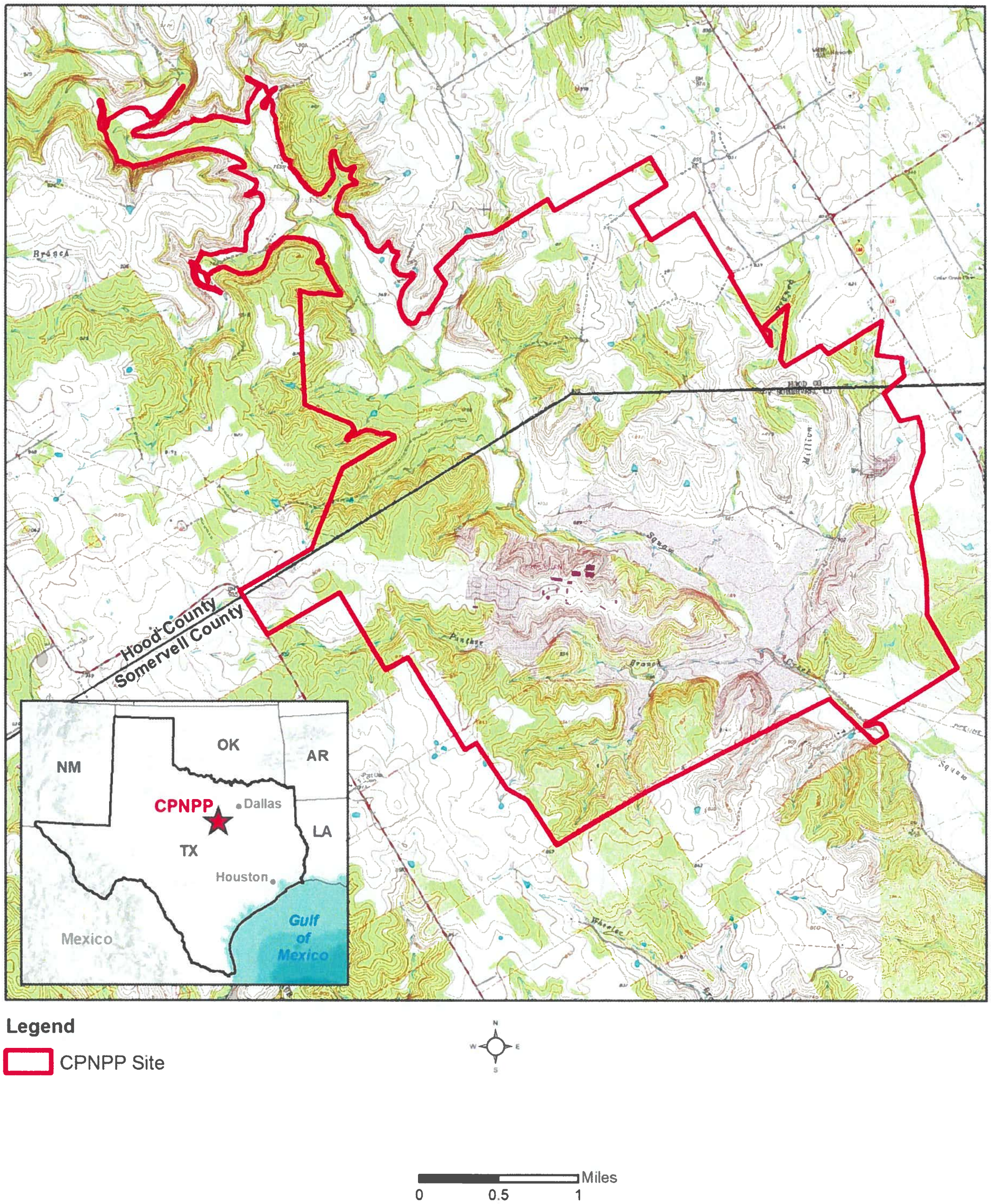
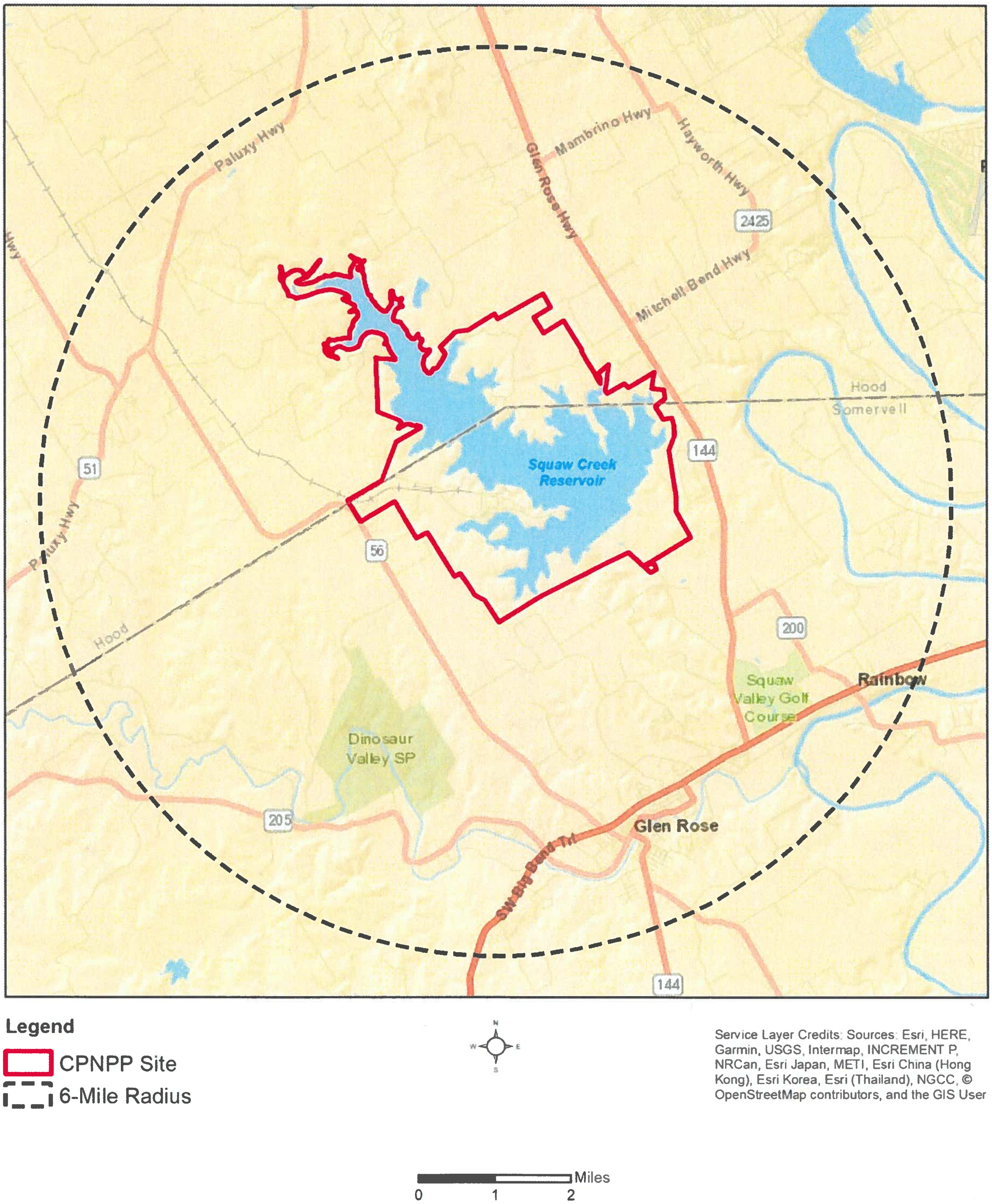


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100011
TXX-21006
March 9, 2021

Amy Lueders
U.S. Fish and Wildlife Services
10711 Burnet Road
Suite 200
Austin, TX 78758

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Ms. Lueders:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	February 8, 2030	February 8, 2050
Unit 2	February 2, 2033	February 2, 2053

The environmental report addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act. This letter seeks input from the U.S. Fish and Wildlife Services (USFWS) regarding such impacts in the vicinity of the CPNPP.

As part of the renewal process, the NRC may request a consultation with the USFWS regarding the license renewal. To facilitate Vistra OpCo's assessment and to ensure an efficient and effective consultation process by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's surroundings, and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant and a table of listed species in the plant's vicinity are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The CPNPP property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those connecting CPNPP to the switchyard.

Species potentially occurring near the power plant site, or within Somervell and Hood counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed Table 2.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the species or habitats noted herein.

As stated earlier, this letter seeks USFWS input on Vistra OpCo's proposed continued operation of the CPNPP on listed species and important habitats within the environs of the plant. We would appreciate USFWS notifying us of your comments and any information USFWS believes we should consider in the preparation of the environmental report. Vistra OpCo requests that USFWS send a response by letter to Randy Harding (see contact information below) by April 21, 2021. Vistra OpCo plans to contact USFWS in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions the USFWS staff may have. We plan to include this letter and any response USFWS provides in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that USFWS send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity

Common Name	Scientific Name	Legal Status
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Piping Plover	*Charadrius melodus*	FT, ST
Red Knot	*Calidris canutus rufa*	FT
Whooping Crane	*Grus americana*	FE, SE
White-Faced Ibis	*Plegadis chihi*	ST
Black Rail	*Laterallus jamaicensis*	PT, ST
Reptiles		
Texas Horned Lizard	*Phrynosoma cornutum*	ST
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Texas Fawnsfoot	*Truncilla macrodon*	FC, ST
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FE= federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species; PT = federally proposed for threatened listing Sources: USFWS 2020; Texas Parks and Wildlife 2020		

Note: The area within a 6-mile radius surrounding CPNPP is considered the plant's vicinity. Somervell County, Texas and Hood County, Texas fall within the 6-mile vicinity and the protected species listings for these counties were used for preparing this table.

