System ID	Age Notes ID	Age Notes
AC	A-AC-a	The relevant conditions could exist in the Reactor Building environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the AC System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AC	A-AC-b	The relevant conditions do not exist in the Reactor Building environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for the following aging effects to occur [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. It can be shown that the surface of the carbon steel components in question are likely to be dry, since condensation would occur only if the surface temperature is well below that of the Reactor Building temperature. The AC System is designed to operate continuously while the plant is in operation, and has a normal system temperature of 95°F [FSAR, Section 9.4.7.2.10, and Dwg. D-302-852]. All of the AC System carbon steel components within the license renewal evaluation boundaries (exposed to a Reactor Building environment) are not well below the Reactor Building temperature, and therefore, are not susceptible to the formation of condensation on their external surfaces, and are expected to be dry. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. It can be shown that the surface of the carbon steel components in question are likely to be dry, since condensation would occur only if the surface temperature is well below that of the Reactor Building temperature. The AC System is designed to operate continuously while the plant is in operation, and has a normal system temperature of 95°F [FSAR, Section 9.4.7.2.10, and Dwg. D-302-852]. All of the AC System carbon steel components within the license renewal evaluation boundaries (exposed to a Reactor Building environment) are not well below the Reactor Building temperature, and therefore, are not susceptible to the formation of condensation on their external surfaces, and are expected to be dry. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a Reactor Building environment.
AC	A-AC-c	The relevant conditions could exist in the sheltered environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of

System ID	Age Notes ID	Age Notes
		extended operation for carbon steel components/component types in the AC System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AC	A-AC-d	The relevant conditions do not exist in the sheltered environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The AC System is designed to operate continuously while the plant is in operation, and has a normal system temperature of 95°F [FSAR, Section 9.4.7.2.10, and Dwg. D-302-852]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The AC System is designed to operate continuously while the plant is in operation, and has a normal system temperature of 95°F [FSAR, Section 9.4.7.2.10, and Dwg. D-302-852]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a sheltered environment. Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The AC System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [TR00160-003, Attachment II]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable carbon steel components/component types (piping) of the AC System that are exposed to a sheltered environment.

System ID	Age Notes ID	Age Notes
AC	A-AC-e	The relevant conditions could exist in the treated water environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for loss of material due to general, galvanic, crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the AC System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb and either halogens > 150 ppb or sulfates > 100 ppb) to occur in carbon steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AC	A-AC-f	The relevant conditions do not exist in the treated water environment of the Auxiliary Coolant (Closed Loop) / CRDM Cooling Water (AC) System for the following aging effects to occur [TR00160-010, Attachment III]: Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the AC System that are exposed to a treated water environment [Dwg. D-302-852]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a treated water environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminates. The AC System is designed to operate continuously while the plant is in operation [FSAR, Section 9.4.7.2.10]. None of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwg. D-302-852 and TR00160-003, Attachment II]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel components exposed to a nitrate-based corrosion inhibitor. The AC System does not utilize a nitrate-based corrosion inhibitor [CP-632]. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a treated water environment. Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. An EPRI report [NSAC-202L-R1] states that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F, or operated less than 2% of the plant operating

System ID	Age Notes ID	Age Notes
		time. The AC System operates continuously while the plant is in operation, under single-phase flow conditions at a normal system temperature of 95°F [FSAR, Section 9.4.7.2.10, and Dwg. D-302-852]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AC System that are exposed to a treated water environment.
AH	A-AH-a	The relevant conditions could exist in the Reactor Building environment of the Air Handling (HVAC) [AH] System for loss of material due to boric acid corrosion (carbon steel and galvanized steel) and general corrosion (carbon steel) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel and galvanized steel components/component types in the AH System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion and the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel and/or galvanized steel exposed to the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-b	The relevant conditions do not exist in the Reactor Building environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in carbon steel and galvanized steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel and galvanized steel components normally exposed to wetted locations (e.g., due to condensation) and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur if the metals are completely dry, since there is no fluid to electrolytically couple the two materials. The internal environment of the AH System is ventilation air for the Reactor Building, and is not at temperatures significantly below ambient conditions [HVAC DBD]. Therefore, condensation does not form on the external surfaces of AH System components. As such, loss of material due to galvanic corrosion is not an aging effect requiring management duing the period of extended operation for carbon steel and galvanized steel components of the AH System that are exposed to the Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The internal environment of the AH System is ventilation air for the Reactor Building [HVAC DBD]. Therefore, all of the carbon steel components within the license renewal evaluation boundaries, that are exposed to the Reactor Building environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management duing the period of extended operation for carbon steel components of the AH System that are exposed to the Reactor Building environment.
AH	A-AH-c	The relevant conditions could exist in the Reactor Building environment of the Air Handling (HVAC) [AH] System for loss of material due to boric acid and galvanic corrosion to occur [TR00160-010, Attachment IX] . If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for copper components/component types in the AH System that are exposed to the Reactor Building environment.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion, and the activities for the Inspections for Mechanical Components will manage loss of material due to galvanic corrosion in copper components/component types exposed to the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-d	The relevant conditions could exist in the Reactor Building environment of the Air Handling (HVAC) [AH] System for cracking due to radiation embrittlement and thermal embrittlement to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for hypalon (chlorosulfanated polyethylene) and rubber components/component types in the AH System that are exposed to the Reactor Building environment . As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage cracking due to radiation embrittlement and thermal embrittlement for hypalon and rubber components/component types exposed to the Reactor Building environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-e	The relevant conditions could exist in the sheltered environment of the Air Handling (HVAC) [AH] System for cracking due to radiation embrittlement and thermal embrittlement to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function (s), and thus, require management during the period of extended operation for neoprene components/component types in the AH System that are exposed to the sheltered environment . As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage cracking due to radiation embrittlement and thermal embrittlement for neoprene components/component types exposed to the sheltered environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-f	The relevant conditions could exist in the ventilation environment of the Air Handling (HVAC) [AH] System for loss of material due to boric acid corrosion (carbon steel and galvanized steel), galvanic corrosion (carbon steel and galvanized steel), and general corrosion (carbon steel) to occur [TR00160-010, Attachment VII]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel and galvanized steel components/component types in the AH System that are exposed to the ventilation environment. Concerning loss of material due to general corrosion, carbon steel can be susceptible to this aging effect in moist air or gas, such as exists in this ventilation environment. Both oxygen and moisture must be present, because oxygen alone or water free of dissolved oxygen, does not corrode iron to any practical extent. The Metals Handbook, Volume 13, Corrosion, page 531, graphically depicts the atmospheric corrosion versus time rate for structural steel, ASTM A-36, in an industrial setting. Structural carbon steel loses approximately 1 mil per year for the first ten years, followed by a rate of approximately 0.3 mils per year. For a sixty year plant life, this yields a total material loss of approximately 25 mils (10 mils for first ten years plus 0.3 mils for fifty years). The slowing of the corrosion rate is due to the metal producing a protective film, which protects the surface. Conservatively, if this slowing of corrosion due to the filming is ignored, a rate of 0.65 mils lost

System ID	Age Notes ID	Age Notes
		per year is determined (13 mils lost over twenty years). For a sixty year plant life, the total conservative material loss is approximately 39 mils. For AH System ventilation environment AMR purposes, a distinction is made between thick-walled and thin-walled carbon steel components. Thick-walled carbon steel components are defined here as components that are not expected to corrode at a rate that will result in a loss of component function over the period of extended operation, as described in the previous paragraph. The only thick-walled carbon steel components in the AH System are valve bodies (XVB-1A/B-AH through XVB-4A/B-AH). As shown on 1MS-54-063, the minimum wall thickness for the subject valve bodies is 3/4 inches, so the loss of 39 mils would be insignificant. Therefore, loss of material due to general corrosion is not an aging effect requiring management for carbon steel valve bodies of the AH System exposed to the ventilation environment. Loss of material due to boric acid corrosion is only an aging effect requiring management for those carbon steel and galvanized steel components with Reactor Building external environments, i.e. sub-components of the Reactor Building Cooling Units (RBCUs). Loss of material due to galvanic corrosion is only an aging effect requiring management for those carbon steel and galvanized steel components which are exposed to completely wetted locations, such as Air Handling Unit (AHU) components near cooling coils. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will manage loss of material due to boric acid, galvanic and general (thin-walled carbon steel only) corrosion for carbon steel and galvanized steel components/component types exposed to the ventilation environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-g	The relevant conditions do not exist in the ventilation environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in carbon steel and galvanized steel components/component types [TR00160-010, Attachment VII]: Loss of material due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel exposed to the ventilation environment, and loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for galvanized steel exposed to the ventilation environment. A review of the relevant flow diagrams demonstrates that none of the carbon steel or galvanized steel components, within the license renewal evaluation boundaries that are exposed to a ventilation environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel and galvanized steel components of the AH System exposed to the ventilation environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers (i.e., tubes), and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no carbon steel and galvanized steel heat exchanger tubes within the license renewal evaluation boundaries of the AH System that are exposed to a ventilation environment [TR00160-007, Attachment I]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel

System ID	Age Notes ID	Age Notes
		and galvanized steel components/component types of the AH System that are exposed to the ventilation environment. Also, as decribed in Note A-AH-f, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel valve bodies of the AH System that are exposed to the ventilation environment.
AH	A-AH-h	The relevant conditions could exist in the ventilation environment of the Air Handling (HVAC) [AH] System for loss of material due to boric acid and galvanic corrosion, and heat exchanger fouling due to particulates to occur [TR00160-010, Attachment VII]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for copper components/component types in the AH System that are exposed to the ventilation environment. In this environment, loss of material due to boric acid corrosion is only applicable to the RBCUs, XAA-1A/B and 2A/B-AH, since they are located in the Reactor Building. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will manage loss of material due to boric acid and galvanic corrosion, and heat exchanger fouling due to particulates, for copper components/component types exposed to the ventilation environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-ii	The relevant conditions do not exist in the ventilation environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in copper components/component types [TR00160-010, Attachment VII]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper exposed to the ventilation environment. A review of the relevant flow diagrams demonstrates that none of the copper components, within the license renewal evaluation boundaries that are exposed to a ventilation environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper components of the AH System exposed to the ventilation environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloys. A review of the relevant flow diagrams demonstrates that none of the components, within the license renewal evaluation boundaries that are exposed to a ventilation environment, are made of brass or copper alloy [TR00160-007, Attachment I]. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper components/component types of the AH System that are exposed to the ventilation environment.
AH	A-AH-j	The relevant conditions do not exist in the ventilation environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VII]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel exposed to the ventilation environment. A review of the relevant flow diagrams demonstrates that none of the stainless steel components, within the license

System ID	Age Notes ID	Age Notes
		renewal evaluation boundaries that are exposed to a ventilation environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components of the AH System exposed to the ventilation environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers (i.e., tubes), and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no stainless steel heat exchanger tubes within the license renewal evaluation boundaries of the AH System that are exposed to a ventilation environment [TR00160-007, Attachment I]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the AH System that are exposed to the ventilation environment.
AH	A-AH-k	The relevant conditions could exist in the sheltered environment of the Air Handling (HVAC) [AH] System for loss of material due to boric acid corrosion (carbon steel and galvanized steel), galvanic corrosion (carbon steel and galvanized steel), general corrosion (carbon steel), and microbiologically induced corrosion [MIC] to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel, galvanized steel and stainless steel components/component types in the AH System that are exposed to the sheltered environment. Loss of material due to MIC is an aging effect for vulnerable carbon steel, galvanized steel and stainless steel components/component types (pipe, process tubing and ductwork) that are in contact with microbes between building walls (or from outside the building) below the 425' elevation, due to groundwater inleakage. Loss of material due to MIC is not an aging effect requiring evaluation in the sheltered environment for carbon steel, galvanized steel and stainless steel components/component types other than pipe, process tubing and ductwork. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (carbon steel and galvanized steel) for components/component types exposed to the sheltered environment. Also, the activities for the Inspections for Mechanical Components will manage loss of material due to galvanic corrosion (carbon steel and galvanized steel) and general corrosion (carbon steel), while the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage loss of material due to MIC (carbon steel, galvanized steel and stainless steel) for components/component types in the AH System that are exposed to the sheltered environment. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-l	The relevant conditions do not exist in the sheltered environment of the Air Handling (HVAC) [AH] System for the following aging effect to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions, and exposed to the sheltered environment. The AH System components containing cooling water are heat exchanger components, which are not insulated. The internal environment of the AH System is ventilation air and is at

System ID	Age Notes ID	Age Notes
		temperatures that approximate ambient conditions. Therefore, all of the carbon steel components within the license renewal evaluation boundaries, that are exposed to the sheltered environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management duing the period of extended operation for carbon steel components of the AH System that are exposed to the sheltered environment.
AH	A-AH-m	The relevant conditions could exist in the raw water environment of the Air Handling (HVAC) [AH] System for loss of material due to crevice, pitting, galvanic, general (carbon steel), and microbiologically induced (MIC) corrosion, loss of material due to erosion, and heat exchanger fouling due to biological materials and particulates to occur [TR00160-010, Attachment IV]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel and copper components/component types in the AH System that are exposed to a raw water environment. As discussed in TR00160-020, the Service Water System Reliability and In Service Testing Program will manage loss of material due to crevice, pitting, galvanic, general (carbon steel), and microbiologically induced (MIC) corrosion; loss of material due to erosion; and heat exchanger fouling due to biological materials and particulates for carbon steel and copper components/component types exposed to a raw water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-n	The relevant conditions do not exist in the raw water environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in carbon steel and copper components/component types [TR00160-010, Attachment IV]: Cracking due to stress corrosion cracking (SCC) is an aging effect for copper exposed to raw water in the presence of ammonia and ammonium compounds. Ammonia and ammonium compounds are often used to control pH or act as a cleaning solvent for raw water systems. The Reactor Building Cooling Unit (RBCU) cooling coils are the only copper components within the license renewal evaluation boundaries of the AH System, and the raw water is from the Service Water (SW) System. The SW System is treated with chemicals, including biocide, which do not contain ammonia or ammonium compounds [CP 913]. Therefore, cracking due to stress corrosion cracking is not an aging effect requiring management during the period of extended operation for copper components/component types of the AH System that are exposed to a raw water environment. Heat exchanger fouling due to precipitation is an aging effect attributed to the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers (i.e., tubes) and could be a significant aging effect in raw water applications, where the heat exchangers are alternately wetted and dried for any reason. The AH System heat exchangers are not expected to be alternately wetted and dried as Service Water is normally flowing through the RBCUs. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for carbon steel and copper components/component types of the AH System that are exposed to a raw water environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloys. However, there are no brass or copper alloy