Figure 1. Comanche Peak Nuclear Power Plant Site

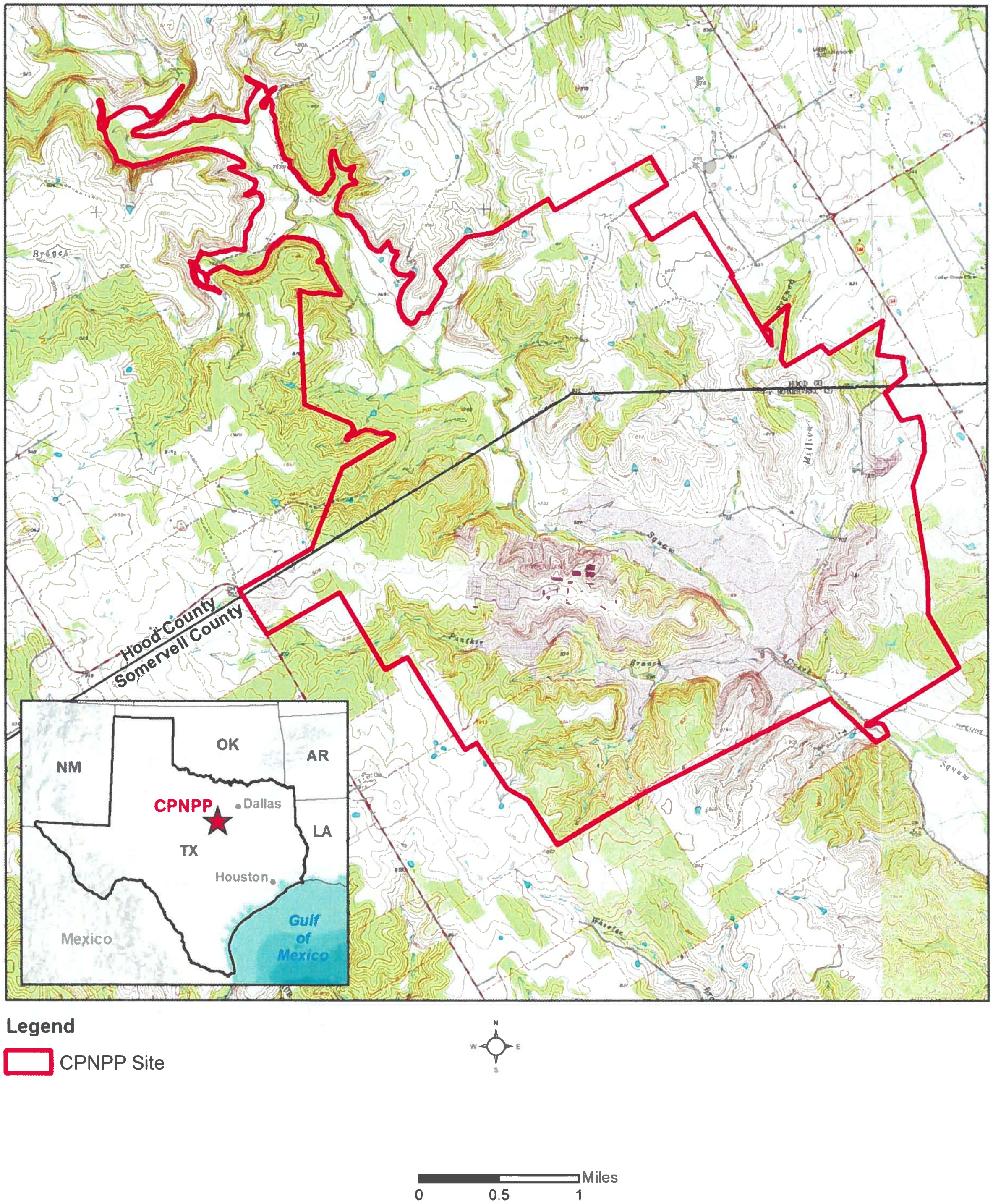
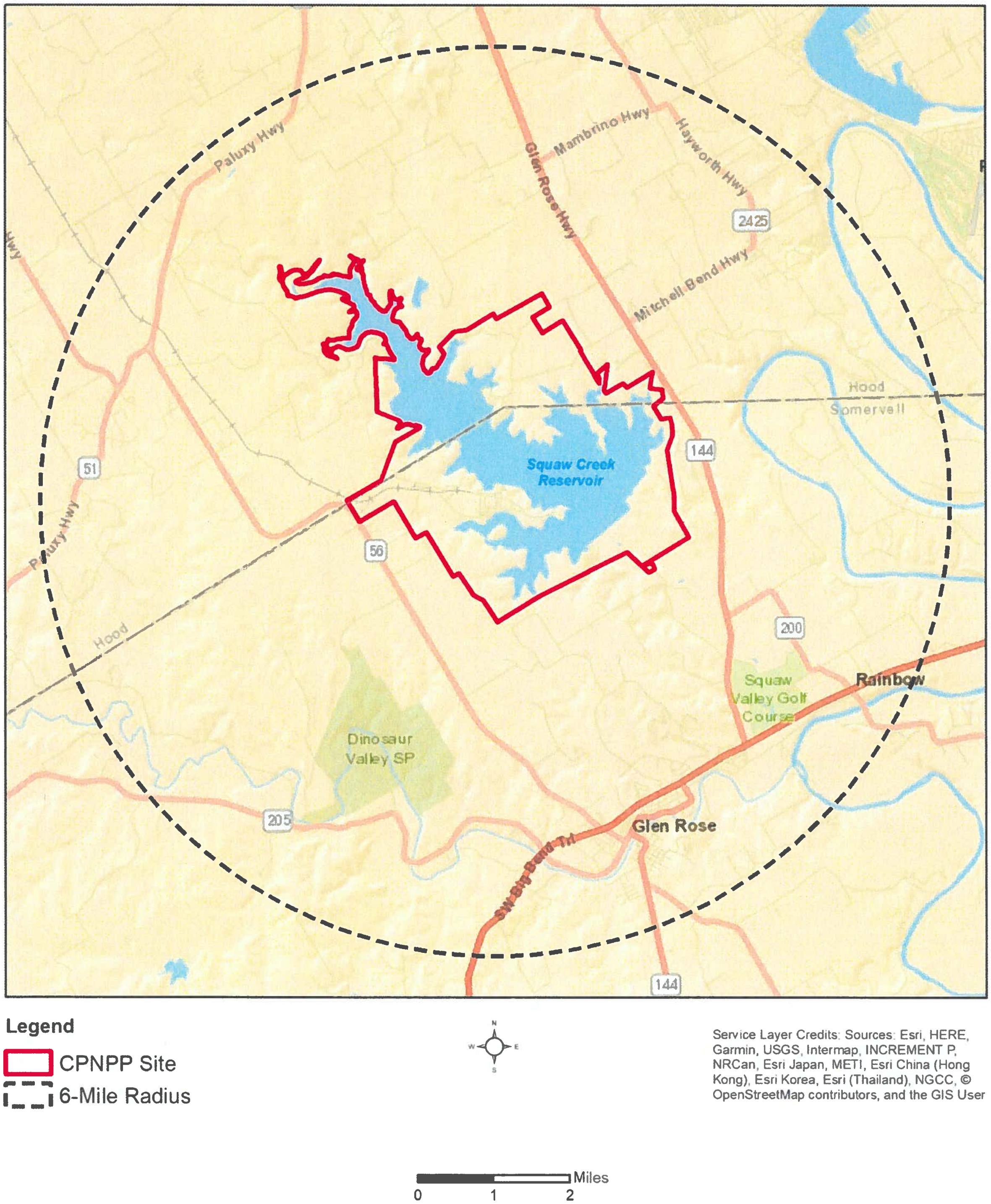


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



MISC 21-047
CP-202100199

TEXAS PARKS & WILDLIFE

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April 8, 2021

Mr. Steven K. Sewell
Comanche Peak Nuclear Power Plant
P.O. Box 1002
Glen Rose, TX 76043

RE: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Sewell:

Texas Parks and Wildlife Department (TPWD) has received the request for review of the proposed project referenced above. TPWD staff has reviewed the information provided and offers the following comments and recommendations concerning this project. For tracking purposes, please refer to TPWD project number 46273 in any return correspondence regarding this project.

Project Description

Vistra Operations Company LLC (Vistra OpCo) is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years. As part of the renewal process, Vistra OpCo is seeking input regarding the effects that license renewal activities may have on listed species and important plant and animal habitats within the plant's surroundings.

Species of Concern/Special Features

In addition to state and federally protected species, TPWD tracks species considered to be Species of Greatest Conservation Need (SGCN) that, due to limited distributions and/or declining populations, face threat of extirpation or extinction but currently lack the legal protections given to threatened or endangered species. Special landscape features, natural plant communities, and SGCN are rare resources for which TPWD actively promotes conservation, and TPWD considers it important to minimize impacts to such resources to reduce the likelihood of endangerment and preclude the need to list SGCN as threatened or endangered in the future. These species and communities are tracked in the Texas Natural Diversity Database (TXNDD). The most current and accurate TXNDD data can be requested from the TXNDD website.

The federal and state-listed endangered species golden-cheeked warbler (*Setophaga chrysoparia*) has been documented in the TXNDD at Dinosaur Valley

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

www.tpwd.texas.gov

State Park southwest of CPNPP. As seen on the attached map, suitable habitat for this species may occur on site.

In April 2018 the U.S. Fish and Wildlife Service (USFWS) published a final rule removing the black-capped vireo *(Vireo atricapilla)* from the Federal List of Endangered and Threatened Wildlife due to recovery and as of March 30, 2020 this species is no longer state-listed endangered by TPWD. The black-capped vireo has been documented in the TXNDD at Dinosaur Valley State Park and suitable habitat for this species may occur at CPNPP.

Please note that the absence of TXNDD information in an area does not imply that a species is absent from that area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare and protected species, data from the TXNDD does not provide a definitive statement as to the presence, absence or condition of species of concern, natural communities, or other significant features within your project area. These data are not inclusive and cannot be used as presence/absence data. This information cannot be substituted for on-the-ground surveys.

Recommendation: Please review the TPWD county lists for Hood and Somervell Counties, as rare and protected species could be present, depending upon habitat availability. The county lists are available on the Rare, Threatened, and Endangered Species of Texas website. For current USFWS threatened and endangered species lists, please see the USFWS Information for Planning and Consultation website. If the project area is found to contain rare or protected species, natural plant communities, or special features, TPWD recommends that precautions be taken to avoid impacts to them.

Determining the actual presence of a species in an area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency, and population density (both wildlife and human). The absence of a species can only be established with repeated negative observations and consideration of all factors contributing to the lack of detectable presence.

TPWD strives to respond to requests for project review within a 45-day comment period. Responses may be delayed due to workload and lack of staff. Failure to meet the 45-day review timeframe does not constitute a concurrence from TPWD that the proposed project will not adversely impact fish and wildlife resources.

TPWD advises review and implementation of these recommendations. If you have any questions, please contact me at Richard.Hanson@tpwd.texas.gov or (806) 761-4936.

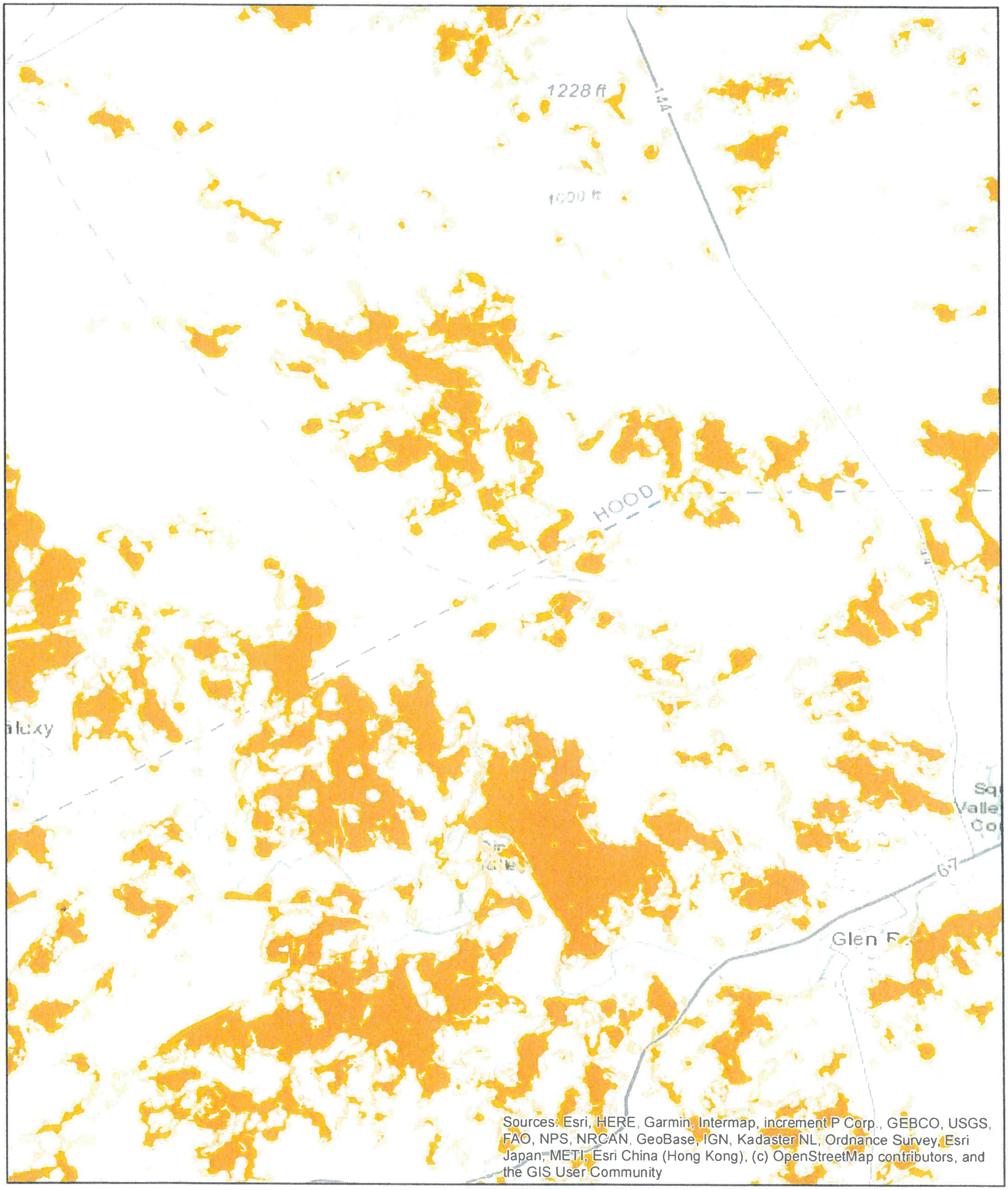
Sincerely,

Rick Hanson

Rick Hanson
Wildlife Habitat Assessment Program
Wildlife Division

RH: 46273
Attachment

Golden-cheeked Warbler Predictive Habitat Model



Date: 04/07/21

Map compiled by the Texas Parks and Wildlife Department, Wildlife Habitat Assessment Program. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.