System ID	Age Notes ID	Age Notes
		components within the license renewal evaluation boundaries of the AH System that are exposed to a raw water environment [TR00160-007, Attachment I]. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper components/component types of the AH System that are exposed to a raw water environment.
AH	A-AH-o	The relevant conditions could exist in the treated water environment of the Air Handling (HVAC) [AH] System for loss of material due to crevice, pitting, galvanic and general (carbon steel) corrosion; loss of material due to erosion-corrosion (copper) and cracking due to stress corrosion (SCC) [carbon steel]; and heat exchanger fouling due to particulates to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for the carbon steel and copper components/component types in the AH System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb) and galvanic corrosion (if chlorides and/or fluorides > 150 ppb, for carbon steel components/component types exposed to a treated water environment. For copper heat exchanger sub-components, the one-time Heat Exchanger Inspections will detect and characterize a loss of material due to crevice corrosion, pitting corrosion, galvanic corrosion, erosion-corrosion, as well as heat exchanger fouling due to particulates. The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
AH	A-AH-p	The relevant conditions do not exist in the treated water environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in carbon steel and copper components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion (SCC) is an aging effect for copper alloys exposed to treated water in the presence of ammonia and ammonium compounds. The Control Room, Relay Room and Battery Room/Charging Room Air Handling Units (AHUs) cooling coils are the only copper components exposed to treated water within the license renewal evaluation boundaries of the AH System. However, the cooling coils material is not a copper alloy, but is copper, and copper is not susceptible to SCC without zinc or aluminum as an alloy. Therefore, cracking due to stress corrosion (SCC) is not an aging effect requiring management during the period of extended operation for the copper components/component types of the AH System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel and copper exposed to a treated water environment. A review of the relevant flow diagrams demonstrates that none of the carbon steel or copper components, within the license renewal evaluation boundaries of the AH System, that are exposed to a treated water environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel and copper components/component types of the AH System that are exposed to a treated water environment. Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. An EPRI report [NSAC-202L-R1] indicates that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F or operated less than 2% of the time. During

System ID	Age Notes ID	Age Notes
		normal plant operation, the AH System operates under single-phase flow conditions, with maximum-expected system temperatures well below 200°F [water supplied from VU System shown on Dwgs. D-302-842 and -843]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AH System that are exposed to a treated water environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloys. However, there are no brass or copper alloy components within the license renewal evaluation boundaries of the AH System that are exposed to a treated water environment [TR00160-007, Attachment I]. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper components/component types of the AH System that are exposed to a treated water environment.
AH	A-AH-q	The relevant conditions do not exist in the yard environment of the Air Handling (HVAC) [AH] System for the following aging effects to occur in galvanized steel components/component types [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal embrittlement is a mechanism where the mechanical properties of a material (strength, ductility and toughness) are affected as a result of prolonged exposure to high temperatures. Galvanized steel is a product used to protect a component or structure from the environment and consists of coating the external surfaces of a carbon steel metal with zinc. Zinc is used because of its corrosion resistance in an external environment and by its galvanic protection of the base metal where discontinuities or damage of the coating has occurred. When exposed to a water environment, corrosion of zinc is affected by pH and temperature. Embrittlement of galvanized steel is a plausible aging mechanism only if exposed to temperatures above 400°F. Should the zinc coating deteriorate, the aging mechanisms would be the same as for carbon steel. Since the yard environment ambient temperature is less than 400°F, thermal embrittlement of galvanized steel is not a concern. Therefore, reduction of fracture toughness due to thermal embrittlement is not an aging effect requiring management during the period of extended operation for galvanized steel components/component types of the AH System exposed to the yard environment.
AH	A-AH-r	The relevant conditions do not exist in the ventilation environment of the AH System for cracking of rubber, hypalon and neoprene exposed to thermal exposure and ionizing radiation to occur [TR00160-010, Attachment VII]: As identified in the AH System screening report, the system has rubber, hypalon and neoprene components. Rubber, hypalon and neoprene products can exhibit the effects of aging by cracking due to drying, embrittlement, thermal exposure and ionizing radiation. This could lead to a loss of pressure boundary. It is probable that the external surfaces of these components would exhibit signs of aging before the internal surfaces, due to the nature of this aging mechanism, which can involve ultraviolet radiation consisting of direct sunlight and fluorescent lighting. Cracked elastomeric components made of rubber, hypalon and neoprene would be replaced upon their discovery during inspections/activities (Also see Notes A-AH-d and A-AH-e). As such, cracking due to drying, embrittlement, thermal exposure, and ionizing radiation are not aging effects requiring management during the period of extended operation for rubber, hypalon and neoprene components/component types of the AH System exposed to a ventilation environment.
AS	A-AS-a	The relevant conditions could exist in the sheltered environment of the Auxiliary Boiler Steam and Feedwater (AS) System for loss of

System ID	Age Notes ID	Age Notes
		material due to general corrosion, boric acid corrosion (aggressive chemical attack) and microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the AS System that are exposed to a sheltered environment. Loss of material due to MIC is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Therefore, loss of material due to MIC is an applicable aging effect for carbon steel piping in the sheltered environment of the AS System. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AS	A-AS-b	The relevant conditions do not exist in the sheltered environment of the Auxiliary Boiler Steam and Feedwater (AS) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The AS System provides process steam to the liquid waste and boron recycle evaporator package, boric acid batching tank and deaerator storage tank. Auxiliary steam is used primarily during plant startup and shutdown, when main steam is not available. All of the carbon steel components within the license renewal evaluation boundaries of the AS System that are exposed to a sheltered environment are generally at the same, or higher temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [Dwg. D-302-051]. As such, loss of material due to galvanic corrosion or pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AS System that are exposed to a sheltered environment.
AS	A-AS-c	The relevant conditions could exist in the treated water environment of the Auxiliary Boiler Steam and Feedwater (AS) System for loss of material due to general, galvanic, crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the AS System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AS	A-AS-d	The relevant conditions do not exist in the treated water environment of the Auxiliary Boiler Steam and Feedwater (AS) System for the following aging effects to occur [TR00160-010, Attachment III]: Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the AS System that are exposed to a treated water environment [Dwg. D-302-051]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AS System that are exposed to a treated water environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, none of the carbon steel components within the license renewal evaluation boundaries of the AS System (i.e., pipe and valves), that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwg. D-302-051 and TR00160-003, Attachment I]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AS System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel components exposed to a nitrate-based corrosion inhibitor. The AS System does not utilize a nitrate-based corrosion inhibitor [CP-632]. As such, cracking due to nitrate-induced SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AS System that are exposed to a treated water environment. EPRI Report NSAC-202L-R1 indcates that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F or operated less than 2% of the time. The AS System carbon steel components with a treated water environment are seldom used, as noted in Supplementary Information of the Treated Water Systems Mechanical Component Aging Management Review For License Renewal, TR00160-013. Thus, it can be concluded that these components are operated less than 2% of the time. As such, erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the AS System that are exposed to a treated water environment.
AS	A-AS-e	The relevant conditions could exist in the treated water environment of the Auxiliary Boiler Steam and Feedwater (AS) System for loss of

System ID	Age Notes ID	Age Notes
		material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the AS System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion (SCC) (either oxygen > 100 ppb and temperature > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
AS	A-AS-f	The relevant conditions do not exist in the treated water environment of the Auxiliary Boiler Steam and Feedwater (AS) System for the following aging effects to occur [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, none of the stainless steel components within the license renewal evaluation boundaries of the AS System, that are exposed to a treated water environment, are subject to temperatures continuously above 482°F [Dwg. D-302-051]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the AS System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the AS System that are exposed to a treated water environment [Dwg. D-302-051]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the AS System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, none of the stainless steel components within the license renewal evaluation boundaries of the AS System (i.e., valves), that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwg. D-302-051 and TR00160-003, Attachment I]. As such, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the AS System that are exposed to a treated water environment.
BD	A-BD-a	The relevant conditions could exist in the Reactor Building environment of the Steam Generator Blowdown (BD) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment IX] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended

System ID	Age Notes ID	Age Notes
		operation for all carbon steel components/component types in the BD System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
BD	A-BD-b	The relevant conditions do not exist in the Reactor Building environment of the Steam Generator Blowdown (BD) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects for carbon steel in the Reactor Building environment when the system internal environment temperature is well below ambient. The normal operating temperature at the carbon steel components within the license renewal evaluation boundaries of the BD System is 557°F [D-302-771, D-302-781]. Thus, the internal environment is above ambient and loss of material due to galvanic and pitting corrosion are not aging effects requiring management for the carbon steel components of the BD System exposed to the Reactor Building environment.
BD	A-BD-c	The relevant conditions could exist in the sheltered environment of the Steam Generator Blowdown (BD) System or loss of material due to boric acid corrosion (aggressive chemical attack), general corrosion, and microbiologically induced corrosion [MIC] (pipe only) [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the BD System that are exposed to the sheltered environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
BD	A-BD-d	The relevant conditions do not exist in the sheltered environment of the Steam Generator Blowdown (BD) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects for carbon steel in the sheltered environment when the system internal environment temperature is well below ambient. The normal operating temperature at the carbon steel components within the license renewal evaluation boundaries of the BD System is 557°F [D-302-771, D-302-781]. Thus, the internal environment is above ambient and loss of material due to galvanic and pitting corrosion are not aging effects requiring management for the carbon steel components of the BD System exposed to the sheltered environment.
BD	A-BD-e	The relevant conditions could exist in the treated water environment of the Steam Generator Blowdown (BD) System for loss of material due to crevice, erosion, galvanic, general, and pitting corrosion [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects

System ID	Age Notes ID	Age Notes
		could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel components/component types in the BD System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to galvanic corrosion (if chlorides and/or fluourides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb),and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel in a treated water environment. Also, the Flow Accelerated Corrosion Monitoring Program will manage loss of material due to erosion-corrosion. These programs, when performed during the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
BD	A-BD-f	The relevant conditions do not exist in the treated water environment of the Steam Generator Blowdown (BD) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in CP 632, nitrites are not used for corrosion inhibiting within the Steam Generator Blowdown System. Therefore, cracking due to SCC is not an aging effect requiring management. Fouling due to particulates is an aging effect for heat exchanger sub-component heat transfer surfaces constructed of carbon steel and exposed to treated water. There are no heat exchangers within the license renewal evaluation boundaries of the BD System [D-302-771, D-302-781]. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel and alloy steel components exposed to treated water and subject to cycles of wetting and drying. A review of the flow diagrams and treated water screening report reveals that there are no mechanical components/component types within the license renewal evaluation boundaries of the BD System which are exposed to wet/dry cycles of treated water. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management.
BR	A-BR-a	This note discusses aging effects applicable to components/component types constructed of carbon steel, stainless steel, or a combination of these two materials and exposed to the sheltered environment. The relevant conditions could exist in the sheltered environment of the Boron Recycle (BR) System for loss of material due to boric acid corrosion (aggressive chemical attack) (carbon steel components) and general corrosion (carbon steel components) [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel/stainless steel components/component types in the BR System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in

System ID	Age Notes ID	Age Notes
		carbon steel/stainless steel in the sheltered environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
BR	A-BR-b	The relevant conditions do not exist in the sheltered environment of the Boron Recycle (BR) System for the following aging effects to occur in carbon steel/stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion are aging effects for carbon steel in the sheltered environment when the system internal environment temperature is well below ambient and when the component is insulated. The cooling water side of all heat exchangers in the BR System is treated water from the Component Cooling System which is 120°F at its coldest [E-302-613]. Thus, the internal environment is above ambient and loss of material due to galvanic and pitting corrosion are not aging effects requiring management for the carbon steel/stainless steel components of the BR System exposed to the sheltered environment. Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for vulnerable carbon steel/stainless steel components/component types (pipe, process tubing, and ductwork) that are in contact with microbes between building walls below the 425' elevation. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for carbon steel/stainless steel components/component types other than pipe, process tubing or ductwork.
BR	A-BR-c	This note discusses aging effects applicable to components/component types constructed of carbon steel, stainless steel or a combination of these two materials and exposed to treated water. The relevant conditions could exist in the treated water environment of the Boron Recycle (BR) System for loss of material due to crevice, galvanic (carbon steel), general (carbon steel), and pitting corrosion and cracking due to stress corrosion cracking (stainless steel) [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel/stainless steel components/component types in the BR System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to galvanic corrosion (if chlorides/ fluorides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb), and cracking due to stress corrosion cracking (if oxygen is > 100 ppb with T > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb with T > 140°F) to occur in carbon steel/stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
BR	A-BR-d	The relevant conditions do not exist in the treated water environment of the Boron Recycle (BR) System for the following aging effects to occur in carbon steel/stainless steel components/component types [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austentitic stainless steel (CASS) components/component types exposed to treated water environments above 482°F. A review of the Borated Water Systems Screening Report [TR00160-002,