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Legend

- 1 Low Quality
- 2
- 3
- 4 High Quality

Harding, Randy

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Tuesday, March 23, 2021 10:56 AM
To: Harding, Randy
Subject: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

EXTERNAL EMAIL

Randy,

Thank you for Luminant's March 9, 2021 letter requesting information on federally listed species in the preparation of an Environmental Report as part of the renewal process for Units 1 and 2. Luminant's letter correctly identifies that the following federally listed species have the potential to occur in Hood and Somervell Counties, Texas:

- golden-cheeked warbler, federally endangered
- whooping crane, federally endangered

We recommend that Luminant evaluate the proposed actions potential to result in adverse impacts to those species and include a determination within the Environmental Report. If Luminant concludes that adverse impacts could occur, we recommend contacting our office for consultation. If Luminant determines that there would be no potential adverse impacts, we recommend that the rationale for this determination be kept in the files for the renewal process. Approximately 9 years ago, I met with staff at Comanche Peak and toured the facility within the vicinity of operations for the power plant and did not see what I would determine to be suitable habitat for the golden-cheeked warbler. The tree canopy was too open, and the average age of the juniper trees was not mature enough to support golden-cheeked warblers. We recommend that Luminant evaluate the habitat present that may be impacted for current golden-cheeked warbler suitability.

Also note that the interior least tern was federally delisted on January 12, 2021 and need not be considered for consultation. The piping plover and red knot are federally listed but are only considered for consultation with wind energy projects in Hood and Somervell Counties. The candidate mussel species you have noted in your letter would not be expected to occur in an impounded waterbody like the Squaw Creek Reservoir. The black-capped vireo was delisted in 2018, and we are conducting post-delisting monitoring of this species to evaluate its status. Pleases contact our office if this species is discovered while conducting your Environmental Report. Let me know how I may be of further assistance and I look forward to further coordination as needed.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

Harding, Randy

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Friday, September 10, 2021 9:50 AM
To: Harding, Randy
Cc: Spicer, Gary
Subject: Re: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

EXTERNAL EMAIL

Randy,

Good morning and I hope you've been well. I would like to offer a clarification to my prior email March 23, 2021 email. After a telephone conversation this morning with Gary Spicer of Luminant, and another review of your March 9, 2020 letter, I understand that the proposed action is a License Renewal and would not involve any impacts to the physical or biological environment at the Comanche Peak Nuclear Power facility in Hood and Somervell Counties, Texas. This being the case, the U.S. Fish & Wildlife Service has no comments, concerns, or recommendations regarding the proposed Relicensing actions. My prior recommendations to evaluate the proposed actions potential to result in adverse impacts to federally listed species are unnecessary, as the conclusion would be No Effect. We do recommend that a statement supporting the rationale for this No Effect conclusion be included within the Environmental Report being prepared for the Relicense. Thank you again for the invitation to participate and please contact me with any additional needs.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

From: Edwards, Sean
Sent: Tuesday, March 23, 2021 10:55 AM
To: randy.harding@luminant.com <randy.harding@luminant.com>
Subject: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

Randy,

Thank you for Luminant's March 9, 2021 letter requesting information on federally listed species in the preparation of an Environmental Report as part of the renewal process for Units 1 and 2. Luminant's letter correctly identifies that the following federally listed species have the potential to occur in Hood and Somervell Counties, Texas:

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We recommend that Luminant evaluate the proposed actions potential to result in adverse impacts to those species and include a determination within the Environmental Report. If Luminant concludes that adverse impacts could occur, we recommend contacting our office for consultation. If Luminant determines that there would be no potential adverse impacts, we recommend that the rationale for this determination be kept in the files for the renewal process. Approximately 9 years ago, I met with staff at Comanche Peak and toured the facility within the vicinity of operations for the power plant and did not see what I would determine to be suitable habitat for the golden-cheeked warbler. The tree canopy was too open, and the average age of the juniper trees was not mature enough to support golden-cheeked warblers. We recommend that Luminant evaluate the habitat present that may be impacted for current golden-cheeked warbler suitability.

Also note that the interior least tern was federally delisted on January 12, 2021 and need not be considered for consultation. The piping plover and red knot are federally listed but are only considered for consultation with wind energy projects in Hood and Somervell Counties. The candidate mussel species you have noted in your letter would not be expected to occur in an impounded waterbody like the Squaw Creek Reservoir. The black-capped vireo was delisted in 2018, and we are conducting post-delisting monitoring of this species to evaluate its status. Pleases contact our office if this species is discovered while conducting your Environmental Report. Let me know how I may be of further assistance and I look forward to further coordination as needed.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

Attachment D: Cultural Resources Consultation

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100008
TXX-21003
February 8, 2021

Mark Wolfe, Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Wolfe,

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The environmental report addresses the potential to impact historic and cultural resources, including tribal cultural resources, on or near the CPNPP site. This letter seeks input from the Texas Historical Commission (THC) regarding such effects in the vicinity of the CPNPP site.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

As part of the renewal process, the NRC may request a consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the license renewal. The timeframe for the NRC consultation request is anticipated to be within a few months of Vistra OpCo's application submittal, currently scheduled for late 2022.

To facilitate Vistra OpCo's preparation of the license renewal environmental report and to ensure an efficient and effective consultation by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's surroundings and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant (Figures 1 and 2) and a table of known archaeological sites and historic properties in the plant's vicinity (Table 2) are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those that connect CPNPP to the switchyard.

A cultural resources survey of the majority of the 7,700-acre property was conducted in 1972 prior to the construction of CPNPP and the Squaw Creek Reservoir. No National Register of Historic Places (NRHP) eligible cultural resources have been confirmed within the 7,700-acre CPNPP property. A review of the Texas Archeological Sites Atlas (The Atlas) revealed that there are 141 cultural resources within 6 miles of CPNPP. Known archaeological sites and historic properties within a 6-mile radius of CPNPP are presented in Table 2 (Enclosure). Of the 141 cultural resources, four are NRHP-listed. No structures within the CPNPP property have been documented through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) programs. This license renewal will extend the CPNPP Units 1 and 2 operating licenses from 40 to 60 years. During this period, some of the CPNPP associated structures will be greater than 50 years of age; however, there are no anticipated changes to use or construction plans that may alter their current status.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the cultural or historic resources noted above.

As stated earlier, this letter seeks THC input on Vistra OpCo's proposed continued operation of CPNPP on historic and cultural resources within the environs of the plant. Vistra OpCo has requested similar input from native American Indian Tribes via separate correspondence. Please notify Vistra OpCo of concerns and any information THC believes Vistra OpCo should consider in the preparation of the environmental report. THC input is requested by March 25, 2021. Vistra OpCo plans to contact THC in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions that THC may have. Vistra OpCo plans to include this letter and any THC response provided in the final environmental report.

Vistra OpCo requests that THC send a letter response to Randy Harding (see contact information below). Please contact Steven Sewell at 254-879-6113 (Steven.Sewell@luminant.com) or Todd Evans at 2540897-8987 (Todd.Evans@luminant.com) if you have any questions or comments.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:

Table 2. Archaeological Sites and Historic Properties within a 6-mile Radius of Comanche Peak Nuclear Power Plant
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

	Site ID#	Quadrangle	Site Type	NRHP Status
1	HD-C005 Nubbin Ridge/Cedar Grove Cemetery	Nemo	Cemetery	Protected by State Burial Law
2	HD-C037 Mitchel Bend Cemetery	Nemo	Cemetery	Protected by State Burial Law
3	41HD57	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
4	41HD64	Hill City	Paleo-Archaic lithic scatter	Not evaluated
5	41HD65	Hill City	Early 20th century farmstead complex	Not evaluated
6	41HD66	Hill City	Small, thin unassigned lithic scatter	Not evaluated
7	41HD76	Hill City	Multi-component Early Archaic lithic scatter and 20th century debris scatter	Determined ineligible in ROW
8	41HD85	Nemo	Unassigned prehistoric lithic scatter	Recommended not eligible
9	41HD87	Hill City	Unassigned prehistoric lithic scatter	Recommended not eligible
10	41HD88	Hill City	Unassigned prehistoric lithic scatter	Undetermined
11	41HD89	Hill City	Early 20th century debris scatter/standing water tower, corral	Recommended not eligible
12	41HD97	Nemo	Stone field fence	Recommended not eligible in ROW
13	79003008 Somervell County Courthouse	Glen Rose West	Historic County Courthouse	NRHP Listed
14	82004523 Barnard's Mill	Glen Rose West	Historic mill and Hospital Complex	NRHP Listed

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
15	12000352 Oakdale Park District	Glen Rose East	Historic District with 29 contributing elements 14 noncontributing elements	NRHP Listed
16	14000820 Glen Rose Downtown Historic District	Glen Rose West	Historic District with 35 contributing elements 12 noncontributing elements	NRHP Listed
17	SV-C001 Post Oak Cemetery	Hill City	Cemetery	Protected by State Burial Law
18	SV-C002 Milam Chapel Cemetery	Hill City	Cemetery	Protected by State Burial Law
19	SV-C003/41SV64 Unknown Grave(s)	Glen Rose West	Cemetery	Protected by State Burial Law
20	SV-C004 Hopewell Cemetery	Hill City/Nemo	Cemetery	Protected by State Burial Law
21	SV-C005/41SV2 Cox Bend/Connally Cemetery	Nemo	Cemetery	Protected by State Burial Law
22	SV-C007 Squaw Creek Cemetery	Nemo	Cemetery	Protected by State Burial Law
23	SV-C008 Herndon Valley (Oldham) Cemetery	Nemo	Cemetery	Protected by State Burial Law
24	SV-C010 Kimmel Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
25	SV-C011 Lanham Mill Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
26	SV-C012 Glen Rose Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
27	SV-C024 McCamant Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
28	SV-C026 Unknown Cemetery	Hill City	Cemetery	Protected by State Burial Law