System ID	Age Notes ID	Age Notes
		Attachment I] and associated references determined that no CASS components/components types exist within the license renewal evaluation boundaries of the BR System. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management for the carbon steel/stainless steel components/component types of the BR System exposed to treated water. EPRI Report NSAC-202L-R1 states that loss of material due to erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase below 200°F or operated less than 2% of the time. The carbon steel components within the license renewal evaluation boundaries of the BR System which are exposed to treated water are limited to those heat exchanger components exposed to Component Cooling System water. Flow diagrams D-302-611, 612, 613 and 614 depict operating temperature of the Component Cooling System at less than 200°F. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management. Fouling due to particulates is an aging effect for carbon steel/stainless steel heat exchanger sub-components exposed to treated water. This aging effect applies to only heat transfer surfaces of heat exchanger sub-components (i.e., tubes). As described in TR00160-002, Attachment I, the heat transfer function is not required to support the system intended function(s) for any of the heat exchangers within the license renewal evaluation boundaries of the BR System. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel/stainless steel components exposed to treated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the BR System which are exposed to wet/dry cycles of treated water. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in the BR System DBD, nitrites are not used for corrosion inhibiting within the Boron Recycle System. Therefore, cracking due to SCC is not an aging effect requiring management for the carbon steel components/component types of the BR System exposed to treated water. NOTE: cracking due to SCC is an aging effect requiring management for stainless steel components/component types exposed to treated water.
BR	A-BR-e	The relevant conditions could exist in the borated water environment of the Boron Recycle (BR) System for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking [TR00160-010, Attachment II] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the BR System that are exposed to borated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb), and cracking due to stress corrosion cracking (if oxygen is > 100 ppb with T > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb with T > 140°F) to occur in stainless steel in a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s)

System ID	Age Notes ID	Age Notes
		will be maintained under all CLB conditions.
BR	A-BR-f	The relevant conditions do not exist in the borated water environment of the Boron Recycle (BR) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austentitic stainless steel (CASS) components/component types exposed to borated water environments above 482°F. A review of the Borated Water Systems Screening Report [TR00160-002, Attachment I] and associated references determined that no CASS components/components types exist within the license renewal evaluation boundaries of the BR System. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management for the stainless steel components/component types of the BR System exposed to borated water. Fouling due to particulates and precipitation are aging effects for stainless steel heat exchanger sub-components exposed to borated water. This aging effect applies to only heat transfer surfaces of heat exchanger sub-components (i.e., tubes). As described in TR00160-002, Attachment I, the heat transfer function is not required to support the system intended function(s) for any of the heat exchangers within the license renewal evaluation boundaries of the BR System. Therefore, fouling due to particulates and precipitation are not aging effects requiring management. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to borated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the BR System which are exposed to wet/dry cycles of borated water. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.
BS	A-BS-a	The relevant conditions do not exist in the air-gas environment of the Building Services (BS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VI]: Cracking due to stress corrosion (SCC) is an aging effect for stainless steel exposed to air-gas in wetted locations where the temperature is greater than 200°F. Within the license renewal evaluation boundaries of the BS System, stainless steel components exposed to air-gas are limited to containment penetrations. As such, these components are not exposed to continuous temperatures of greater than 200°F. Therefore, cracking due to SCC is not an aging effect requiring management for the stainless steel components/component types of the BS System exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. A review of the Air-Gas Systems Screening Report [TR00160-006], Attachment I and associated references determined that there are no stainless steel components within the license renewal evaluation boundaries of the BS System which are exposed to alternate wetting and drying in the air-gas environment. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management for the stainless steel components/component types of the BS System exposed to an air-gas environment.
BS	A-BS-b	The relevant conditions do not exist in the sheltered environment of the Building Services (BS) System for the following aging effects to

System ID	Age Notes ID	Age Notes
		occur [TR00160-010, Attachment X]: Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for stainless steel components and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Within the license renewal evaluation boundaries of the BS System, there are no pipe, process tubing or ductwork below the 425' elevation. Therefore, loss of material due to MIC is not an aging effect requiring management for stainless steel components/component types of the BS System exposed to a sheltered environment.
BS	A-BS-c	The relevant conditions do not exist in the ventilation* (same aging effects as the ventilation environment) environment of the Building Services (BS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VI]: Heat exchanger fouling due to particulates is an aging effect for stainless steel heat exchanger components exposed to the ventilation environment. There are no heat exchangers within the license renewal evaluation boundaries of the BS System. Therefore, heat exchanger fouling is not an aging effect requiring management for stainless steel components/component types of the BS System exposed to the ventilation environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a ventilation environment, and subject to alternate wetting and drying that may concentrate contaminates. A review of the Air-Gas Systems Screening Report [TR00160-006], Attachment I and associated references determined that there are stainless steel components within the license renewal evaluation boundaries of the BS System which are exposed to alternate wetting and drying in the ventilation environment. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management for stainless steel components/component types of the BS System exposed to the ventilation environment.
BS	A-BS-d	The relevant conditions do not exist in the air-gas environment of the Building Services (BS) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. A review of the Air-Gas Systems Screening Report [TR00160-006], Attachment I and associated references determined that there are no carbon steel components within the license renewal evaluation boundaries of the BS System which are exposed to alternate wetting and drying in the air-gas environment. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the BS System that are exposed to an air-gas environment.
BS	A-BS-e	The relevant conditions could exist in the sheltered environment of the Building Services (BS) System for loss of material due to boric acid

System ID	Age Notes ID	Age Notes
		corrosion (aggressive chemical attack), galvanic corrosion and general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the BS System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage loss of material due to galvanic corrosion and general corrosion in carbon steel exposed to a sheltered environment. Also, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack). These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
BS	A-BS-f	The relevant conditions could exist in the air-gas environment of the Building Services (BS) System for loss of material due to galvanic and general corrosion to occur [TR00160-010, Attachment VI]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the BS System that are exposed to the air-gas environment. Loss of material due to galvanic and general corrosion are aging effects for carbon steel components exposed to a moist air or gas environment. The carbon steel components within the license renewal evaluation boundaries of the BS System, that are exposed to an air-gas environment, consist of the test blocks used to facilitate test connections [Dwg. 1MS-05-143 Rev.7, and 1MS-05-172 Rev.6]. These components are in contact with service air. As discussed in TR00160-020, the one-time Service Air System Inspection will assess the condition of pertinent components in order to detect and characterize a loss of material due to galvanic and general corrosion in carbon steel exposed to an air-gas environment, if any to assure that the applicable aging effects will not result in loss of the intended functions during the period of extended operation.. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
BS	A-BS-g	The relevant conditions do not exist in the sheltered environment of the Building Services (BS) System for the following aging effect to occur [TR00160-010, Attachment X]: Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for carbon steel components and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Within the license renewal evaluation boundaries of the BS System, there are no pipe, process tubing or ductwork below the 425' elevation. Therefore, loss of material due to MIC is not an aging effect requiring management for carbon steel components/component types of the BS System exposed to a sheltered environment.
CC	A-CC-a	The relevant conditions do not exist in the sheltered environment of the Component Cooling (CC) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]:

System ID	Age Notes ID	Age Notes
		Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel components in systems with external surface temperatures significantly below the ambient conditions. The Component Cooling System is normally operated between 95 - 105°F [CC DBD, Section 2], so external surface temperatures are near or above ambient conditions in the sheltered environment. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the Component Cooling System that are exposed to the sheltered environment.
CC	A-CC-b	The relevant conditions could exist in the sheltered environment of the Component Cooling (CC) System for loss of material due to boric acid corrosion, general corrosion and microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the CC System that are exposed to the sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following carbon steel components/component types in the CC System: heat exchangers (channel head and shell), motor water boxes, pumps, tanks and valves. For the CC System, MIC is applicable only to pipe. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
CC	A-CC-c	The relevant conditions could exist in the treated water environment of the Component Cooling (CC) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject stainless steel components/component types in the CC System that are exposed to a treated water environment. The following stainless steel components/component types are located in the treated water environment of the CC System: pipe (thermowells), tube and fittings, flex hoses, orifices, valve (bodies), pump (casings) and heat exchanger (tubes). As noted below, cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in treated water with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of System and Design Data Tables [D-302-611, -612, -613 and -614] and TR00160-003, Attachment III, demonstrates that a relatively small portion of the CC System is exposed to system temperatures greater than 140°F; note that some portions of the CC System only operate during emergency conditions following an accident. This means that a very limited number of stainless steel components, within the license renewal evaluation boundaries of the CC

System ID	Age Notes ID	Age Notes
		System, are continuously exposed to the threshold temperature of 140°F for cracking due to stress corrosion cracking (SCC) in treated water. However, this aging effect is being conservatively considered for License Renewal as an aging effect requiring management based on the system flow diagram temperatures. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb), and cracking due to stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-d	The relevant conditions do not exist in the treated water environment of the Component Cooling (CC) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-003, Attachment V], components are normally water-solid and there are no alternately wetted and dried treated water environments for the stainless steel components within the license renewal boundaries of the CC System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the CC System that are exposed to a treated water environment. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel (CASS) components in treated water environments with temperatures continuously greater than or equal to 482°F. A review of the screening report [TR00160-003, Attachment V] and associated references determined that no operating temperatures continuously greater than or equal to 482°F exist within the treated water environment of the CC System license renewal evaluation boundaries. As such, reduction in fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CC System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect where foulants (such as corrosion products) accumulate on the heat transfer surfaces. This typically occurs where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer function (i.e., tubes) of heat exchangers. For the CC System heat exchangers, XHE-2A/B, component cooling water circulates through the shell side (hot side); thus, the outside surface of the tubes is exposed to treated water. In the design configuration of the CC System, there is the potential for an accumulation of particles in the component cooling water surge tank, XTK-3. However, due to the continuous, turbulent flow through the heat exchanger shell, heat exchanger fouling due to particulates is not expected to occur on the exterior surface of the tubes and the heat transfer function is not expected to be adversely affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CC System that are exposed to a treated water environment. [CC DBD and D-302-611]

System ID	Age Notes ID	Age Notes
CC	A-CC-e	The relevant conditions could exist in the raw water environment of the Component Cooling (CC) System for loss of material due to erosion, loss of material due to crevice, galvanic, general, microbiologically induced, and pitting corrosion and fouling due to biological materials & particulates in carbon steel piping exposed to raw water [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the carbon steel piping in the CC System that is exposed to raw water. Carbon steel components subject to raw water include heat exchanger tubesheets and channel heads. Loss of material due to galvanic corrosion is a possibility since carbon steel heat exchanger components are in contact with the stainless steel heat exchanger tubes. As discussed in TR00160-020, the Service Water System Reliability and In Service Testing Program will manage loss of material due to erosion (high velocity), loss of material due to crevice corrosion (stagnant conditions), galvanic corrosion (electrolytically coupled to more noble metal), general corrosion (oxygen and moisture present), microbiologically induced corrosion (groundwater contact), and pitting corrosion (stagnant and low flow conditions) and fouling due to biological materials & particulates in carbon steel piping in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-f	The relevant conditions do not exist in the raw water environment of the Component Cooling (CC) System for the following aging effects to occur in carbon steel piping [TR00160-010, Attachment IV]: Heat exchanger fouling due to precipitation is an aging effect for carbon steel heat exchanger sub-components exposed to raw water and subject to alternate wetting and drying. None of the copper and copper alloy components within the license renewal evaluation boundaries, that are exposed to a raw water environment, are subject to alternate wetting and drying [Dwgs. D-302-841, D-302-221 and -222]. Therefore, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for carbon steel heat exchanger sub-components of the CC System that are exposed to raw water.
CC	A-CC-g	The relevant conditions could exist in the treated water environment of the Component Cooling (CC) System for loss of material due to crevice corrosion, loss of material due to pitting corrosion, loss of material due to general corrosion, loss of material due to galvanic corrosion and loss of material due to corrosive impacts of alternate wetting and drying to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject carbon steel components/component types in the CC System that are exposed to a treated water environment. Examples of the potential for galvanic corrosion are 1) the carbon steel tubesheet interface with copper-nickel tubes in MPP-1A/B/C, 2) the carbon steel pipe interface with stainless steel thermowells and 3) the carbon steel surge tank interface with stainless steel tubing connected to the tank. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and halogens >

System ID	Age Notes ID	Age Notes
		150 ppb or sulfates > 100 ppb), loss of material due to general corrosion (if oxygen is > 100 ppb) and loss of material due to galvanic corrosion (if chlorides and/or fluorides > 150 ppb) to occur in carbon steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions. As detailed in TR00160-020, the one-time Above Ground Tank Inspection will assess condition in order to detect and characterize a loss of material due to the corrosive impacts of alternate wetting and drying (concentrated contaminants in tank air-water interfaces) if any. This one-time activity will serve to provide reasonable assurance that component intended function will be retained for CLB conditions.
CC	A-CC-h	The relevant conditions do not exist in the treated water environment of the Component Cooling (CC) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: EPRI Report NSAC-202L-R1 states that loss of material due to erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase below 200°F or operated less than 2% of the time. Flow diagrams D-302-611, 612, 613 and 614 depict operating temperature of treated water (Component Cooling Water) at less than 200°F. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CC System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for carbon steel components in treated water environments in systems using nitrite-based corrosion inhibitors, such as Chilled Water, Switchgear Cooling and Diesel Generator Cooling. The Component Cooling System does not use nitrite-based corrosion inhibitors [Chemistry Procedures CP-632, Section 3 and CP-620, Section 3.4]. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CC System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Fouling affects only the heat transfer function (I.e. tubes), and no carbon steel heat exchanger components within the license renewal boundaries of the CC System have a heat transfer function. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CC System that are exposed to a treated water environment.
CC	A-CC-j	The relevant conditions could exist in the raw water environment of the Component Cooling (CC) System for loss of material due to erosion, loss of material due to crevice, microbiologically induced and pitting corrosion and fouling due to biological materials and particulates [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the CC System that are exposed to raw water. As discussed in TR00160-020, the Service Water System Reliability and In-Service Testing Program will manage loss of material due to erosion (high velocity), loss of material due to crevice (corrosive environment), microbiologically induced (groundwater contact), and pitting

System ID	Age Notes ID	Age Notes
		corrosion (corrosive environment) and fouling due to biological materials (microorganisms) and particulates (foulant accumulation) in stainless steel components in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-k	The relevant conditions do not exist in the raw water environment of the Component Cooling (CC) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment IV]: Cracking due to stress corrosion cracking (SCC) is a potential aging effect for stainless steel components in raw water that occurs through the combined actions of stress, a corrosive environment and a susceptible material. Perry's Chemical Engineering Handbook states that stress corrosion cracking (SCC) is not an aging effect for stainless steel in systems operated at temperatures below 120°F. D-302-221 depicts the raw water operating temperature of 95°F. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for stainless components/component types of the CC System that are exposed to a raw water environment. Heat exchanger fouling due to precipitates is an aging effect of foulants in raw water applications and that are alternately wetted and dried for any reason. The subject CC System heat exchangers are not expected to be alternately wetted and dried as Service Water is normally flowing through the subject heat exchangers [D-302-222]. As such, heat exchanger fouling due to precipitates is not an aging effect requiring management during the period of extended operation for stainless steel components of the CC System that are exposed to a raw water environment.
CC	A-CC-l	The relevant conditions could exist in the sheltered environment of the Component Cooling (CC) System for loss of material due to microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. The vulnerable stainless steel components/component types (tubing) in the CC System could pass between pertinent buildings through a non-fire seal penetration or enter a building from outside (i.e., underground, embedded) below the 425' elevation. As discussed in TR00170-003, the Maintenance Rule Structures Program, will manage loss of material due to MIC (groundwater contact) to occur. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-m	The relevant conditions could exist in the Reactor Building environment of the Component Cooling (CC) System for loss of material due to general corrosion and loss of material due to boric acid corrosion to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types (pipe and valves) in the CC System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components, will manage loss of material due to general corrosion (oxygen and moisture) and the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water) to occur in carbon steel in a Reactor Building environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-n	The relevant conditions do not exist in the Reactor Building environment of the Component Cooling (CC) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]:

System ID	Age Notes ID	Age Notes
		Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon steel in the Reactor Building environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry. The CC System operates at temperatures which are not well below the Reactor Building environment (maximum average 120°F) ambient temperature [inlet operating temperature typically at 120°F and outlet operating temperature typically at 145°F per D-302-612]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the CC System that are exposed to a Reactor Building environment.
CC	A-CC-o	The relevant conditions could exist in the ventilation* (same aging effects as ventilation) environment of the Component Cooling (CC) System for loss of material due to galvanic and general corrosion to occur [TR00160-010, Attachment VII]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the carbon steel components/component types (air cooler tubesheets, pipe, valves, tank) in the CC System that are exposed to the ventilation environment. Examples of the potential for galvanic corrosion are 1) the carbon steel surge tank interface with stainless steel tubing connected to the tank and 2) the carbon steel tubesheet interface with copper-nickel tubes in MPP-1A/B/C. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will a manage loss of material due to galvanic and general corrosion for carbon steel heat exchanger components exposed to ambient conditions with intermittent steam exposure. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions. Also, as detailed in TR00160-020, the one-time Above Ground Tank Inspection will detect and characterize a loss of material due to galvanic and/or general corrosion (concentrated contaminants in tanks and attached pipe and valves) if any, in order to provide reasonable assurance that component intended function will be maintained for CLB conditions.
CC	A-CC-p	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Component Cooling (CC) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VII]: Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminants. The CC System surge tanks are subject to this aging effect, and discussed in the treated water environment (See Note A-CC-g). Loss of material due to boric acid corrosion is only an aging effect requiring management for those carbon steel components with a Reactor Building external environment. The MPP-1A/B/C tubesheets are located in the Intermediate Building. Therefore, loss of material due to boric acid corrosion is not an aging effect requiring management for the carbon steel components of the CC System exposed to the ventilation* environment during the period of extended operation.

System ID	Age Notes ID	Age Notes
		Heat exchanger fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components. Fouling effects only the heat transfer surfaces of heat exchangers (I.e., tubes). A review of TR00160-003 revealed that there are no carbon steel heat exchanger tubes within the license renewal evaluation boundaries of the CC System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation.
CC	A-CC-q	The relevant conditions could exist in the treated water environment of the Component Cooling (CC) System for loss of material due to crevice corrosion, pitting corrosion, erosion-corrosion and galvanic corrosion, and also, heat exchanger fouling (tubes of MPP-1A/B/C) due to particulates, to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject copper-nickel components/component types (heat exchanger tubesheets and tubes) in the CC System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb) and galvanic corrosion (if chlorides and/or fluorides > 150 ppb), to occur in copper-nickel in a treated water environment. For heat exchanger components, in addition to the Chemistry Program, the new Heat Exchanger Inspections will detect and characterize a loss of material due to erosion-corrosion and heat exchanger fouling due to particulates (supply originates at the bottom of a tank). The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CC	A-CC-r	The relevant conditions do not exist in the treated water environment of the Component Cooling (CC) System for the following aging effects to occur in copper-nickel components/component types [TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams noted in the screening report [TR00160-003] and CC System operation [CC DBD], there are no alternately wetted and dried treated water environments for the copper-nickel components within the license renewal boundaries of the CC System. As such, loss of material due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper-nickel components/component types of the CC System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for copper-nickel components in treated water environments in systems using ammonia, ammonium compounds or hydrazine at elevated temperatures. The CC System does not use these chemicals [Chemistry Procedure CP-632, Section 3.2 and CP-620, Section 3.4]. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for copper-nickel components/component types of the CC System that are exposed to a treated water environment.
CC	A-CC-s	For the Component Cooling (CC) System, the ventilation* (same aging effects as ventilation) environment contains aluminum components. The relevant conditions do not exist in the air-gas environment of the CC System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment VII]:

System ID	Age Notes ID	Age Notes
		Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the air-gas screening report [TR00160-006], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for aluminum components of the CC System that are exposed to a ventilation* environment. Loss of material due to boric acid corrosion is an aging effect from hot borated water systems such as the Reactor Coolant System, which could introduce steam containing boric acid into the Reactor Building environment. The subject aluminum components are part of MPP-1A/B/C and are located in the Intermediate Building, and should not be subject to loss of material due to boric acid corrosion. As such, loss of material due boric acid corrosion is not an aging effect requiring management during the period of extended operation for aluminum components of the CC System that are exposed to a ventilation* environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The aluminum components (fins)of the CC System are mounted on copper-nickel tubes and are normally at temperatures near or above ambient, so condensation is not a concern, and wetted locations are not expected to exist. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for aluminum components (fins) of the CC System that are exposed to a ventilation* environment.
CC	A-CC-t	The relevant conditions could exist in the ventilation* (same aging effects as ventilation) environment of the Component Cooling (CC) System for heat exchanger fouling due to particulates to occur [TR00160-010, Attachment VII]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for the copper-nickel components/component types (MPP-1A/B/C tubes) in the CC System that are exposed to the ventilation* environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up onto heat exchanger surfaces. Particulate fouling of the air side can occur from the accumulation and build-up of dust, dirt or debris on and between the fins of air coolers. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will manage heat exchanger fouling due to particulates for copper-nickel components/component types exposed to the ventilation* environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.

System ID	Age Notes ID	Age Notes
CC	A-CC-u	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Component Cooling (CC) System for the following aging effects to occur in copper-nickel components/component types [TR00160-010, Attachment VII]: Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper-nickel exposed to the ventilation environment. A review of TR00160-007, flow diagrams, and associated references revealed that there are no copper-nickel components within the license renewal evaluation boundaries of the CC System exposed to alternate wet/dry cycles. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management for the copper-nickel components of the CC System exposed to the ventilation* environment. Loss of material due to boric acid corrosion is an aging effect from hot borated water systems such as the Reactor Coolant System, which could introduce steam containing boric acid into the Reactor Building environment. The subject aluminum components are part of MPP-1A/B/C and are located in the Intermediate Building, and should not be subject to loss of material due to boric acid corrosion. As such, loss of material due boric acid corrosion is not an aging effect requiring management during the period of extended operation for copper-nickel components of the CC System that are exposed to a ventilation* environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The copper-nickel components (tubes) of the CC System are normally at temperatures near or above ambient as this is a ventilation environment and the area is also warmed by motor heat. Therefore, condensation is not a concern, and wetted locations are not expected to exist. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for copper-nickel components (tubes) of the CC System that are exposed to a ventilation* environment.
CC	A-CC-v	The relevant conditions do not exist in the lube oil environment of the Component Cooling (CC) System for the following aging effects to occur in copper-nickel components/component types: Loss of material due to crevice and pitting corrosion are aging effects for copper-nickel exposed to lube oil in locations conducive to pooling water and contaminants. Water pooling, should it occur, would be expected in the bottom of an oil reservoir and not the heat exchanger tubes and tubesheets in the CC System. Also, there is expected to be constant oil flow in these components, which inhibits water pooling. As such, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for copper-nickel components/component types of the CC System that are exposed to a lube oil environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat transfer function, which involves the tubes, which are copper-nickel. The subject copper-nickel tubes are located in the RCP Upper and Lower Bearing Oil coolers, which do not support a system intended function for the Reactor Coolant System (see CC System screening note CC-g), but only a pressure boundary function for the CC System. There is no heat transfer function required for license renewal purposes. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for copper-nickel heat exchanger

System ID	Age Notes ID	Age Notes
		components of the CC System that are exposed to a lube oil environment. As stated in the Aging Effects Identification, loss of material due to microbiologically induced corrosion and galvanic corrosion are not aging effects for copper-nickel components that are exposed to a lube oil environment.
CC	A-CC-w	The relevant conditions could exist in the ventilation* (same aging effects as ventilation) environment of the Component Cooling (CC) System for heat exchanger fouling due to particulates to occur [TR00160-010, Attachment VII]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for the aluminum components/component types (fins) in the CC System that are exposed to the ventilation* environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up onto heat exchanger surfaces. Particulate fouling of the air side can occur from the accumulation and build-up of dust, dirt or debris on and between the fins of air coolers. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will manage heat exchanger fouling due to particulates for aluminum components/component types exposed to the ventilation* environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CO	A-CO-a	The relevant conditions could exist in the treated water environment of the Condensate (CO) System for loss of material due to crevice, galvanic, general, and pitting corrosion and loss of material due to corrosive impacts of alternate wetting and drying to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the CO System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to galvanic corrosion (if chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb), and loss of material due to pitting corrosion (if oxygen > 100 ppb, and either halogens > 150 ppb or sulfates > 100 ppb) to occur in carbon steel in a treated water environment. Also, as detailed in TR00160-020, the one-time Above Ground Tank Inspection will detect and characterize a loss of material due to the corrosive impacts of alternate wetting and drying (concentrated contaminants in tank air-water interfaces) if any, in order to provide reasonable assurance that component intended function will be retained for CLB conditions. This program and activity, when continued into the period of extended operation (activity implemented prior to the period of extended operation) will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CO	A-CO-b	The relevant conditions do not exist in the treated water environment of the Condensate (CO) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion cracking is an aging effect in treated water environments in systems which use nitrite corrosion inhibitors. The Condensate System does not use nitrite corrosion inhibitors [CO DBD and CP 632]. Therefore, cracking due to stress corrosion