	Site ID#	Quadrangle	Site Type	NRHP Status
29	SV-C029 Booker Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
30	41SV1	Nemo	Reported late Paleo to early ceramic camp	Site reported destroyed by plowing and borrow pit
31	41SV3	Nemo	Unassigned prehistoric camp	No further work recommended
32	41SV4	Nemo	Archaic camp	1991 No further work 2004 Ineligible in ROW
33	41SV5	Nemo	Unassigned prehistoric camp with burned rock	No further work recommended
34	41SV6	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
35	41SV7	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
36	41SV8	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
37	41SV9	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
38	41SV10	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
39	41SV11	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
40	41SV12	Glen Rose East	Small unassigned prehistoric midden	No further work recommended
41	41SV13	Glen Rose East	Two areas of unassigned prehistoric middens	No further work recommended
42	41SV14	Glen Rose East	Reported site, observed as a thin lithic scatter	No further work recommended
43	41SV15	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
44	41SV16	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
45	41SV18	Glen Rose East	Archaic camp	Not evaluated

	Site ID#	Quadrangle	Site Type	NRHP Status
46	41SV19	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
47	41SV20	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
48	41SV21	Glen Rose East	Small unassigned lithic scatter with mussel shell	Not evaluated
49	41SV22	Glen Rose East	Small unassigned lithic scatter with little mussel shell	Not evaluated
50	41SV25	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
51	41SV26	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
52	41SV27	Glen Rose East	Thin unassigned prehistoric lithic scatter	Not evaluated
53	41SV28	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
54	41SV29	Hill City	Early to mid-20th century debris and windmill	Not evaluated
55	41SV30	Hill City	Multi-component site, with a prehistoric scatter/late 19th to early 20th century Hopewell Community School	Not evaluated
56	41SV31	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
57	41SV32	Hill City	Small unassigned prehistoric lithic scatter	Not evaluated
58	41SV33	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
59	41SV34	Hill City	Unassigned prehistoric lithic scatter	Not evaluated

	Site ID#	Quadrangle	Site Type	NRHP Status
60	41SV35	Hill City	Early 20th century cattle camp or farmstead	Not evaluated
61	41SV36	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
62	41SV37	Hill City	Unassigned prehistoric knapping station	Not evaluated
63	41SV38	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
64	41SV39	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
65	41SV40	Hill City	Late prehistoric lithic scatter/camp	Not evaluated
66	41SV41	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
67	41SV42	Hill City	Early to mid-20th century farmstead	Not evaluated
68	41SV43	Hill City	Early to mid-20th century farmstead	Not evaluated
69	41SV44	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
70	41SV45	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
71	41SV46	Hill City	Late 19th to early 20th century farmstead	Not evaluated
72	41SV47	Nemo	Late Prehistoric Period camp site	Avoid or testing recommended
73	41SV48	Hill City	Unassigned lithic scatter	Testing recommended
74	41SV49	Nemo	Archaic lithic scatter/camp	No further work recommended
75	41SV50	Nemo	Archaic to Late Prehistoric lithic scatter/camp	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
76	41SV51	Nemo	Petroglyph, a lithic scatter with diagnostic points reported from the Paleo to Late Prehistoric Periods	Protection of petroglyph recommended/Determined ineligible in ROW
77	41SV52	Hill City	Unassigned lithic scatter	Destroyed by construction
78	41SV53	Hill City	Early 20th century concrete wall features	Not evaluated
79	41SV54	Hill City	Small unassigned prehistoric lithic scatter with burned rock	Not evaluated
80	41SV55	Nemo	Archaic camp with manos and metates	Not Evaluated
81	41SV56	Hill City	Late Prehistoric camp with hearths	Determined eligible
82	41SV57	Hill City/Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
83	41SV58	Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
84	41SV59	Hill City	Unassigned prehistoric camp	Determined eligible
85	41SV61	Hill City	A possible hearth eroding from riverbank, no cultural material observed	Not evaluated as cultural material was not observed, monitoring for cultural material recommended
86	41SV62	Hill City	Unassigned lithic scatter with shell midden	Monitoring recommended
87	41SV63	Glen Rose West	1930s to 1950s trash midden and concrete slab	Undetermined
88	41SV65	Glen Rose West	Late 19th to mid-20th century farmstead	Not evaluated
89	41SV103	Glen Rose East	Unassigned prehistoric camp with PPK fragments, manos, metates and flakes exposed by plowing	Not evaluated

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
90	41SV109	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
91	41SV110	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
92	41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
93	41SV112	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Not evaluated
94	41SV113	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Further survey recommended
95	41SV114	Glen Rose West	Unassigned prehistoric lithic scatter with mano and metate fragments	Site reported destroyed
96	41SV115	Hill City	Archaic to Late Prehistoric Period lithic scatter	Site reported destroyed
97	41SV117	Glen Rose West	1903 to 1943 Lanham Mill School site	Undetermined
98	41SV118	Not stated	Unassigned prehistoric site No site form	Determined ineligible
99	41SV119	Hill City	Unassigned prehistoric site No site form	Undetermined
100	41SV120	Glen Rose West	Unassigned prehistoric site No site form	Undetermined
101	41SV121	Glen Rose East	Late Prehistoric Period open camp with pottery, arrow points, and faunal fragments	Site reported destroyed

	Site ID#	Quadrangle	Site Type	NRHP Status
102	41SV122	Glen Rose East	Archaic to Late Prehistoric open camp based on PPK	Site reported destroyed
103	41SV123	Glen Rose West	Unassigned prehistoric site exposed by bulldozing	Site reported destroyed
104	41SV127	Nemo	Archaic to Late Prehistoric open camp	Not evaluated
105	41HD128	Hill City	Small Archaic activity site	No further work recommended
106	41SV129	Hill City	Unassigned lithic scatter	No further work recommended
107	41SV130	Hill City	Unassigned lithic scatter with two hearths	Testing recommended
108	41SV131	Hill City	Early 20th century Moonshine still	No further work recommended
109	41SV132	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter	No further work recommended
110	41SV133	Hill City	Thin unassigned prehistoric lithic scatter	No further work recommended
111	41SV134	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter on bedrock no deposits	Not eligible
112	41SV135	Hill City	Thin unassigned prehistoric lithic scatter on exposed bedrock no soils	Not eligible
113	41SV136	Hill City	Thin unassigned camp with minor burned rock cultural deposit present	Testing for eligibility was recommended
114	41SV137	Hill City	Early to mid-20th century farmstead	No further work recommended
115	41SV138	Glen Rose West	Thin unassigned prehistoric lithic scatter	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
116	41SV139	Glen Rose West	Mid-20th century trash dump	No further work recommended
117	41SV140	Glen Rose West	Thin unassigned prehistoric lithic scatter, no deposits	No further work recommended
118	41SV141	Glen Rose West	Small thin unassigned prehistoric lithic scatter with burned rock, no deposits	No further work recommended
119	41SV142	Glen Rose West	Small unassigned prehistoric camp with burned rock, debitage, an unidentified dart point and mussel shell	Preservation recommended
120	41SV143	Glen Rose West	Small unassigned prehistoric camp with a hearth and charcoal	Unclear recommendation
121	41SV144	Glen Rose West	Small Archaic camp site, with debitage, burned rock and Granbury point	No further work recommended
122	41SV145	Glen Rose West	Small unassigned prehistoric lithic scatter with no diagnostics or cultural deposits	No further work recommended
123	41SV146	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	No further work recommended
124	41SV147	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	A possible cistern was recommended for further study as destruction of the site was imminent
125	41SV148	Glen Rose West	Mid-20th century artesian wells utilized by the Lanham Mill Community	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
126	41SV149	Glen Rose West	A single hearth exposed in the riverbank three meters below the surface	Further investigations of the hearth and surrounding soils was recommended
127	41SV150	Nemo	A probable Archaic camp site.	Unknown as the site form missing/report redacted
128	41SV151	Nemo	A single buried hearth exposed in backhoe trenching; no additional cultural material was observed	Determined Eligible
129	41SV153	Nemo	An extensive lens of burned rock observed in several backhoe trenches	Ineligible in ROW/undetermined
130	41SV154	Hill City	An early to mid-20th century house, well and cellar depression in poor condition	Not fully evaluated
131	41SV155	Hill City	An early to mid-20th century stone barn	Evaluation by Architectural Historian recommended
132	41SV156	Glen Rose East	A WPA constructed dam on the Paluxy River that was blown up with dynamite in the mid-20th century	Evaluation by Architectural Historian recommended
133	41SV157	Glen Rose West	Burned rock and a few flakes recovered from three backhoe test trenches, no features observed	Determined ineligible
134	41SV160	Hill City	A possible Middle Archaic lithic scatter with a mano/hammerstone fragment	No further work was recommended
135	41SV161	Hill City	An early 20th century farmstead consisting of foundations, a cistern, storm cellar two wells, corrals, and associated debris	No further work was recommended
136	41SV162	Nemo	An unassigned prehistoric lithic scatter	No further work recommended

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
137	41SV169	Hill City	An early to mid-20th century dry laid stone skirt on an earthen dam	No further work recommended
138	41SV170	Hill City	A late 19th century ford on Panther Creek	No further work recommended
139	41SV172	Glen Rose East	Buried burned rock, mussel shell and lithic debitage observe in backhoe trenches	Undetermined
140	41SV174	Nemo	Site type not listed on Atlas	Determined ineligible
141	41SV175	Nemo	Site type not listed on Atlas	Undetermined

Figure 1. Comanche Peak Nuclear Power Plant Site

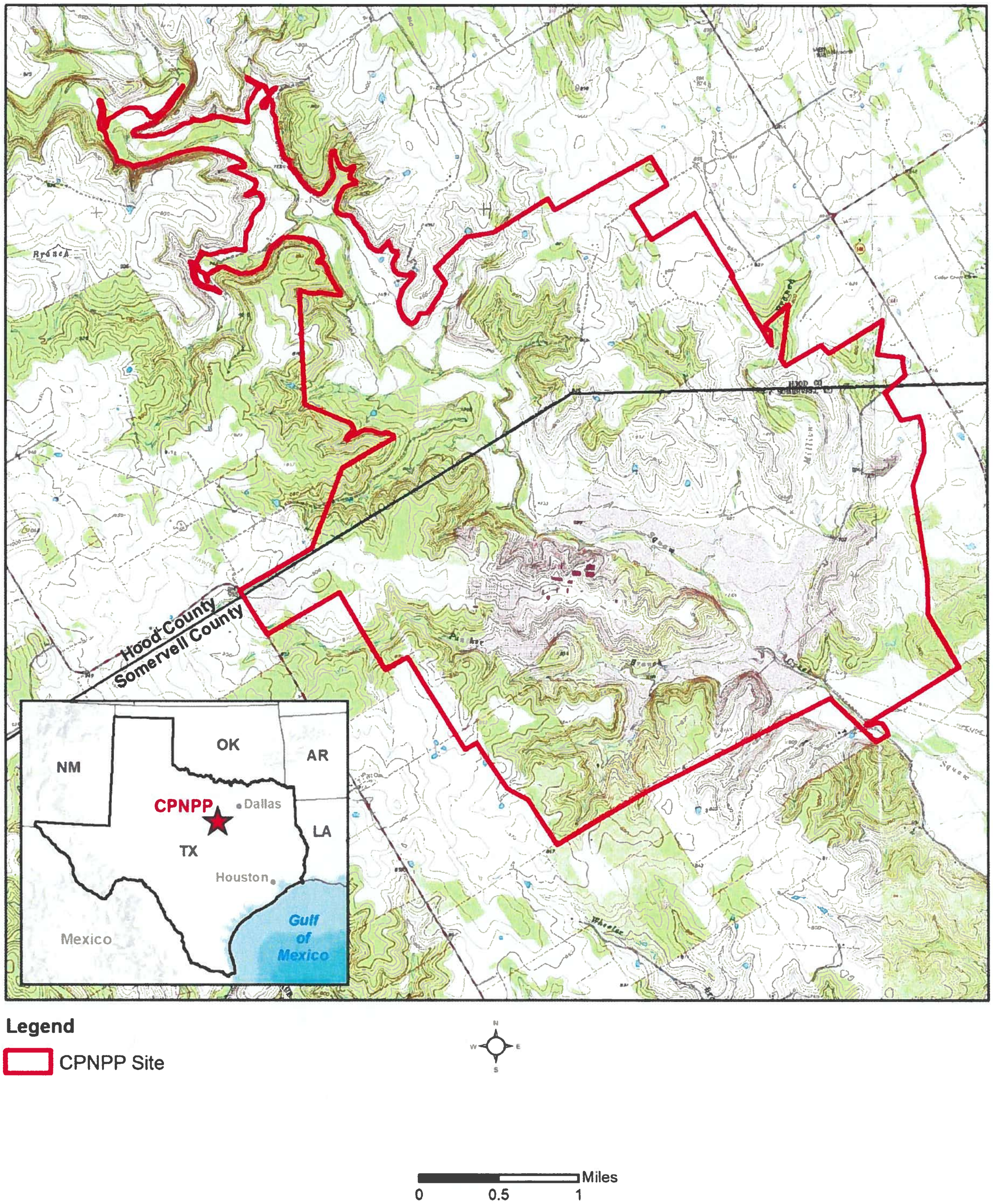
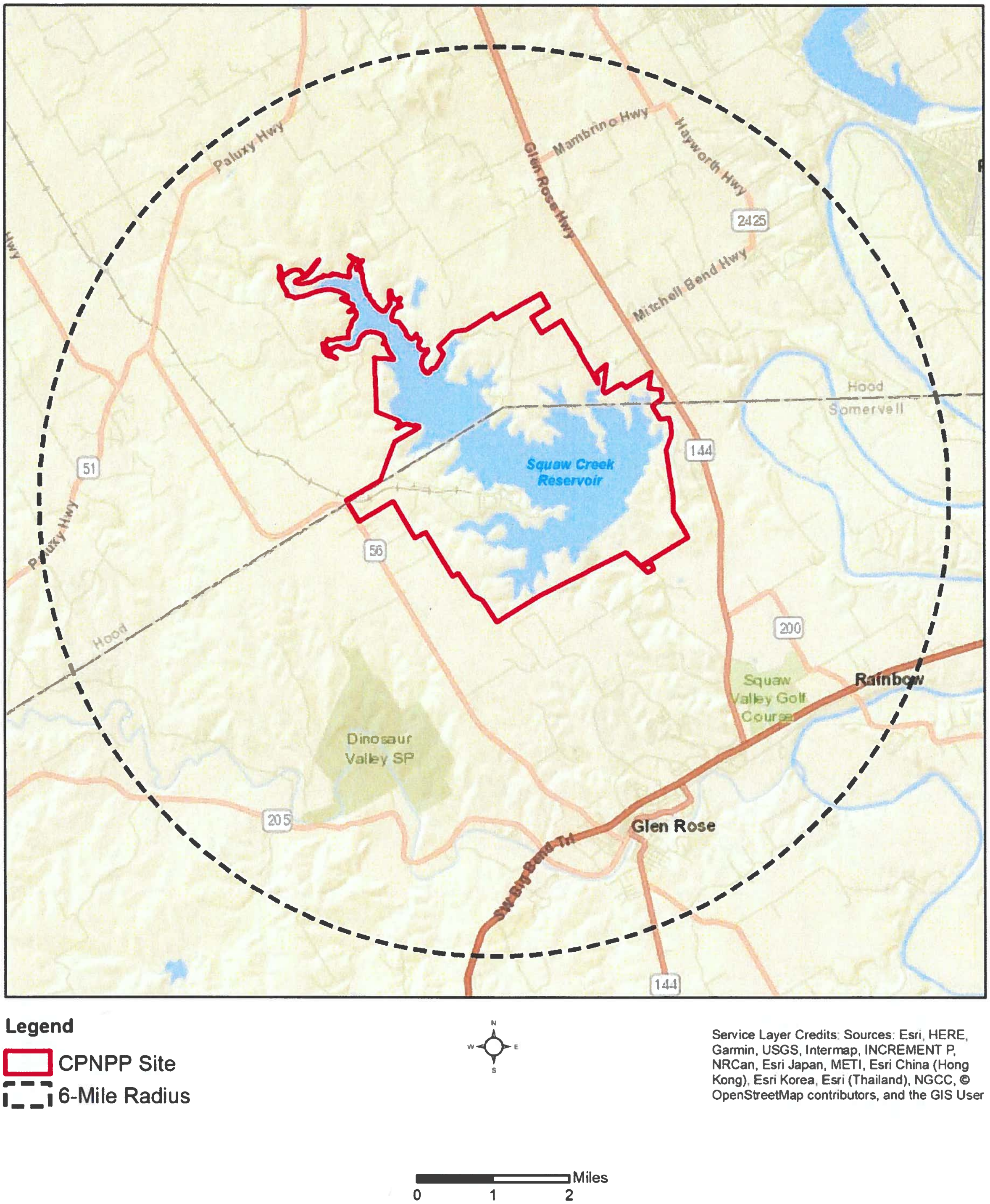


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



CP-202100162
MISC 21-032

Harding, Randy

From: noreply@thc.state.tx.us
Sent: Monday, March 22, 2021 8:41 AM
To: Harding, Randy; reviews@thc.state.tx.us
Subject: Section 106 Submission

EXTERNAL EMAIL

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
THC Tracking #202106168
Date: 03/22/2021
Comanche Peak Nuclear Power Plants

,TX

Description: Renew operating licenses for Units 1 and 2.

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Rebecca Shelton, Caitlin Brashear, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

Archeology Comments

- No identified historic properties, archeological sites, or other cultural resources are present or affected. However, if cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: rebecca.shelton@thc.texas.gov, caitlin.brashear@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

Rebecca Shelton

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

CP-202100329
MISC 21-065

TEXAS HISTORICAL COMMISSION

real places telling real stories

May 27, 2021

Randy Harding
Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, TX 76043

Re: *Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal, Hood County (NRC/106, THC # 202109853)*

Dear Mr. Harding:

Thank you for your correspondence describing the above referenced projects. This letter serves as comment on the proposed undertakings from Mark Wolfe, Executive Director of the Texas Historical Commission and the State Historic Preservation Officer.

The review staff led by Caitlin Brashear has completed its review of the above-referenced project. It is our understanding that Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CNPP) Units 1 and 2 for an additional 20 years, and that the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application addresses the potential to impact historic and cultural resources. Per our correspondence of March 22, 2021, we have determined that there will be no historic resources present or affected by the proposed license renewal (see attachment). We understand that during this 20-year period, there will be above-ground resources that reach historic age (50 years or older), however as there are no anticipated changes to use or construction plans that may alter these resources, our determination of **no historic properties affected** will continue to apply. Additional consultation with our office may be required, however, for any future federal undertakings at the CNPP that include construction, demolition, or decommissioning of historic-age resources.

For future submittals, please consider using the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review, or if we can be of further assistance, please contact Caitlin Brashear at 512-463-5851 or caitlin.brashear@thc.texas.gov.

Sincerely,

Caitlin Brashear

Caitlin Brashear, Historian, Federal Programs
For: Mark Wolfe, State Historic Preservation Officer

Attachment

Attachment: Copy of Response Letter Dated March 22, 2021

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
THC Tracking #202106168
Date: 03/22/2021
Comanche Peak Nuclear Power Plants

,TX

Description: Renew operating licenses for Units 1 and 2.

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Rebecca Shelton, Caitlin Brashear, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

Archeology Comments

- No identified historic properties, archeological sites, or other cultural resources are present or affected. However, if cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THCs Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: rebecca.shelton@thc.texas.gov, caitlin.brashear@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

Rebecca Shelton

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

As noted in ER Section 9.5.11, Vistra OpCo sent consultation letters to Native American groups recognized as potential stakeholders with the opportunity for comment. A list of these recipients is provided below. An example consultation letter sent by Vistra OpCo is provided in this attachment, as are all responses received.

Table D-1 List of Native American Group Recipients

Native American Tribe	First Name	Last Name	Title
Comanche Nation. Oklahoma	Martina	Minthorn	Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana	Linda	Langley	Tribal Historic Preservation Officer
Apache Tribe of Oklahoma	Bobby	Komardley	Chairman
Tonkawa Tribe of Indians of Oklahoma	Lauren	Norman-Brown	Tribal Historic Preservation Officer
Delaware Nation, Oklahoma	Nekole	Alligood	Director of Cultural Resources
Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie), Oklahoma	Gary	McAdams	Tribal Historic Preservation Officer
Alabama Coushatta Tribe of Texas	Bryant	Celestine	Tribal Historic Preservation Officer
Alabama Quassarte Tribal Town	Samantha	Robison	Tribal Historic Preservation Officer
Caddo Nation	Derek	Hill	Section 106 Specialist
Cherokee Nation of Oklahoma	Elizabeth	Toombs	Tribal Historic Preservation Officer
Kialegee Tribal Town	David	Cook	Tribal Administrator
Kickapoo Traditional Tribe of Texas	Jennie	Hernandez	Tribal Administrator
Kickapoo Tribe of Oklahoma	David	Pacheco, Jr.	Chairperson
Kiowa Tribe of Oklahoma	Kellie	Lewis	Tribal Historic Preservation Officer
Mascalero Apache Tribe	Holly	Houghten	Tribal Historic Preservation Officer
Quapaw Tribe of Oklahoma	Everett	Bandy	Tribal Historic Preservation Officer
Seminole Nation of Oklahoma	Theodore	Isham	Tribal Historic Preservation Officer
Thlopthlocco Tribal Town	Terry	Clothier	Tribal Historic Preservation Officer
Tunica-Biloxi Tribe	Earl	Barbry, Jr.	Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians	Sheila	Bird	Tribal Historic Preservation Officer

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100019
TXX-21014
January 19, 2021

Martina Minthorn
Comanche Nation, Oklahoma
6 SW D Avenue
Lawton, OK 73502

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2
License Renewal

Dear Ms. Minthorn:

Vistra Operation Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is preparing an application for renewing the operating licenses for the two power generation units at our Comanche Peak Nuclear Power Plant for an additional 20 years (see Table 1).

Comanche Peak has been providing zero-carbon power to Texas since 1990. Our company and our employees are committed to safe and reliable operations and exemplary environmental stewardship.

As part of the license renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operations and any refurbishment to be undertaken to enable the continued operation of the units. This letter seeks your assistance and input regarding tribal cultural resources within the plant's surrounding area. Vistra OpCo is not aware of any tribal cultural resources within the plant's surrounding area.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The Comanche Peak site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood County and Somervell County, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the site boundary. Figures 1 and 2 depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

While environmental impacts of the existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Texas Historical Commission and your tribe regarding license renewal. During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. Other than our normal activities to maintain existing structures and operations, we do not anticipate any ground-disturbing activities during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment activities in conjunction with license renewal, nor is the continued operation of Comanche Peak anticipated to adversely affect the environment or any cultural or historic resources. Again, Vistra OpCo is not aware of any tribal cultural resources within the plant's surrounding area.

Vistra OpCo is contacting you early in the application process with the intent of making you aware of the project, providing any data you need to ensure an efficient and effective consultation process, and to request the following:

- Input regarding tribal cultural resources within the plant's surrounding area, and
- Input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's surrounding area, and
- Any questions or additional information you find necessary for this consultation process.