System ID	Age Notes ID	Age Notes
		cracking is not an aging effect requiring management for the carbon steel components/component types of the Condensate System which are exposed to treated water. Loss of material due to erosion-corrosion is an aging effect for carbon steel in treated water. Erosion-corrosion is not a concern where the treated water at the component is single phase < 200°F, highly oxygenated, or superheated. The only carbon steel component within the license renewal evaluation boundaries of the Condensate System is the Condensate Storage Tank (CST). The CO DBD states that the CST is maintained at ambient conditions. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management. Heat exchanger fouling due to particulates is an aging effect for carbon steel heat exchanger heat transfer surfaces (tubes) exposed to treated water. The only carbon steel component within the license renewal evaluation boundaries of the Condensate System is the CST. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management.
CO	A-CO-c	The relevant conditions could exist in the yard environment of the Condensate (CO) System for loss of material due to general corrosion to occur [TR00160-010, Attachment XII]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for carbon steel components/component types in the CO System that are exposed to the yard environment. As discussed in TR00160-020, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CO	A-CO-d	The relevant conditions do not exist in the yard environment of the Condensate (CO) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment XII]: Loss of material due to galvanic corrosion is an aging effect for carbon steel in the yard environment. Galvanic corrosion occurs only when the material is completed wetted such that an electrolyte is created at the galvanic bridge. Systems which are normally operated well below ambient conditions are considered to be wetted due to the formation of condensation. The only carbon steel component within the license renewal evaluation boundaries of the Condensate System is the Condensate Storage Tank (CST). The CO DBD states that the CST is maintained at ambient conditions. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management for the carbon steel components of the Condensate System which are exposed to the yard environment.
CO	A-CO-e	Not Used.
CO	A-CO-f	Not Used.
CO	A-CO-g	The relevant conditions could exist in the ventilation * environment (ambient air) of the Condensate (CO) System for loss of material due to galvanic and general corrosion to occur [TR00160-010, Attachment VII]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the CO System that are exposed to the ventilation envrionment.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the one-time Above Ground Tank Inspection detect and characterize a loss of material due to galvanic and general corrosion, if any, in order to provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CO	A-CO-h	The relevant conditions do not exist in the ventilation* environment of the Condensate (CO) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VII]: Loss of material due to boric acid corrosion (aggressive chemical attack) is an aging effect for carbon steel components/component types exposed to ventilation environments associated with the Reactor Building. The only carbon steel component within the license renewal evaluation boundaries of the Condensate System is the Condensate Storage Tank (CST). The ventilation environment within the CST is the air space at the top of the tank which is not associated with the Reactor Building environment, but the yard environment. Therefore, loss of material due to boric acid corrosion (aggressive chemical attack) is not an aging effect requiring management for the carbon steel components/component types of the Condensate System which are exposed to ventilation* environments. Heat exchanger fouling due to particulates is an aging effect for carbon steel heat exchanger heat transfer surfaces (tubes) exposed to the ventilation environment. The only carbon steel component within the license renewal evaluation boundaries of the Condensate System is the CST. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel in ventilation* environments. This aging effect is discussed as part of the treated water environment for carbon steel components in the CO System since there is only one component/component type requiring AMR.
CO	A-CO-ii	Not Used.
CS	A-CS-a	The relevant conditions do not exist in the borated water environment of the Chemical and Volume Control (CS) and Chemical and Volume Control Vents and Drains (CV) Systems for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482 degrees F. Although there are portions of the CS System that meet this temperature threshold (Regenerative Heat Exchanger and associated piping and components), there are no cast austenitic steel components in these portions of the system [1MS-94B-073 for the heat exchanger, Piping Line Spec. 2501R for the piping, and various BOM's for the valves]. Therefore, reduction in fracture toughness due to thermal aging is not an aging effect requiring aging management during the period of extended operation for stainless steel components/component types when exposed to the borated water environment. Loss of material/cracking due to the corrosive impacts of alternate wetting and drying is an aging effect for stainless steel components/component types in a borated environment. However, tanks XTK0012A and XTK0012B are not subject to alternate wetting and drying due to the installed diaphragm preventing the walls from drying out [SP 209]. Also, the Volume Control Tank, XTK0046, has a fluctuating level but the walls are always wet due to the constant spray into the tank from letdown [SP-209]. Therefore, loss of

System ID	Age Notes ID	Age Notes
		material/cracking due to the corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS system in the borated water environment. Heat exchanger fouling due to precipitation is an aging effect for stainless steel components/component types in a borated environment. However, the heat exchangers in the CS system are not subject to heat exchanger fouling due to precipitation because these heat exchangers are always in a fluid-solid (filled and vented) condition during normal operation [SOP-102]. Therefore, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS system in the borated water environment. Heat exchanger fouling due to particulates is an aging effect where foulants (such as corrosion products) accumulate on the heat transfer surfaces. This typically occurs where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer function (i.e., tubes) of heat exchangers. For CS System heat exchanger, XHE-0003, reactor coolant letdown flow circulates through the shell side; thus, the outside surface of the tubes is exposed to borated water. For CS System heat exchanger, XHE-0011, reactor coolant flows through the tubes; thus, the inside surface of the tubes is exposed to borated water. For CS System heat exchanger, XHE-0014, reactor coolant flows through the tubes; thus, the inside surface of the tubes is exposed to borated water. In the design configuration of the CC System, there is the potential for an accumulation of particles in the component cooling water surge tank, XTK-3. However, due to the continuous, turbulent flow through the shells and tubes of these heat exchangers, heat exchanger fouling due to particulates is not expected to occur on the interior and exterior surfaces of the tubes and the heat transfer function is not expected to be adversely affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a borated water environment. [CS and CC DBDs]
CS	A-CS-b	The relevant conditions could exist in the borated water environment of the Chemical and Volume Control (CS) and Chemical and Volume Control Vents and Drains (CV) Systems for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the CS and CV Systems that are exposed to a borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb), and cracking due to stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides, fluorides, copper > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-c	The relevant conditions could exist in the treated water environment of the Chemical and Volume Control (CS) System for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion to occur in stainless steel components/component types [TR00160-

System ID	Age Notes ID	Age Notes
		010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the CS System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb), and cracking due to stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides, fluorides, copper > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-d	The relevant conditions do not exist in the treated water environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to the corrosive impacts of alternate wetting and drying could occur in stainless steel components/component types in the treated water environment. However, there are no tanks exposed to treated water in the CS system. The heat exchangers in the CS system are always in a fluid-solid (filled and vented) condition during normal operation. Therefore, loss of material/cracking due to the corrosive impacts of alternate wetting and drying is not an aging effect requiring aging management during the period of extended operation for stainless steel components/component types of the CS system when exposed to the treated water environment. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. Although there are portions of the CS System that meet this temperature threshold (Regenerative Heat Exchanger and associated piping and components), there are no cast austenitic steel components in these portions of the system [1MS-94B-073 for the heat exchanger, Piping Line Spec. 2501R for the piping, and various BOM's for the valves]. Also, the Component Cooling (CC) system provides the treated water cooling to various CS system components. The temperature of the CC system remains below 200°F. Therefore, reduction in fracture toughness due to thermal aging is not an aging effect requiring aging management during the period of extended operation for stainless steel components/component types of the CS system when exposed to the treated water environment. Loss of material due to pitting and crevice corrosion and cracking due to stress corrosion are aging effects for stainless steel in the treated water environment. ILT0112 and ILT0115 are associated with the Volume Control Tank level measurement. The stainless steel tube and tube fittings for this instrumentation are filled with demineralized, de-aerated water and are isolated from the CS System borated water with diaphragms on each end [TR00160-002, Attachment III]; there is no means of air (oxygen) intrusion into the treated water. Therefore, loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking are not aging effects requiring management for the period of extended operation for these stainless steel components of the CS System exposed to treated water. Heat exchanger fouling due to particulates is an aging effect where foulants (such as corrosion products) accumulate on the heat transfer

System ID	Age Notes ID	Age Notes
		surfaces. This typically occurs where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer function (i.e., tubes) of heat exchangers. For CS System heat exchanger, XHE-0011, component cooling water flows through the shell side; thus, the outside surface of the tubes is exposed to treated water. For CS System heat exchanger, XHE-0014, component cooling water flows through the shell side; thus, the outside surface of the tubes is exposed to treated water. In the design configuration of the CC System, there is the potential for an accumulation of particles in the component cooling water surge tank, XTK-3. However, due to the continuous, turbulent flow through the shells of these heat exchangers, heat exchanger fouling due to particulates is not expected to occur on the exterior surfaces of the tubes and the heat transfer function is not expected to be adversely affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a treated water environment. [CS and CC DBDs]
CS	A-CS-e	The relevant conditions do not exist in the lube oil environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment V]: Loss of material due to crevice and pitting corrosion are aging effects for stainless steel components/component types exposed to lube oil in locations conducive to pooling water and contaminants. The charging pump lubrication system operates in such a way as to preclude condensation in the lube oil. When the charging pump is stopped, cooling to the lube oil heat exchangers is shut off and an auxiliary AC powered lube oil pump is started thereby minimizing excessive cooldown and providing constant flow of the lube oil. The temperature of the lube oil remains above ambient, therefore condensation does not occur in the charging pump lubrication system. Also, the constant flow of lube oil minimizes the possibility of water pooling in the subject components in the CS System. Therefore, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to microbiologically influenced corrosion (MIC) and cracking due to stress corrosion cracking are aging effects for stainless steel components that are exposed to a lube oil environment when the lube oil does not contain corrosion inhibiters or when the system has a likelihood of containing contaminants. The lube oil used at VCSNS contains corrosion inhibiters added by the manufacturer. The lube oil system is a relatively clean system utilizing filters. Therefore, loss of material due to MIC and cracking due to stress corrosion are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a lube oil environment. Fouling due to particulates is an aging effect for stainless steel heat exchanger sub-components exposed to lube oil. This aging effect is applicable only to heat transfer surfaces (i.e., heat exchanger tubes). There are no stainless steel heat exchanger tubes exposed to a lube oil environment in the CS system that have a heat transfer intended function for license renewal. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a lube oil environment.
CS	A-CS-f	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Chemical and Volume Control

System ID	Age Notes ID	Age Notes
		(CS) System for the following aging effects to occur in stainless steel component/component types [TR00160-010, Attachment VII]: Loss of material/cracking due to the corrosive impacts of alternate wetting and drying is an aging effect for stainless steel components/component types in the ventilation* environment. The space above the diaphragm of tanks XTK0012A and XTK0012B is vented to the atmosphere of the Auxiliary Building and, as such, is classified as a ventilation* environment. Because of the diaphragms, there is no wetting and drying occurring in this space. Therefore, loss of material/cracking due to the corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a ventilation* environment. Heat exchanger fouling due to particulates is an aging effect for stainless steel components/component types in the ventilation* environment. The aging mechanism for alternate wetting and drying concerns ventilation cooling coils and is, therefore, not applicable to the CS system since there are no ventilation cooling coils in this system. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS System that are exposed to a ventilation* environment.
CS	A-CS-g	The relevant conditions do not exist in the sheltered environment of the Chemical and Volume Control (CS) and Chemical and Volume Control Vents and Drains (CV) Systems for the following aging effects to occur in stainless steel component/component types [TR00160-010, AttachmentX]: Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for various metals in the sheltered environment for piping, tubing, and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (I.e., underground, rattle spaces) below the 425' elevation. There are no components in the CS system matching these requirements. Per the highlighted boundary drawings in Attachment XVII of TR00160-002, there are no penetrations involving the CS and CV systems between the Auxiliary Building and underground or between the Auxiliary Building and any building other than the Reactor Building. The penetrations from the Auxiliary Building to the Reactor Building occur in the Penetration Area and, therefore, do not involve a rattle space. Therefore, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the CS and CV Systems that are exposed to the sheltered environment.
CS	A-CS-h	The relevant conditions do not exist in the lube oil environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, galvanic, general, and pitting corrosion are aging effects for carbon steel exposed to lube oil in locations conducive to pooling water and contaminants. The charging pump lubrication system operates in such a way as to preclude condensation in the lube oil. When the charging pump is stopped, cooling to the lube oil heat exchangers is shut off and an auxiliary AC powered lube oil pump is started, thereby minimizing excessive cooldown and providing constant flow of the lube oil. The temperature of the lube oil remains above ambient, therefore condensation does not occur in the charging pump lubrication system. Also, the constant flow of lube oil minimizes the possibility of water pooling in the subject components in the CS System. Therefore, loss of material due to crevice, galvanic, general,

System ID	Age Notes ID	Age Notes
		and pitting corrosion are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel when materials with different electrochemical potentials are in contact. However, as stated in TR00160-010, Attachment V, lube oil is not a good conducting electrolyte. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components that are exposed to a lube oil environment when the lube oil does not contain corrosion inhibiters or when the system has a likelihood of containing contaminants. The lube oil used at VCSNS contains corrosion inhibiters added by the manufacturer. The lube oil system is a relatively clean system utilizing filters. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CS System that are exposed to a lube oil environment. Fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components exposed to lube oil. This aging effect is applicable only to heat transfer surfaces (i.e., heat exchanger tubes). There are no carbon steel heat exchanger tubes exposed to a lube oil environment in the CS system that have a heat transfer intended function for license renewal. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CS System that are exposed to a lube oil environment.
CS	A-CS-ii	The relevant conditions could exist in the sheltered environment of the Chemical and Volume Control (CS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel components/component types in the CS System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack). Also, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the sheltered environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-j	The relevant conditions do not exist in the sheltered environment of the CS system for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel in the sheltered environment when the system internal environment temperature is well below ambient which results in condensation. Loss of material due to pitting corrosion is an aging effect for carbon steel in the sheltered environment when the internal environment temperature is well below ambient and the component is insulated. The cooling water side of all heat exchangers in the CS System is treated water from the Component Cooling System which is 120°F at its coldest [Drawings D-302-612 and D-302-613]. This is the coldest internal environment within the license renewal evaluation boundaries of

System ID	Age Notes ID	Age Notes
		the CS System. The internal environment is above ambient which precludes condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components of the CS System exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for various metals in the sheltered environment for piping, tubing, and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (i.e., underground, rattle spaces) below the 425' elevation. There are no components in the CS system matching these requirements. Per the highlighted boundary drawings in Attachment XVII of TR00160-002, there are no penetrations involving the CS system between the Auxiliary Building and underground or between the Auxiliary Building and any building other than the Reactor Building. The penetrations from the Auxiliary Building to the Reactor Building occur in the Penetration Area and, therefore, does not involve a rattle space. Therefore, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the CS System that are exposed to the sheltered environment.
CS	A-CS-k	The relevant conditions could exist in the Reactor Building environment of the Chemical and Volume Control (CS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel components/component types in the CS System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack). Also, the activities for the Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the sheltered environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-l	The relevant conditions do not exist in the Reactor Building environment of the CS system for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel in the Reactor Building environment when the system internal environment temperature is well below ambient which results in condensation. Loss of material due to pitting corrosion is an aging effect for carbon steel in the Reactor Building environment when the internal environment temperature is well below ambient and the component is insulated. The cooling water side of all heat exchangers in the CS System is treated water from the Component Cooling System which is 120°F at its coldest [Drawings D-302-612 and D-302-613]. This is the coldest internal environment within the license renewal evaluation boundaries of the CS System. The internal environment is above ambient which precludes condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components of the CS System exposed to the Reactor Building environment.
CS	A-CS-m	The relevant conditions could exist in the treated water environment of the CS System for loss of material due to crevice, galvanic, general, and pitting corrosion [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects could result in loss of component

System ID	Age Notes ID	Age Notes
		intended function and thus, require management during the period of extended operation for all carbon steel components/component types in the CS System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to galvanic corrosion (if chlorides/ fluorides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb), and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel in a treated water environment. This program, when performed during the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-n	The relevant conditions do not exist in the treated water environment of the CS system for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to erosion-corrosion is an aging effect for carbon steel in a treated water environment for high flow velocity, high temperature systems. Section 4.2.2 of an Electric Power Research Institute (EPRI) report [NSAC-202L-R1] states that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase below 200°F or operated less than 2% of the time. The treated water environment of the CS system is supplied by the Component Cooling System, which is a single-phase system below 200°F [Drawings D-302-611, D-302-612, and D-302-613]. Therefore, loss of material due to erosion/corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel components/component types of the CS System exposed to the treated water environment. Loss of material is an aging effect for carbon steel in a treated water environment where there is a condition of alternate wetting and drying. There are no tanks exposed to treated water in the CS system. The heat exchangers in the CS system are always in a fluid-solid (filled and vented) condition during normal operation (SOP-102). Therefore, loss of material due to the corrosive impacts of alternate wetting and drying is not an aging effect requiring aging management during the period of extended operation for the carbon steel components/component types of the CS System exposed to the treated water environment. Fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components exposed to treated water. This aging effect is applicable only to heat transfer surfaces (i.e., heat exchanger tubes). XHE0003, XHE0011, and XHE0014 are the only heat exchangers in the CS system that have a heat transfer intended function. These heat exchangers do not have carbon steel tubes. Therefore, fouling due to particulates is not an aging effect requiring aging management during the period of extended operation for the carbon steel components/component types of the CS System exposed to the treated water environment. Cracking due to stress corrosion is an aging effect for carbon steel in treated water systems which use nitrite-based corrosion inhibitors. The treated water water cooling used by the CS system is supplied from the Component Cooling Water system which does not use nitrite-based corrosion inhibitors [CP 632]. Therefore, cracking due to stress corrosion is not an aging effect requiring aging management during the period of extended operation for the carbon steel components/component types of the CS System exposed to the treated water

System ID	Age Notes ID	Age Notes
		environment.
CS	A-CS-o	The relevant conditions could exist in the sheltered environment of the Chemical and Volume Control (CS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all cast iron components/component types in the CS System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in cast iron in the sheltered environment. Also, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in cast iron in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-p	The relevant conditions do not exist in the sheltered environment of the CS system for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for cast iron in the sheltered environment when the system internal environment temperature is well below ambient which results in condensation. Loss of material due to pitting corrosion is an aging effect for cast iron in the sheltered environment when the internal environment temperature is well below ambient and the component is insulated. The cooling water side of all heat exchangers in the CS System is treated water from the Component Cooling System which is 120°F at its coldest [Drawings D-302-612 and D-302-613]. This is the coldest internal environment within the license renewal evaluation boundaries of the CS System. The internal environment is above ambient which precludes condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the cast iron components/component types of the CS System exposed to the sheltered environment. Loss of material due to microbiologically induced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for various metals in the sheltered environment for piping, tubing and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (I.e., underground, rattle spaces) below the 425' elevation. There are no components in the CS system matching these requirements. Per the highlighted boundary drawings in Attachment XVII of TR00160-002, there are no penetrations involving the CS system between the Auxiliary Building and any building other than the Reactor Building, or that enter the Auxiliary Building from underground. The penetrations from the Auxiliary Building to the Reactor Building are located in the Penetration Area and, therefore, do not involve a rattle space. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the CS System that are exposed to the sheltered environment.
CS	A-CS-q	The relevant conditions do not exist in the lube oil environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, galvanic, general, and pitting corrosion and selective leaching are aging effects for cast iron exposed to lube oil in locations conducive to pooling water and contaminants. The charging pump lubrication system operates in such a way as to preclude condensation in the lube oil. When the charging pump is stopped, cooling to the lube oil heat exchangers is shut off and an auxiliary AC

System ID	Age Notes ID	Age Notes
		powered lube oil pump is started thereby minimizing excessive cooldown and providing constant flow of the lube oil. The temperature of the lube oil remains above ambient, therefore condensation does not occur in the charging pump lubrication system. Also, keeping the lube oil temperature above ambient promotes evaporation of moisture in the lube oil which thereby minimizes the possibility of water pooling in the subject components in the CS System. As such, loss of material due to crevice, galvanic, general, and pitting corrosion and selective leaching are not aging effects requiring management during the period of extended operation for cast iron components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for cast iron components that are exposed to a lube oil environment when the lube oil does not contain corrosion inhibiters or when the system has a likelihood of containing contaminants. The lube oil used at VCSNS contains corrosion inhibiters added by the manufacturer. The lube oil system is a relatively clean system utilizing filters. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the CS System that are exposed to a lube oil environment. Fouling due to particulates is an aging effect for cast iron heat exchanger sub-components exposed to lube oil. This aging effect is applicable only to heat transfer surfaces (i.e., heat exchanger tubes). There are no cast iron heat exchanger tubes exposed to a lube oil environment in the CS system that have a heat transfer intended function for license renewal. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the CS System that are exposed to a lube oil environment.
CS	A-CS-r	The relevant conditions do not exist in the lube oil environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in copper components/component types [TR00160-010, Attachment V]: Loss of material due to general, crevice, and pitting corrosion are aging effects for copper exposed to lube oil in locations conducive to pooling water and contaminants. The charging pump lubrication system operates in such a way as to preclude condensation in the lube oil. When the charging pump is stopped, cooling to the lube oil heat exchangers is shut off and an auxiliary AC powered lube oil pump is started thereby minimizing excessive cooldown and providing constant flow of the lube oil. The temperature of the lube oil remains above ambient, therefore condensation does not occur in the charging pump lubrication system. Also, the constant flow of lube oil minimizes the possibility of water pooling in the subject components in the CS System. As such, loss of material due to general, crevice, and pitting corrosion are not aging effects requiring management during the period of extended operation for copper components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for copper components that are exposed to a lube oil environment when the lube oil does not contain corrosion inhibiters or when the system has a likelihood of containing contaminants. The lube oil used at VCSNS contains corrosion inhibiters added by the manufacturer. The lube oil system is a relatively clean system utilizing filters. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for copper components/component types of the CS System that are exposed to a lube oil environment.

System ID	Age Notes ID	Age Notes
		Fouling due to particulates is an aging effect for copper heat exchanger sub-components exposed to lube oil. This aging effect is applicable only to heat transfer surfaces (i.e., heat exchanger tubes). There are no cast iron heat exchanger tubes exposed to a lube oil environment in the CS system that have a heat transfer intended function for license renewal. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for copper components/component types of the CS System that are exposed to a lube oil environment. Loss of material due to galvanic corrosion and selective leaching are aging effects for copper components exposed to fuel oil environments. The copper components within the license renewal evaluation boundaries of the CS System are exposed to lubricating oil and not fuel oil. Therefore, loss of material due to galvanic corrosion and selective leaching are not aging effects requiring management.
CS	A-CS-s	The relevant conditions could exist in the sheltered environment of the Chemical and Volume Control (CS) System for loss of material (copper components) due to boric acid corrosion (aggressive chemical attack) [TR00160-010, Attachment X] to occur. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for all copper components/component types in the CS System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in copper in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-t	The relevant conditions do not exist in the sheltered environment of the CS system for the following aging effects to occur in copper components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for copper in the sheltered environment when the system internal environment temperature is well below ambient which results in condensation. The cooling water side of all heat exchangers in the CS System is treated water from the Component Cooling System which is 120°F at its coldest [Drawings D-302-612 and D-302-613]. This is the coldest internal environment within the license renewal evaluation boundaries of the CS System. The internal environment for the CS system is above ambient which precludes condensation. Therefore, loss of material due to galvanic is not an aging effect requiring management during the period of extended operation for the copper components/component types of the CS System exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for various metals in the sheltered environment for piping, tubing, and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (I.e., underground, rattle spaces) below the 425' elevation. There are no components in the CS system matching these requirements. Per the highlighted boundary drawings in Attachment XVII of TR00160-002, there are no penetrations involving the CS system between the Auxiliary Building and underground or between the Auxilairy Building and any building other than the Reactor Building. The penetrations from the Auxiliary Building to the Reactor Building occur in the Penetration Area and, therefore, does not involve a rattle space. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for copper components/component types of the CS System that are exposed to the sheltered environment.

System ID	Age Notes ID	Age Notes
CS	A-CS-u	The relevant conditions do not exist in the lube oil environment of the Chemical and Volume Control (CS) System for the following aging effects to occur in copper-nickel components/component types: Loss of material due to crevice, galvanic, and pitting corrosion are aging effects for copper-nickel exposed to lube oil in locations conducive to pooling water and contaminants. Water pooling, should it occur, would be expected in the bottom of an oil reservoir and not the heat exchanger tubes and tubesheets in the CS System. As such, loss of material due to crevice, galvanic, and pitting corrosion are not aging effects requiring management during the period of extended operation for copper-nickel components/component types of the CS System that are exposed to a lube oil environment. Fouling due to particulates is an aging effect for copper-nickel heat exchanger sub-components exposed to borated water. This aging effect applies to only heat transfer surfaces of heat exchanger sub-components (i.e., tubes). The only heat exchangers in the Chemical and Volume Control (CS) system that contain copper-nickel are XPP0043A,B,C-HE1. As described in TR00160-002, Attachment II, the heat transfer function is not required to support the system intended function(s) for these heat exchangers. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for copper-nickel components/component types for the CS system that are exposed to the lube oil environment.
CS	A-CS-v	The relevant conditions could exist in the treated water environment of the CS System for loss of material due to crevice, erosion, pitting and galvanic corrosion [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject copper-nickel components/component types in the CS System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb) and galvanic corrosion (if chlorides and/or fluorides >150 ppb) to occur in copper-nickel in a treated water environment. The new Heat Exchanger Inspections will detect and characterize a loss of material due to erosion-corrosion, if any. The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
CS	A-CS-w	The relevant conditions do not exist in the treated water environment of the CS system for the following aging effects to occur in copper-nickel components/component types [TR00160-010, Attachment III]: Loss of material due to the corrosive impacts of alternate wetting and drying is an aging effect for copper-nickel in the treated water environment. There are no tanks exposed to treated water in the CS system. The heat exchangers in the CS sytem are always in a fluid-solid (filled and vented) condition during normal operation [SOP-102]. Thus no wetting and drying occurs in the CS system. Therefore, loss of material due to the corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for copper-nickel components/component types of the CS System that are exposed to a treated water environment. Loss of material due to erosion-corrosion is an aging effect for copper nickel components/component types exposed to treated water.

System ID	Age Notes ID	Age Notes
		Section 4.2.2 of an Electric Power Research Institute (EPRI) report [NSAC-202L-R1] states that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase below 200°F or operated less than 2% of the time. The treated water environment of the CS system is supplied by the Component Cooling system, which is a single-phase system below 200°F [Drawings D-302-611, D-302-612, and D-302-613]. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management. Fouling due to particulates is an aging effect for copper-nickel heat exchanger sub-components exposed to treated water. This aging effect applies to only heat transfer surfaces of heat exchanger sub-components (i.e., tubes). The only heat exchangers in the Chemical and Volume Control (CS) system that contain copper-nickel are XPP0043A,B,C-HE1. As described in TR00160-002, Attachment II, the heat transfer function is not required to support the system intended function(s) for these heat exchangers. Therefore, fouling due to particulates is not an aging effect requiring management. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for copper-nickel components in treated water environments in systems using ammonia, ammonium compounds or hydrazine at elevated temperatures. The Component Cooling (CC) System does not use these chemicals [Chemistry Procedure CP-632, Section 3.2 and CP-620, Section 3.4]. Because the treated water cooling for the CS system heat exchangers is supplied by the CC system, cracking due to SCC is not an aging effect requiring management during the period of extended operation for copper nickel components/component types of the CC System that are exposed to a treated water environment.
DG	A-DG-a	The relevant conditions do not exist in the air-gas environment of the DG System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VI]: For the Diesel Generator Services (DG) Systems, the air-gas environment contains carbon steel engine exhaust, starting air, fuel oil tank vents and intake air components. Concerning loss of material due to general corrosion, diesel generator operation, which occurs on a periodic basis, dries the carbon steel components and adjacent insulation. During the periodic diesel generator operations, degradation of components such as exhaust piping and silencers would be discovered by visual observation. Exhaust system leaks would be detected by Operations personnel in noting the distinctive odor from diesel exhaust leakage inside the Diesel Generator Building. Visual detection of leaks is possible. Also, changes in operating characteristics would be observed, such as a change in noise or backpressure during these periodic operations. Carbon steel can be susceptible to loss of material due to general corrosion in moist air or gas. Both oxygen and moisture must be present because oxygen alone or water free of dissolved oxygen does not corrode iron to any practical extent. The Metals Handbook, Volume 13 Corrosion, page 531, graphically depicts the atmospheric corrosion versus time rate for structural steel, ASTM A-36, in an industrial setting. Structural carbon steel loses approximately 1 mil per year for the first ten years, followed by a rate of approximately 0.3 mils per year for the next 50 years. For a sixty year plant life, this yields a total material loss of approximately 25 mils (10 mils for first ten years plus 15 mils for remaining fifty years). The slowing of the corrosion rate is due to the metal producing a protective film, which protects the surface. Conservatively, if this slowing of corrosion due to the filming is ignored, a rate of 0.65 mils lost per year is determined (13 mils lost over