We appreciate your assistance and ask that you provide us with your comments and any information you believe Vistra OpCo should consider in the preparation of the environmental report. We request that you send your response by letter to Randy Harding (see contact information below) by Feb. 26, 2021. Vistra OpCo plans to include this letter and any response letter you provide in the environmental report.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Should you, tribal members, or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Sincerely,

Steven K. Sewell

Enclosures: Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

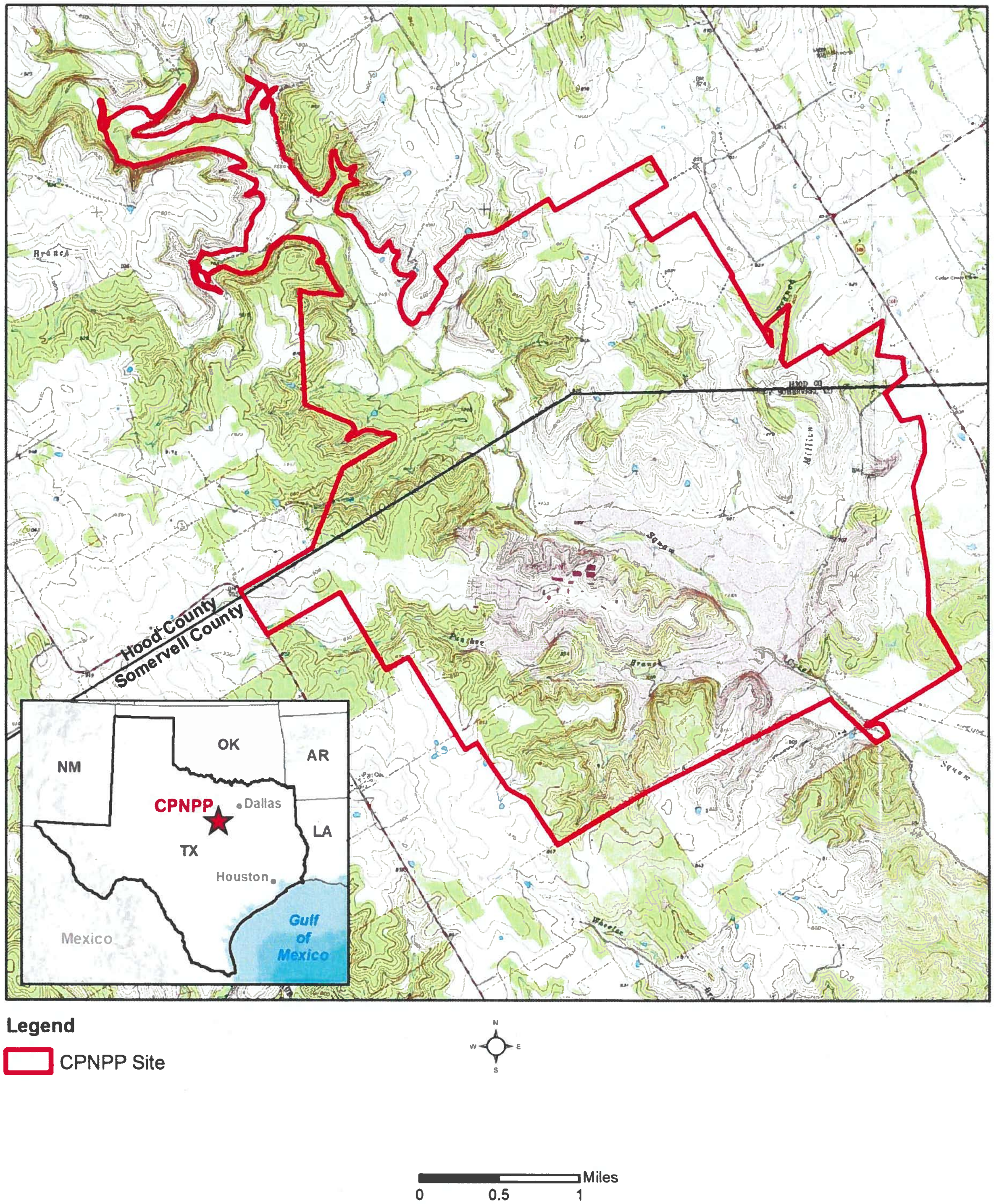
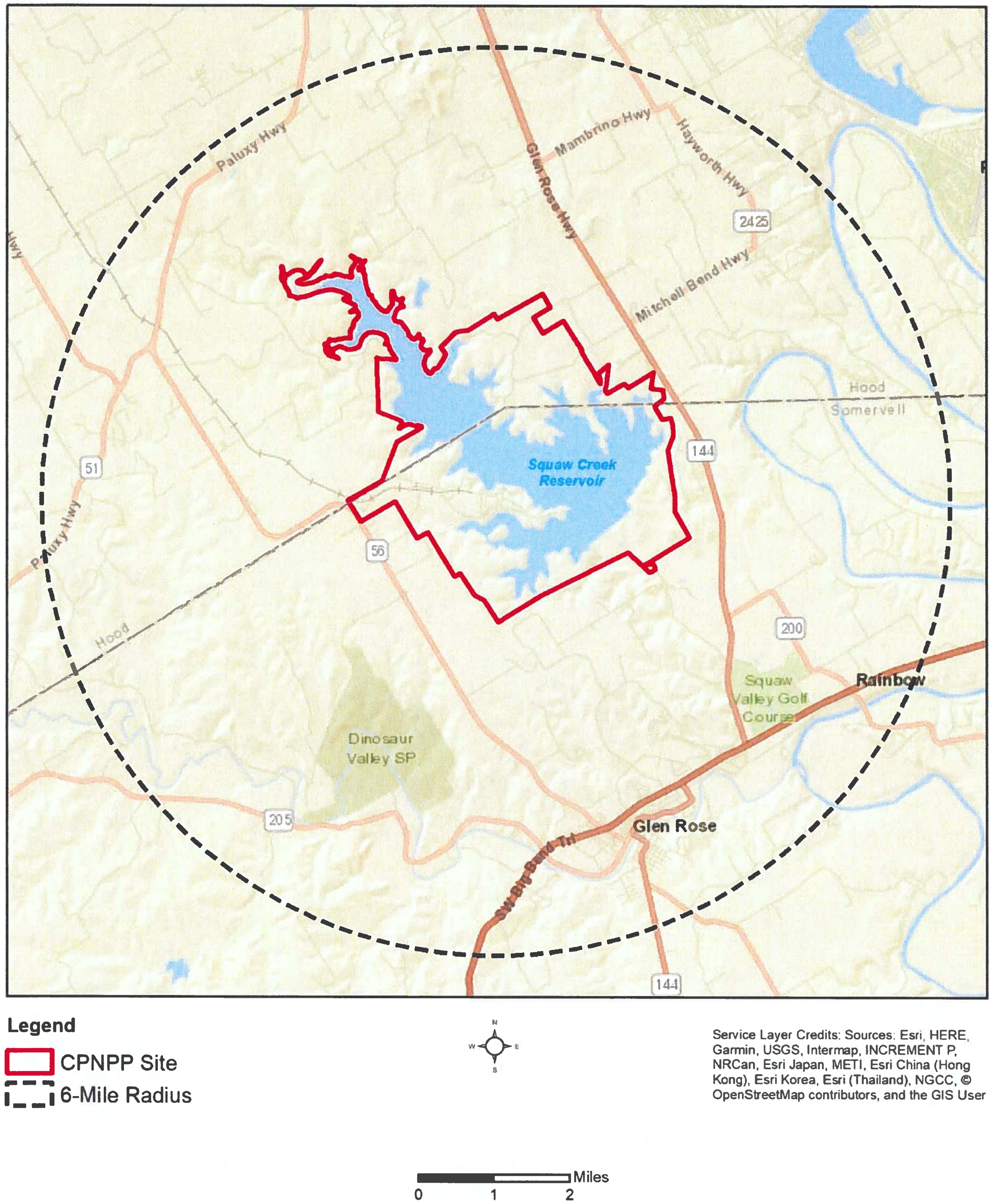


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



QUAPAW NATION

P.O. Box 765
Quapaw, OK 74363-0765

(918) 542-1853
FAX (918) 542-4694

CP-202100145
MISC-21-027

February 24, 2021

RECEIVED
MAR 17 2021
REGULATORY AFFAIRS

P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

Re: Comanche Peak Nuclear Power Plant Units 1 and 2.

To Whom It May Concern,

This project is outside of the current area of interest for the Quapaw Nation; therefore, the Quapaw Nation does not desire to comment on this project at this time. Thank you for your efforts to consult with us on this matter.

Sincerely,

Everett Bandy

Everett Bandy, THPO
Quapaw Nation
P.O. Box 765
Quapaw, OK 74363
(p) 918-238-3100

Attachment E: Other Consultations

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100009
TXX-21004
April 1, 2021

Joel Massey, Regions 2/3 Regional Medical Director
Texas Department of State Health Services
PO Box 149347
Austin, TX 78714-9347

Subject: Comanche Peak Nuclear Power Plants Units 1 and 2 License Renewal

Dear Mr. Massey,

Vistra Operations Company LLC (Vistra OpCo) is seeking a response from the Texas Department of State Health Services (DSHS) concerning thermophilic microorganisms in the portion of Squaw Creek Reservoir (SCR) that receives the circulating water system discharge from Comanche Peak Nuclear Power Plant (CPNPP). The basis for this request and specific microorganisms of potential concern is presented below. Figures depicting the plant site and the vicinity within a 6-mile radius of the station are enclosed.

Reason for Request

Vistra OpCo, a subsidiary of Vistra Corp, is preparing an application to be submitted to the U.S. Nuclear Regulatory Commission (NRC) for renewing the operating licenses for the CPNPP Units 1 and 2 for an additional 20 years (see Table 1). Vistra OpCo is contacting DSHS for assistance in assessing the potential health impacts from continued operation during the renewed license period.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

As part of the renewal process, the NRC requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses. Per NRC regulations, the environmental report must include an assessment of the impact of the proposed action on public health from thermophilic organisms in affected waters. NRC guidance also states that the applicant should consult the state health departments regarding the potential risks posed by thermophilic microorganisms in the vicinity of the plant.
Vistra OpCo seeks DSHS concurrence with the following assessment regarding the public health risk posed by the potential for CPNPP's thermal discharge to SCR to enhance the concentration of thermophilic microorganisms.

Information to Support Consultation on Thermophilic Microorganisms

The CPNPP circulating water system utilizes a cooling system in which cooling water is withdrawn from SCR from its intake on the north side of the plant, the cooling water increases in temperature as it passes through the plant condensers, and is returned to SCR through the discharge point on the southeast side of the plant. The discharge is pumped through a submerged outlet into a deep arm of the SCR, allowing for high velocity subsurface mixing.

Activities in SCR include recreational boating and fishing. SCR has a public park area as well. Swimming and wading are not allowed in SCR, and in-water barriers restrict public approach to the discharge outlet by more than 1,800 feet.

The current Texas Pollution Discharge Elimination System (TPDES) permit for CPNPP establishes limits for daily maximum and daily average discharge temperatures based on a flow-weighted average temperature (FWAT) computed on a daily basis. The daily maximum discharge temperature permitted limit is 116°F for the highest FWAT during the calendar month. The daily average discharge temperature permitted limit is 113°F based on the arithmetic mean of the FWATs for the calendar month. No testing for thermophilic microorganisms is required by the TPDES.

Naegleria fowleri is ubiquitous in nature and thrives in heated water bodies at temperatures ranging from 95 to 106°F or higher. CPNPP's discharge area in the SCR could seasonally have temperatures above 95°F. However, the public is restricted from the area near the discharge and the discharge is in deep water with high-velocity mixing. Accordingly, the risk of a member of the public contracting Primary Amebic Meningoencephalitis, the infection from *N. fowleri,* is very low. There have only been 36 cases of Primary Amebic Meningoencephalitis in Texas from 1972 to 2018 according to DSHS (https://www.dshs.texas.gov/IDCU/disease/primary_amebic_menigoencephalitis/Data.aspx). The risk of infection is higher in shallow, still waters. SCR is a deep lake and CPNPP's cooling water system pumps as well as wind provide enough water movement to reduce conditions favorable to the concentration of *N. fowleri*. Further, the route of infection is through the nasal passages which requires immersion and permitted SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri*. In summary, lake conditions, along with restricting public access to the discharge area and prohibiting swimming in the SCR, reduces the risk of *N. fowleri* infection.