System ID	Age Notes ID	Age Notes
		twenty years). For a sixty year plant life, the total conservative material loss for the structural steel is approximately 39 mils. For the DG System, drawing 1MS-32-005-7 depicts mechanical components for the crankcase vacuum, air intake and exhaust subsystems. This drawing states that the recommended air intake and exhaust piping is 3/8" minimum wall piping constructed of ASTM A53 Grade A or API5L Grade A. ASTM A53 material is hot-dipped galvanized carbon steel pipe. The Metals Handbook, Volume 13 Corrosion, page 532, states that galvanizing is used to provide protection even under conditions in which the corrosive environment is quite severe. The zinc coating is anodic and corrodes preferentially, which protects exposed steel surfaces. Thus it is likely that the corrosion performance of the A53 carbon and low alloy steel DG System piping and piping components will be better than that of the structural steel corrosion losses of 39 mils referenced above. Using engineering judgement, a reasonable allowable minimum wall loss from properly designed pipe would be 12 ½% of the original wall thickness over the life of the pipe (Consistent with the 2001 ASME Code Section II, Part A, Ferrous Material Specification for SA-53. The SA-53 Specification at Part A, Para. 12.3 Permissible Variations in Weight and Dimensions Thickness states "The minimum wall thickness at any point shall be not more than 12 1/2 % under the nominal wall thickness specified"). With an allowable minimum wall loss of 12 ½%, the above-forecasted 39 mils of wall thickness loss would not exceed the allowable minimum wall thickness for 3/8” (12 ½% of 0.375” = 47 mils) pipe. Based upon the preceding example, for DG System license renewal purposes, a distinction is made between thick-walled and thin-walled carbon steel components. In the example above, pipe is considered to be thick-walled, since the conservative material loss over the extended period of operation would not exceed the allowable minimum wall thickness. Other thick-walled carbon steel components are defined here as components, which are not expected to corrode over the period of extended operation causing a material loss resulting in loss of component function (e.g. minimum wall thickness less than allowable). Thick-walled carbon steel components in the DG System are defined to include: filter bodies, heat exchanger shells, mufflers, pipe, strainer bodies, tanks, turbochargers, air reservoirs and silencers. In summary, it is reasonable that the conservative predicted material loss over the extended period of operation of thick-walled DG System carbon steel components would not exceed the allowable wall thickness loss nor affect the components ability to perform its intended function. Also, it is likely that degradation of components would be discovered during periodic diesel generator operations. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for thick-walled carbon steel components/component types within the license renewal evaluation boundaries of the DG System that are exposed to an air-gas environment (Also see Note A-DG-n for thin-walled components requiring management). Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The normal operating temperature of the intake air subsystem is depicted as 70°F and the normal operating temperature of the muffler exhaust is depicted as 850°F [D-302-353]. For the starting air subsystem, the carbon steel components of the DG System are subject to compressed air downstream of the aftercoolers, moisture separators and air dryers, with some moisture remaining in the compressed air and condensing in the starting air tanks. This condensate does not contain impurities in sufficient quantities to promote the referenced electrolytic reaction. The normal operating temperature of the starting air subsystem downstream of the starting air package is depicted as 80°F [D-302-353]. In summary, for engine exhaust and intake air components, the carbon steel components of the DG System are normally at temperatures near or above ambient, so condensation is not a

System ID	Age Notes ID	Age Notes
		concern, and wetted locations are not expected to exist. Thus, the required conditions do not exist to promote this aging effect. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to an air-gas environment.
DG	A-DG-b	The relevant conditions could exist in the sheltered environment of the DG System for loss of material due to general corrosion, galvanic corrosion (certain piping) and loss of material due to microbiologically influenced corrosion [MIC] (pipe) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types in the DG System that are exposed to a sheltered environment. Loss of material due to galvanic corrosion is an aging effect requiring system specific evaluation for carbon and low alloy steels in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Certain DG System components could be susceptible to galvanic corrosion as they are colder than ambient and subject to condensation. Carbon steel piping, which contains raw water is susceptible to condensation during the colder weather months of the year. The piping connects to stainless steel heat exchanger channel heads, allowing the possibility of loss of material due to galvanic corrosion of the less noble material, carbon steel. This aging effect also exists for certain heat exchanger components. As discussed in TR00160-020, the Inspections for Mechanical Components will manage loss of material due to general corrosion (corrosive environment) and galvanic corrosion (dissimilar metals) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC (groundwater contact with pipe) in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
DG	A-DG-c	The relevant conditions do not exist in the sheltered environment of the DG System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: In some cases, external corrosion of vulnerable carbon steel components/component types (pipe) that are in contact with microbes can cause microbiologically induced corrosion [MIC] (See Note A-DG-b). Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following carbon steel DG System components/component types: expansion joints, filters, heat exchangers, heaters, mufflers, pumps, reservoirs, silencers, strainers, valves, turbochargers and tanks. Loss of material due to pitting corrosion (insulated components) is an aging effect requiring system specific evaluation for carbon and low alloy steels in the sheltered environment in systems with normal operating temperatures well below ambient conditions. There is carbon steel piping, which contains raw water, that is susceptible to condensation for a portion of the year, and this piping is not insulated. This piping is colder than ambient and has condensation during the colder weather months. In addition to the raw water piping, the DG System operates at temperatures which are greater than the sheltered environment ambient temperature. The carbon steel components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to pitting corrosion (insulated components) is not an aging effect requiring management during the period of extended operation for the carbon steel

System ID	Age Notes ID	Age Notes
		components/component types of the DG System that are exposed to a sheltered environment. Loss of material due to boric acid corrosion is an aging effect for carbon steel components exposed to sheltered environments near borated water systems. A review of the DG System flow diagrams and the screening report TR00160-005, revealed that the sheltered environment of the DG System is located in the Diesel Generator Building, where there are no borated water systems. As such, loss of material due to boric acid corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-d	The relevant conditions do not exist in the air-gas environment of the DG System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VI]: For the DG System, the air-gas environment contains stainless steel engine exhaust and starting air components. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-005], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to an air-gas environment. Cracking due to stress corrosion cracking (SCC) can be an aging effect in stainless steel exposed to an air-gas environment. It is conservatively assumed that sufficient stresses exist to initiate SCC, given an environment conducive to the progression of SCC. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-006], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. Cracking due to intergranular attack (IGA) is a concern in wetted locations where the temperature is greater than 200°F. The diesel generator is normally in standby, and the diesel generator air-gas environment is normally subject to ambient conditions of the Diesel Generator Building, which are significantly less than 200°F. As such, cracking due to SCC and IGA are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to an air-gas environment.
DG	A-DG-e	The relevant conditions do not exist in the air-gas environment of the DG System for the following aging effects to occur in brass/copper/copper alloy components/component types [TR00160-010, Attachment VI]:

System ID	Age Notes ID	Age Notes
		For the DG System, the air-gas environment contains brass/copper/copper alloy starting air components. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-005], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The brass/copper/copper alloy components of the DG System are not coupled to materials that are more cathodic. Intercooler components connect to carbon steel heads and shell, and valves connect to carbon steel pipe. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloy components in moist air or gas environments in wetted locations. The brass and copper alloy components of the DG System are normally at temperatures near or above ambient, so condensation is not a concern, and wetted locations are not expected to exist in these components of the starting air system. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to an air-gas environment.
DG	A-DG-f	The relevant conditions do not exist in the air-gas environment of the DG System for the following aging effects to occur in aluminum/aluminum alloy components/component types [TR00160-010, Attachment VI]: For the DG System, the air-gas environment contains aluminum starting air components. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-005], this environment is expected to

System ID	Age Notes ID	Age Notes
		be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The aluminum/aluminum alloy components of the DG System are normally at temperatures near or above ambient, so condensation is not a concern, and wetted locations are not expected to exist. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloy components in moist air or gas environments in wetted locations. The aluminum/aluminum alloy valves in the DG System may have alloys of brass or bronze. However, the aluminum/aluminum alloy of the DG System are normally at temperatures near or above ambient, so condensation is not a concern, and wetted locations are not expected to exist in the subject components of the starting air system. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to an air-gas environment.
DG	A-DG-g	The relevant conditions do not exist in the sheltered environment of the DG System for loss of material due to microbiologically influenced corrosion to occur [TR00160-010, Attachment X]. There are no vulnerable stainless steel components/component types (tubing) in the DG System that pass between pertinent buildings through a non-fire seal penetration or enters the Diesel Generator Building from outside (i.e. underground, embedded) below the 425' elevation. As such, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-h	The relevant conditions do not exist in the sheltered environment of the DG System for the following aging effects to occur in brass/copper/copper alloy components/component types [TR00160-010, Attachment X]: Loss of material due to boric acid corrosion is an aging effect for brass/copper/copper alloy components exposed to sheltered environments near borated water systems. A review of the DG System flow diagrams and the screening report [TR00160-005], revealed that the sheltered portion of the DG System is located in the Diesel Generator Building, where there are no borated water systems. As such, loss of material due to boric acid corrosion is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to a sheltered environment. In some cases, corrosion of vulnerable brass and copper components/component types (pipe and tubing) that are in contact with microbes can cause microbiologically influenced corrosion (MIC). The relevant conditions do not exist in the sheltered environment of the DG System for loss of material due to microbiologically influenced corrosion to occur [TR00160-010, Attachment X]. There are no vulnerable brass and

System ID	Age Notes ID	Age Notes
		copper components/component types (pipe and tubing) in the DG System that pass between pertinent buildings through a non-fire seal penetration or enters the Diesel Generator Building from outside (i.e. underground, embedded) below the 425' elevation. As such, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for brass and copper pipe and tubing of the DG System that are exposed to a sheltered environment. Loss of material due to galvanic corrosion is an aging effect requiring system specific evaluation for brass/copper/copper alloys in the sheltered environment in systems with normal operating temperatures well below ambient conditions. The DG System operates at temperatures which are greater than the sheltered environment ambient temperature and the subject brass/copper/copper alloy components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-j	The relevant conditions do not exist in the sheltered environment of the DG System for any aging effects to occur in glass components/component types [TR00160-010, Attachment X]. Glass is an amorphous inorganic oxide, mostly silica, and cooled to a rigid condition without crystallization. The characteristic properties of glass are its transparency, its hardness and rigidity at ordinary temperatures, its capacity for plastic working at elevated temperatures, and its resistance to weathering and to most chemicals except hydrofluoric acid. The external surfaces of glass will not be subjected to either unusually high temperatures or hydrofluoric acid in the sheltered environment. As such, there are no aging effects requiring management during the period of extended operation for glass components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-k	The relevant conditions do not exist in the sheltered environment of the DG System for the following aging effects to occur in cast iron and ductile iron components/component types [TR00160-010, Attachment X]: Loss of material due to boric acid corrosion is an aging effect for cast iron and ductile iron components exposed to sheltered environments near borated water systems. A review of the DG System flow diagrams and the screening report [TR00160-005], revealed that the sheltered portion of the DG System is located in the Diesel Generator Building, where there are no borated water systems. As such, loss of material due to boric acid corrosion is not an aging effect requiring management during the period of extended operation for cast iron and ductile iron components/component types of the DG System that are exposed to a sheltered environment. Loss of material due to galvanic corrosion and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for cast iron and ductile iron in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Portions of the DG System are in operation during plant normal operation and during accident operation and they operate at temperatures which are greater than the sheltered environment ambient temperature [DG DBD]. The subject cast iron and ductile iron components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for cast iron and ductile iron components/component types of the DG System that are exposed to a sheltered

System ID	Age Notes ID	Age Notes
		environment. In some cases, corrosion of vulnerable cast iron components/component types (pipe and tubing) that are in contact with microbes can cause microbiologically influenced corrosion (MIC). There are no cast iron components/component types (pipe and tubing) in the DG System. As such, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-l	The relevant conditions could exist in the sheltered environment of the DG System for loss of material due to general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for all cast iron and ductile iron components/component types in the DG System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components, will manage loss of material due to general corrosion in cast iron and ductile iron (corrosive environment) in a sheltered environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-m	The relevant conditions do not exist in the sheltered environment of the DG System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment X]: Loss of material due to boric acid corrosion is an aging effect for aluminum components exposed to sheltered environments near borated water systems. A review of the DG System flow diagrams and the screening report [TR00160-005], revealed that the sheltered portion of the DG System is located in the Diesel Generator Building, where there are no borated water systems. As such, loss of material due to boric acid corrosion is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to a sheltered environment. Loss of material due to galvanic corrosion is an aging effect requiring system specific evaluation for aluminum in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Portions of the DG System are in operation during plant normal operation and during accident operation and they operate at temperatures which are greater than the sheltered environment ambient temperature [DG DBD]. The subject aluminum components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to a sheltered environment. In some cases, corrosion of vulnerable aluminum components/component types (pipe and tubing) that are in contact with microbes can cause microbiologically influenced corrosion (MIC). There are no aluminum components/component types (pipe and tubing) in the DG System. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the DG System that are exposed to a sheltered environment.
DG	A-DG-n	The relevant conditions could exist in the air-gas environment of the DG System for loss of material due to general corrosion to occur in components which are thin-walled, and for loss of material due to corrosive impacts of alternate wetting and drying in the starting air tanks