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95 to 115°F, although the bacteria can persist in waters from 68 to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs (https://www.osha.gov/legionnaires-disease/hazards). As such, human infection is often associated with complex water systems housed within buildings or structures. Thus, the greater health risk from *Legionella* posed by CPNPP's water systems would be to workers (i.e., occupational risk), rather than the small risk to recreational boaters at SCR. CPNPP has a comprehensive occupational safety program to address such potential risks.

Other human pathogens, including *Salmonella,* grow at a range of temperatures. The exposure route of concern would be contact with water contaminated with a sufficient microorganism population for human infection. The Centers for Disease Control reported no cases of infection from waterborne *Salmonella* spp. in the United States in 2018 (https://www.cdc.gov/salmonella/outbreaks-2018.html). The latest Centers for Disease Control data on the incidence of infection cases from waterborne pathogens in untreated recreational water is for years 2013-2014 and no cases were recorded for Texas (https://www.cdc.gov/healthywater/surveillance/recreational/2013-2014-tables.html). Thus, the risk of infection from these other human pathogens are very low generally. CPNPP's deep, high velocity thermal discharge would further minimize the risk of enhancing their concentration. The already restricted access to the discharge area and not allowing swimming further reduces the already low risk of waterborne pathogen infection.

In summary, Vistra OpCo concludes that the CPNPP thermal discharge described above does not result in an increase in public health risk posed by the thermophilic microorganisms of concern.

As stated earlier, this letter seeks DSHS input on the potential existence and concentration of the thermophilic microorganisms of concern in SCR and DSHS concurrence that the thermal discharge to the SCR during continued operation of the CPNPP would not increase public health risk from the thermophilic microorganisms of concern. DSHS input is requested by May 13, 2021. Vistra OpCo plans to contact DSHS in a few weeks to request the scheduling of a virtual meeting to review this request and answer any questions the DSHS staff may have. Vistra OpCo plans to include this letter and any DSHS response provided in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that DSHS send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steve Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures: Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

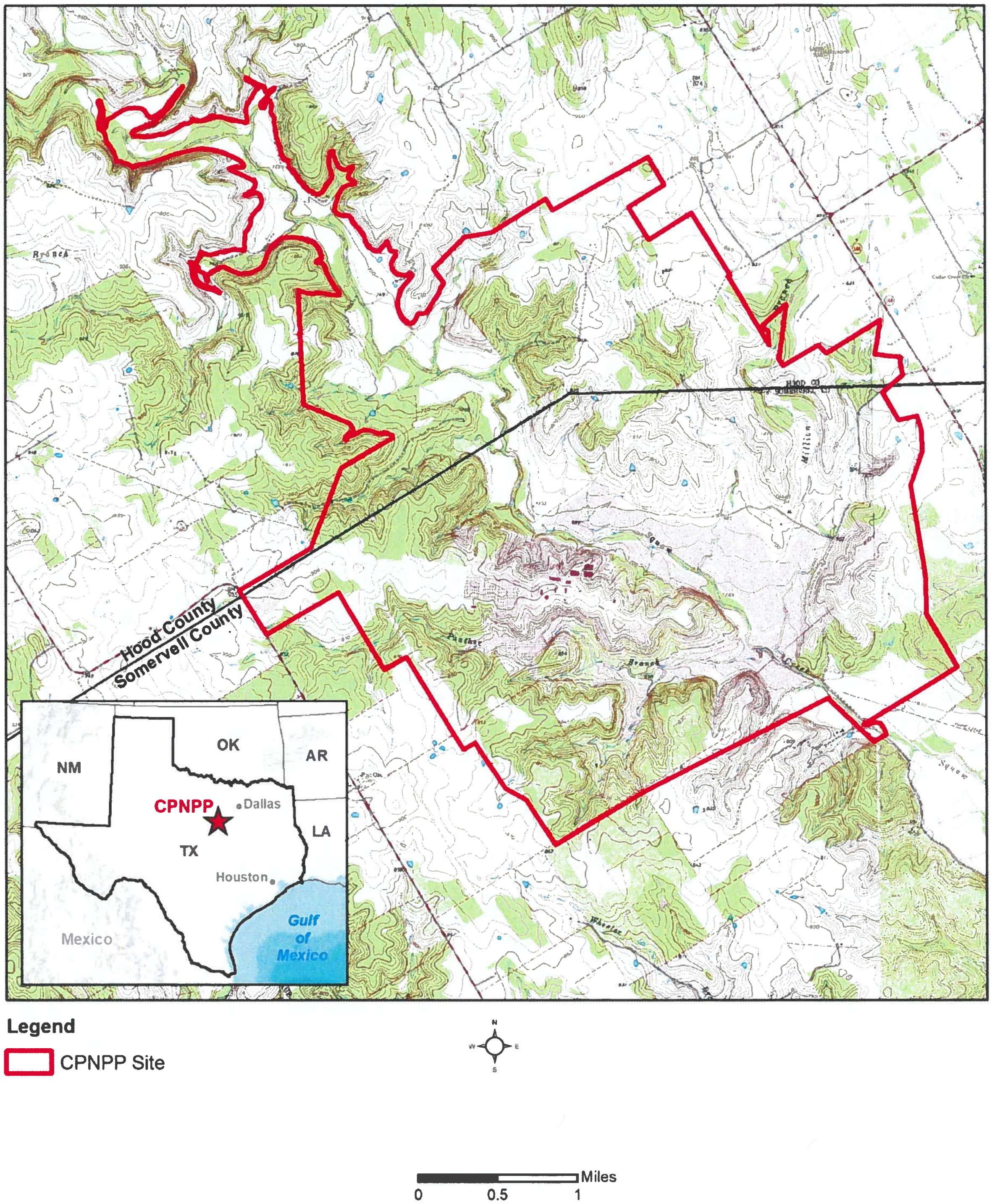
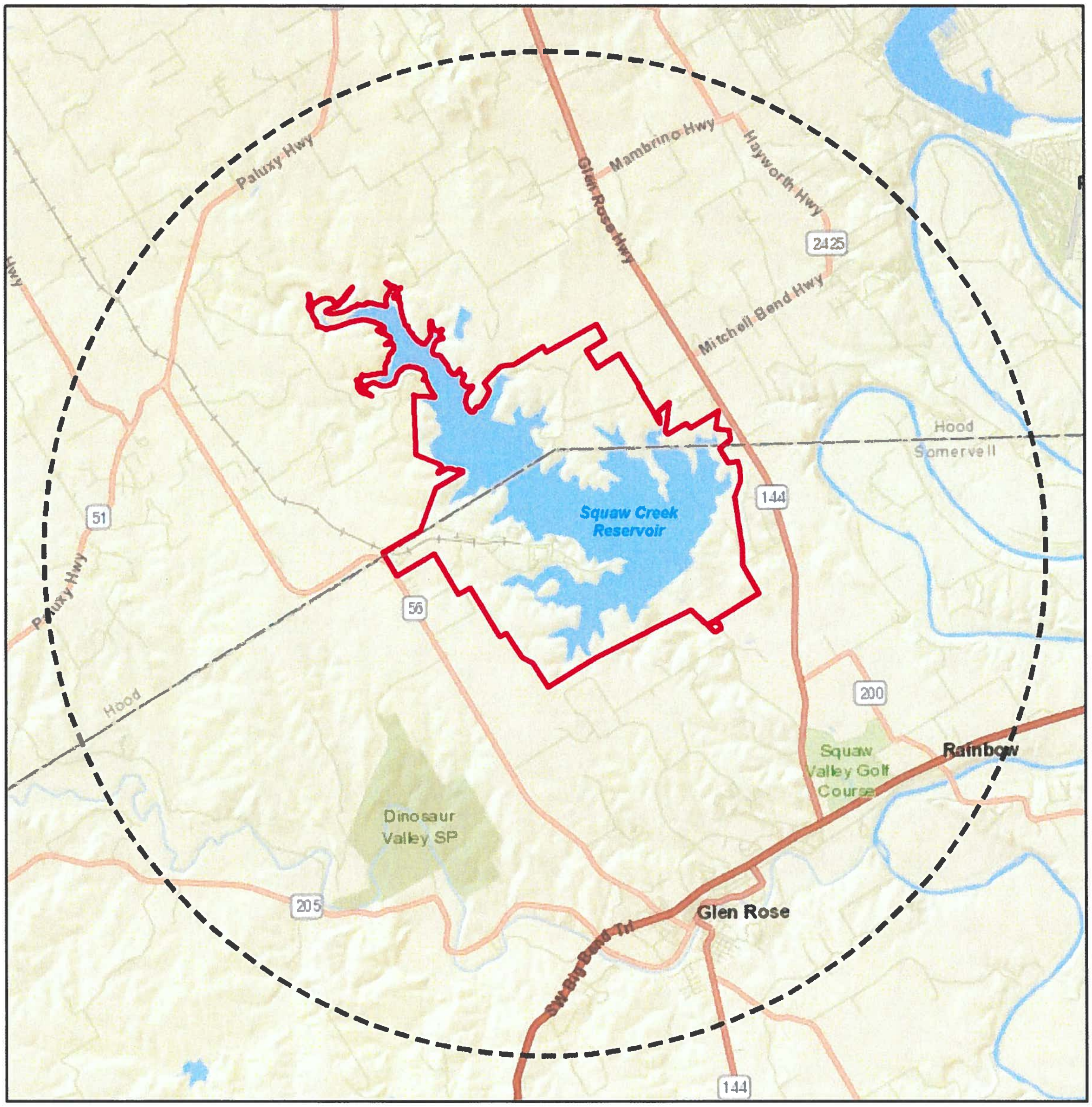


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



Legend

CPNPP Site

6-Mile Radius

N W E S

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User

Miles
0 1 2

Harding, Randy

From:	Massey,Joel (DSHS) <Joel.Massey@dshs.texas.gov>
Sent:	Tuesday, April 13, 2021 8:23 AM
To:	Sewell, Steven
Cc:	Evans, Todd; Harding, Randy
Subject:	Environmental impact assessment request
Attachments:	Comanche Peak Power Plant.pdf

EXTERNAL EMAIL

Good morning Mr. Sewell,

I have received the attached request (post-marked April 5, 2021) for a response regarding an environmental impact report concerning the possibility of thermophilic organisms at the Comanche Peak Nuclear Power Plants and an assessment of human exposure risk.

The Texas Department of State Health Services does not routinely conduct environmental impact assessments or environmental surveys or testing for thermophilic organisms, especially when there are no known reports of outbreaks in the human population of reportable disease caused by these organisms in the recent past related to this facility. The Texas Commission for Environmental Quality, or perhaps a private contractor, might be better equipped to assist you in achieving your desired objective.

Best regards,

Joel Massey, MD, MPH
Medical Director, Public Health Region 2/3
1301 S. Bowen Rd. Ste 200
Arlington, TX 76013
(817) 264-4501 (office)
(817) 264-4506 (fax)
TEXAS Health and Human Services | Texas Department of State Health Services

Visit www.dshs.texas.gov/coronavirus/tools/vaccine-comm.aspx for more information on COVID-19 vaccination.

TEXAS
Health and Human Services

Texas Department of State Health Services

John Hellerstedt, M.D.
Commissioner

June 10, 2021

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322North FM 56 / E30
Glen Rose, Texas 76043

Mr. Harding,

I have received the attached request to respond to an environmental impact report concerning the possibility of thermophilic organisms at the Comanche Peak Nuclear Power Plants and an assessment of human exposure risk.

The Texas Department of State Health Services does not routinely conduct environmental impact assessments or environmental surveys or testing for thermophilic organisms, especially when there are no known reports of outbreaks in the human population of reportable disease caused by these organisms in the recent past related to this facility. Therefore, DSHS is not able to provide a letter of concurrence. The Texas Commission for Environmental Quality, might be better equipped to assist you achieve your desired objective. I have also consulted with the DSHS Radiation Control Program, and they have no further input related to this request.

Thank you for your concern about environmental health regarding this facility and surrounding property and persons.

Respectfully,

Joel Massey M.D.

Joel Massey, MD, MPH
Regional Medical Director

P.O. Box 149347 • Austin, Texas 78714-9347 • Phone: 888-963-7111 • TTY: 800-735-2989 • *dshs.texas.gov*

TEXAS
Health and Human Services

Texas Department of State Health Services

John Hellerstedt, M.D.
Commissioner

CP-202200017
MISC 22-002

January 7, 2022

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Mr. Harding,

Texas Department of State Health Services (DSHS)- Public Health Region 2/3 received a request from Vistra Operations Company, LLC (CP-2021000009; TXX-21004; dated April 1, 2021) to provide input on the potential existence and concentration of the thermophilic microorganisms of concern in Squaw Creek Reservoir (SCR) and concurrence that the thermal discharge to the SCR during continued operation of the Comanche Peak Nuclear Power Plant would not increase public health risk from the thermophilic microorganisms of concern.

DSHS agrees that a pure administrative renewal of a contract would not have an environmental impact. DSHS does not conduct environmental impact assessments and would not assess the potential health impacts of the Squaw Creek Reservoir.

Respectfully,

Becky Earlie-Royer, Ph.D., M.P.H., C.H.E.S.®
Deputy Regional Director
Texas Department of State Health Services
Public Health Region 2/3 Headquarters
1301 S Bowen Rd Suite 200 Arlington, Texas 76013
(817) 264-4500 (main)
(817) 264-4506 (fax)
becky.earlieroyer@dshs.texas.gov

Attachment F: Coastal Zone Management Program Certification

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100012
TXX-21007
March 4, 2021

Brian Carter, Director of Asset Enhancement
Texas General Land Office
1700 Congress Avenue
Austin, TX 78701-1495

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Carter:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating license for Comanche Peak Nuclear Power Plant Units 1 and 2 (CPNPP) for an additional 20 years (see Table 1).

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The CPNPP site is in Hood and Somervell counties, in north central Texas (see Figures 1 and 2). Vistra OpCo is contacting the Texas General Land Office (GLO) to request confirmation that CPNPP is located outside the Texas Coastal Zone and therefore is not required to provide a Coastal Management Program (CMP) consistency certification for CPNPP. This confirmation is sought on the basis that CPNPP's license renewal falls outside of the federal agency actions listed in 31TAC 506.12(a)(2)(F) as being subject to Texas's Coastal Management Program because CPNPP is not within the coastal management boundary.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. Vistra OpCo appreciates GLO's assistance in providing confirmation that CPNPP is not subject to the consistency requirement with regards to the Texas CMP. Please notify Vistra OpCo of concerns and any information GLO believes Vistra OpCo should consider in the preparation of the environmental report. GLO input is requested by April 22, 2021. Vistra OpCo plans to include this letter and GLO response provided in the environmental report.

Vistra OpCo requests that GLO send a letter response to Randy Harding (see contact information below). Should you or the GLO staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

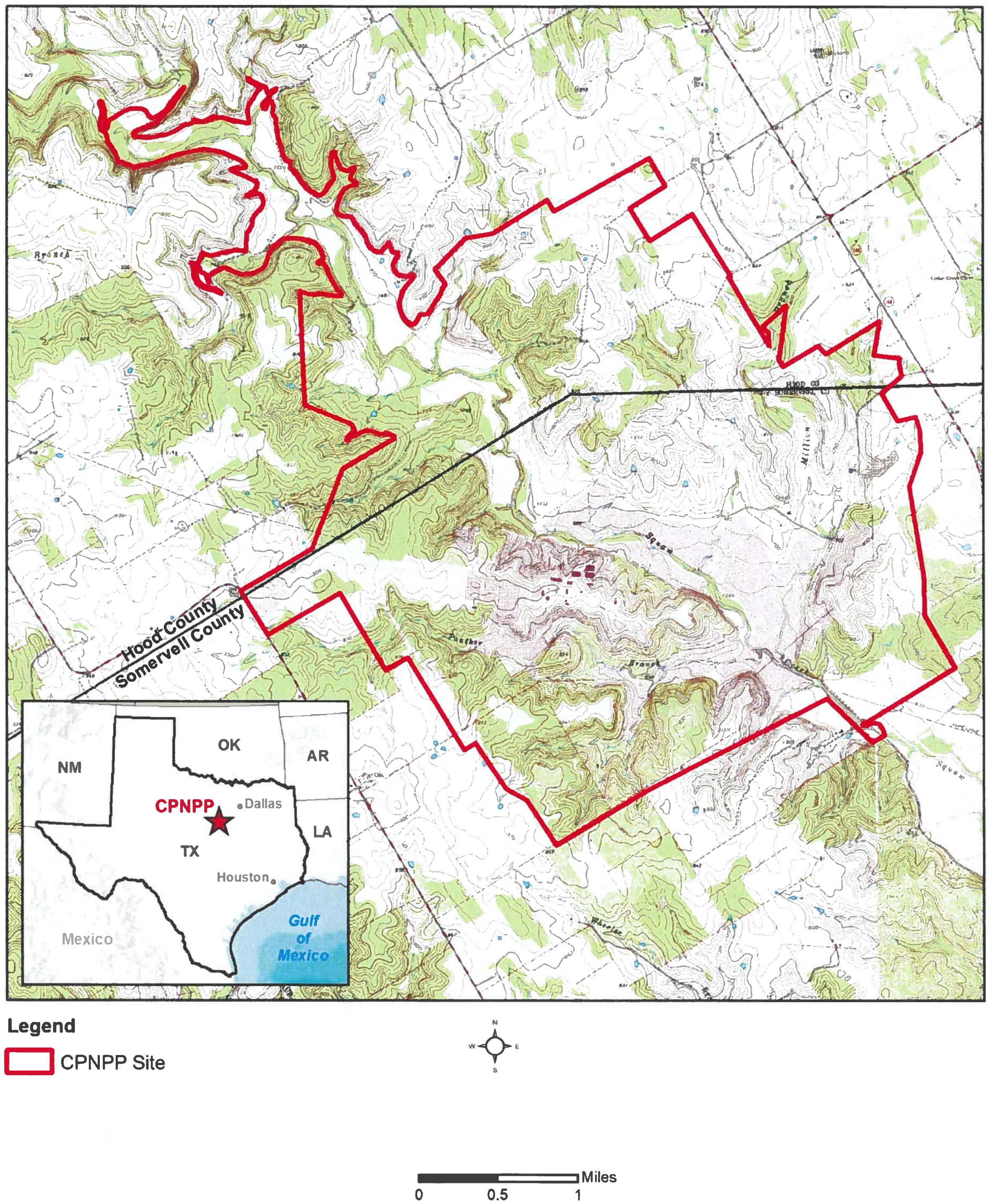
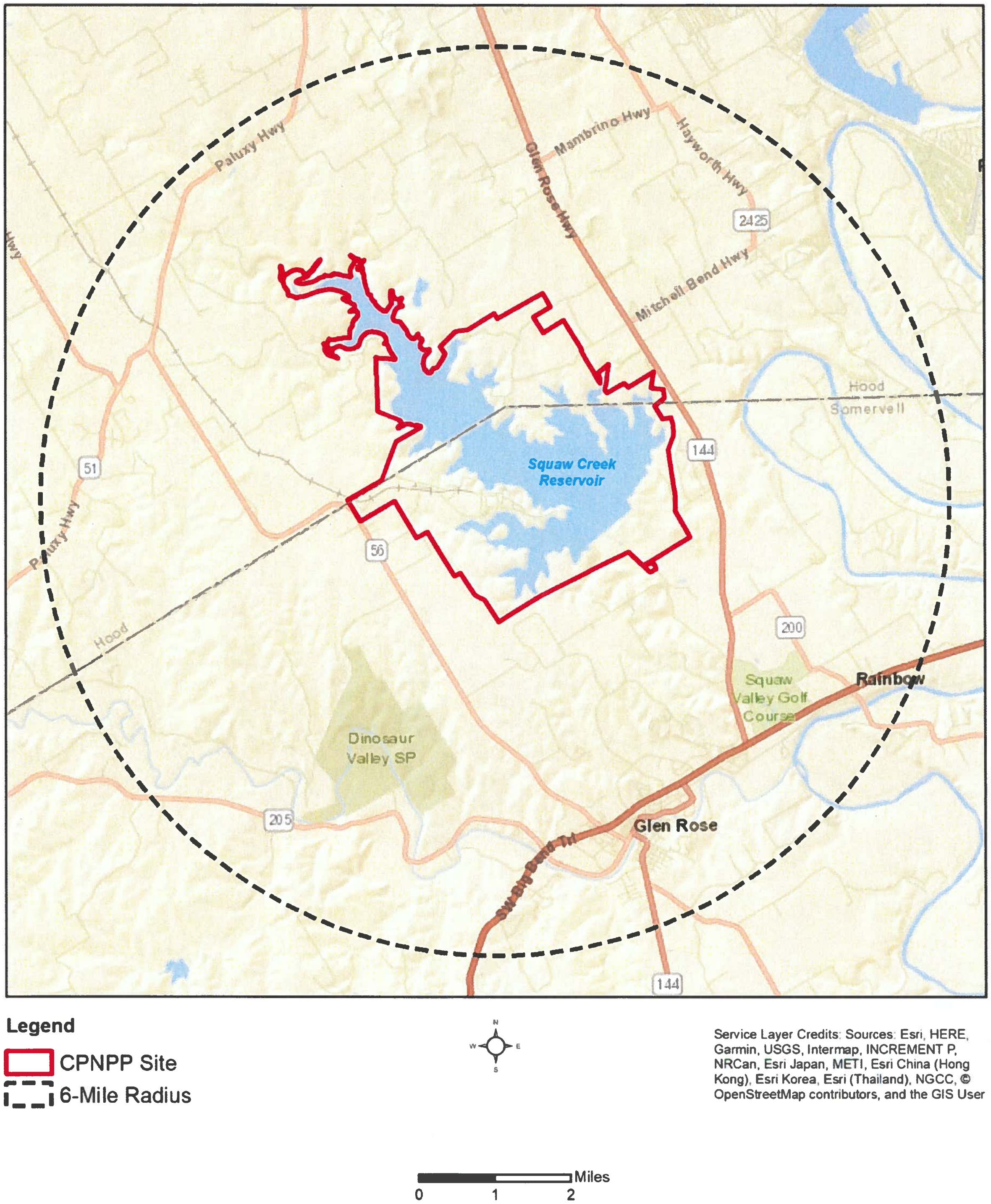


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



CP-202100328
MISC 21-064

Harding, Randy

From: Federal Consistency <Federal.Consistency@GLO.TEXAS.GOV>
Sent: Tuesday, March 9, 2021 4:06 PM
To: Sewell, Steven; Evans, Todd
Cc: Sheila Cerini
Subject: Comanche Peak Nuclear Power Plants License Renewal

EXTERNAL EMAIL

This email is to confirm receipt of the letter dated March 4, 2021 to Brian Carter at the Texas General Land Office. The statement is the letter is correct. This project site is not in the Coastal Zone and no certification is needed.

Please contact me with any additional questions.

Allison Buchtien
Federal Consistency
Texas General Land Office
federal.consistency@glo.texas.gov

Please send all Federal Consistency review requests to this email address.