System ID	Age Notes ID	Age Notes
		[TR00160-010, Attachment VI]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the subject carbon steel components/component types in the DG System that are exposed to an air-gas environment. Components which are constructed of thick-walled carbon steel are expected to corrode at a rate which will not cause a loss of component function over the period of extended operation (See Note A-DG-a). Thick-walled carbon steel components in the DG System include: filters, heat exchanger shells, mufflers, pipe, strainers, tanks, turbochargers, air reservoirs and silencers. Thin-walled carbon steel components in the DG System, tubing and expansion joints, are susceptible to loss of material due to general corrosion. Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. With the exception of the starting air tanks, based upon a review of the system flow diagrams and the air-gas screening report [TR00160-006], the air-gas environment is expected to be an environment which will not have cyclic wet and dry conditions and have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. This includes the vented to atmosphere air space at the top of the fuel oil tanks. The fuel oil tank level changes but fuel oil does not concentrate contaminants at the surface of the oil and any water in the fuel oil tanks would be at the tank bottom. The air-gas, carbon steel components subject to alternate wetting and drying include the starting air tanks. The starting air tanks have the potential for moisture, as evidenced by the practice of Operations personnel blowing down very small amounts of moisture every shift. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is only an aging effect requiring management during the period of extended operation for the starting air tanks. As discussed in TR00160-020, the Diesel Generator Systems Inspections will assess the conditions in order to detect and characterize, if any, a loss of material due to general corrosion (corrosive environment) in DG System thin-walled carbon steel components, tubing and expansion joints, and loss of material due to corrosive impacts of alternate wetting and drying (moisture buildup and release) of carbon steel starting air tanks in an air-gas environment. This one-time activity will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions for the period of extended operation.
DG	A-DG-o	The relevant conditions could exist in the fuel oil environment of the DG System for loss of material due to general, galvanic, crevice and pitting corrosion and loss of material due to microbiologically induced corrosion (MIC) in carbon steel in a fuel oil environment [TR00160-010, Attachment V]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject carbon steel components/component types in the DG System that are exposed to a fuel oil environment. Loss of material due to general, galvanic, crevice and pitting corrosion are aging effects for carbon steel fuel oil tanks in the DG System. Loss of material due to microbiologically influenced corrosion is an aging effect for carbon steel fuel oil components in the DG System

System ID	Age Notes ID	Age Notes
		including filters, pumps, pipe, strainers, tanks, valves and tubing. Normal operating temperature of the fuel oil subsystem is shown as 70°F [D-302-351]. As stated in the Aging Effects Identification, heat exchanger fouling due to particulates is not an aging effect for carbon steel heat exchanger components that are exposed to a fuel oil environment. As discussed in TR00160-020, the existing Chemistry Program, will manage the conditions required for loss of material due to general, galvanic, crevice and pitting corrosion from exposure to locations conducive to water pooling and contaminants (i.e., tanks) and loss of material due to MIC (moisture contamination and microorganism contamination) in carbon steel filters, pumps, pipe, strainers, tanks and tubing in a fuel oil environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-p	The relevant conditions do not exist in the lube oil environment of the DG System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment V]: The carbon steel in lube oil components that are not susceptible to water pooling include filters, heat exchanger shells, heaters, pipe, strainers, valves, reservoirs and tubing. Loss of material due to general, crevice and pitting corrosion are aging effects for carbon steel exposed to lube oil in locations conducive to pooling water and contaminants. The diesel generator lubrication prelube and filter system supplies continuous pre-lubrication at warm temperatures when the diesel is in standby, and the normal temperature of the lube oil is 155°F [DG DBD, Sections 2.3 and 3.2]. The diesel generators are in standby the majority of the time and this heated and constant flow of lube oil minimizes the possibility of water pooling in the DG System. Since the diesel generators are run monthly, all lube oil components are considered to have an internal environment of lube oil, even though all components may not be submerged in lube oil, the internal surface of the components are covered by a lube oil film. As such, loss of material due to general, crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a lube oil environment. As stated in the Aging Effects Identification, loss of material due to microbiologically influenced corrosion and galvanic corrosion are not aging effects for carbon steel components that are exposed to a lube oil environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat transfer function, and the DG System Lube Oil Heat Exchangers heat transfer function only involves the tubes. The only carbon steel components of the referenced heat exchangers are the shells. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel heat exchanger components/component types of the DG System that are exposed to a lube oil environment.
DG	A-DG-q	The relevant conditions could exist in the fuel oil environment of the DG System for loss of material due to microbiologically influenced

System ID	Age Notes ID	Age Notes
		corrosion in stainless steel [TR00160-010, Attachment V]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for stainless steel components (orifices) in the DG System that are exposed to a fuel oil environment. As stated in the Aging Effects Identification, heat exchanger fouling due to particulates is not an aging effect for stainless steel heat exchanger components that are exposed to a fuel oil environment. As discussed in TR00160-020, the existing Chemistry Program, will manage the conditions required for loss of material due to microbiologically influenced corrosion (moisture contamination and microorganism contamination) in stainless steel orifices in a fuel oil environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-r	The relevant conditions do not exist in the fuel oil environment of the DG System for the following aging effects to occur in stainless steel orifices [TR00160-010, Attachment V]: Loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC) are aging effects for stainless steel exposed to fuel oil in locations conducive to pooling water and contaminants. A review of the DG System flow diagrams, screening report and attachments revealed that none of the subject stainless steel components (orifices) are exposed to locations conducive to pooling water and contaminants. As such, loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC) are not aging effects requiring management during the period of extended operation for stainless steel orifices of the DG System that are exposed to a fuel oil environment.
DG	A-DG-s	The relevant conditions do not exist in the lube oil environment of the DG System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment V]: Loss of material due to crevice and pitting corrosion are aging effects for stainless steel exposed to lube oil in locations conducive to pooling water and contaminants. The diesel generator lubrication prelube and filter system supplies continuous pre-lubrication at warm temperatures when the diesel is in standby [DG DBD, Section 2.3]. The Diesel Generators are in standby the majority of the time and this heated and constant flow of lube oil minimizes the possibility of water pooling in the subject components in the DG System. The stainless steel components that are not susceptible to water pooling include heat exchanger shells and tubing. As such, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a lube oil environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat transfer function, and the DG System Lube Oil Heat Exchangers heat transfer function only involves the tubes. The only stainless steel components of the referenced heat exchangers which are in contact with lube oil are the tubesheets. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel heat exchanger components of the DG System that

System ID	Age Notes ID	Age Notes
		are exposed to a lube oil environment. As stated in the Aging Effects Identification, loss of material due to microbiologically influenced corrosion and cracking due to stress corrosion cracking are not aging effects for stainless steel components that are exposed to a lube oil environment.
DG	A-DG-t	The relevant conditions could exist in the fuel oil environment of the DG System for loss of material due to microbiologically influenced corrosion in brass/copper/copper alloys [TR00160-010, Attachment V]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for the pipe and tubing in the DG System that are exposed to a fuel oil environment. As discussed in TR00160-020, the existing Chemistry Program, will manage the conditions required for loss of material due to microbiologically influenced corrosion [MIC] (moisture contamination and microorganism contamination) in brass/copper/copper alloy pipe and tubing in a fuel oil environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-u	The relevant conditions do not exist in the fuel oil environment of the DG System for the following aging effects to occur in brass/copper/copper alloys [TR00160-010, Attachment V]: Loss of material due to galvanic, crevice and pitting corrosion, selective leaching and cracking due to stress corrosion cracking (SCC) are aging effects for brass/copper/copper alloys exposed to fuel oil in locations conducive to pooling water and contaminants. A review of the DG System flow diagrams listed in the DG System's screening report and attachments revealed that none of the brass/copper/copper alloy components (pipe and tubing) are exposed to locations conducive to pooling water and contaminants. As such, loss of material due to galvanic, crevice and pitting corrosion, selective leaching and cracking due to stress corrosion cracking (SCC) are not aging effects requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to a fuel oil environment. As stated in the Aging Effects Identification, heat exchanger fouling due to particulates is not an aging effect for brass/copper/copper alloy heat exchanger components/component types that are exposed to a fuel oil environment.
DG	A-DG-v	The relevant conditions do not exist in the lube oil environment of the DG System for the following aging effects to occur in brass/copper/copper alloy components/component types [TR00160-010, Attachment V]: Loss of material due to crevice and pitting corrosion are aging effects for brass/copper/copper alloys exposed to lube oil in locations conducive to pooling water and contaminants. The diesel generator lubrication prelube and filter system supplies continuous pre-lubrication at warm temperatures when the diesel is in standby [DG DBD, Section 2.3]. The Diesel Generators are in standby the majority of the time and this heated and constant flow of lube oil minimizes the possibility of water pooling in the subject components (pipe and heat exchanger tubes) in the DG System. As such, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the DG System that are exposed to a lube oil environment.

System ID	Age Notes ID	Age Notes
		Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat transfer function, and the DG System lube oil heat exchangers heat transfer function only involves brass tubes. However, lube oil is filtered by a 5 micron filter [1MS-32-005, Sheet 3], and so the lube oil subsystem is kept clean and unlikely to allow particulates to accumulate that would foul the heat exchangers. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy heat exchanger components/component types of the DG System that are exposed to a lube oil environment. As stated in the Aging Effects Identification, loss of material due to microbiologically influenced corrosion, selective leaching and galvanic corrosion and cracking due to stress corrosion cracking are potential aging effects for fuel oil and not for brass/copper/copper alloy components that are exposed to a lube oil environment.
DG	A-DG-w	The relevant conditions do not exist in the lube oil environment of the DG System for the following aging effects to occur in cast iron and ductile iron components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, general and pitting corrosion and selective leaching are aging effects for cast iron and ductile iron exposed to lube oil in locations conducive to pooling water and contaminants. The diesel generator lubrication prelube and filter system supplies continuous pre-lubrication at warm temperatures when the diesel is in standby [DG DBD, Section 2.3]. The Diesel Generators are in standby the majority of the time and this heated and constant flow of lube oil minimizes the possibility of water pooling in the subject components (pumps and valves) in the DG System. As such, loss of material due to crevice, general and pitting corrosion and selective leaching are not aging effects requiring management during the period of extended operation for cast iron and ductile iron components/component types of the DG System that are exposed to a lube oil environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Within the license renewal boundaries of the DG System, there are no heat exchanger components constructed of cast iron and ductile iron. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for cast iron and ductile iron heat exchanger components/component types of the DG System that are exposed to a lube oil environment. As stated in the Aging Effects Identification, loss of material due to microbiologically influenced corrosion and galvanic corrosion are not aging effects for cast iron and ductile iron components that are exposed to a lube oil environment.
DG	A-DG-x	The relevant conditions do not exist in the oil/fuel oil environment of the DG System for any aging effects to occur in glass components/component types [TR00160-010, Attachment V]. Glass is an amorphous inorganic oxide, mostly silica, and cooled to a rigid condition without crystallization. The characteristic properties of glass are its transparency, its hardness and rigidity at ordinary temperatures, its capacity for plastic working at elevated temperatures, and

System ID	Age Notes ID	Age Notes
		its resistance to weathering and to most chemicals except hydrofluoric acid. The external surfaces of glass will not be subjected to either unusually high temperatures or hydrofluoric acid in the oil/fuel oil environment. As such, there are no aging effects requiring management during the period of extended operation for glass components/component types of the DG System that are exposed to an oil/fuel oil environment.
DG	A-DG-y	The relevant conditions could exist in the yard environment of the DG System for loss of material due to general and galvanic corrosion in carbon steel [TR00160-010, Attachment XII]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for the components in the DG System that are exposed to a yard environment. The components associated with this material-environment combination include fuel oil piping and valves, vent piping from fuel oil tanks and muffler exhaust piping, which penetrates the outside wall of the Diesel Generator Building. As discussed in TR00160-020, the activities for Inspections for Mechanical Components, will manage a loss of material due to general corrosion (moisture and oxygen) and galvanic corrosion (presence of corrosive environment) in yard carbon steel. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-z	Not Used
DG	A-DG-za	The relevant conditions could exist in the underground environment of the DG System for loss of material due to general, crevice, galvanic, pitting and microbiologically influenced corrosion in carbon steel with fuel oil [TR00160-010, Attachment XI]. The underground environment is one in which equipment is in contact with soil and groundwater, but these components are usually coated and wrapped to prevent contact with soil or groundwater. For the purposes of license renewal, the coating and/or wrapping are assumed to have failed such that those aging effects associated with carbon steel in contact with soil or groundwater are plausible. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the carbon steel pipe and tanks in the DG System that are exposed to an underground environment with fuel oil. As discussed in TR00160-020, the activities for the new Buried Piping and Tanks Inspection, will manage loss of material due to general, crevice, galvanic, pitting and microbiologically induced corrosion [MIC] (groundwater contact) in underground carbon steel pipe and tanks with fuel oil. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-zb	The relevant conditions could exist in the raw water environment of the DG System for loss of material due to erosion, loss of material due to crevice, microbiologically influenced, and pitting corrosion and fouling due to biological materials and particulates for brass heat exchanger sub-components exposed to raw water [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the brass components (heat exchanger components) in the DG System that are exposed to raw water. As discussed in TR00160-020, the Service Water System Reliability and In Service Testing Program will manage loss of material due to

System ID	Age Notes ID	Age Notes
		erosion (high velocity), loss of material due to crevice (corrosive environment), microbiologically influenced (groundwater contact), and pitting corrosion (corrosive environment) and fouling due to biological materials (microorganisms) and particulates (foulant accumulation) in brass heat exchanger components in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions. Loss of material due to galvanic corrosion is an aging effect in materials in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The brass tubes of the DG System heat exchangers XHE-17 A/B-HE1, 2, 3 are coupled to stainless steel tubesheets. Brass is less cathodic than stainless steel. The channel heads of these heat exchangers are stainless steel with zinc sacrificial anodes, which protects the brass tubes. The Service Water System Reliability and In Service Testing Program will also inspect and replace as required the sacrificial anodes in the XHE-17 A/B-HE1, 2, 3 heat exchangers.
DG	A-DG-zc	The relevant conditions do not exist in the raw water environment of the DG System for the following aging effects to occur in brass heat exchanger tubes [TR00160-010, Attachment IV]: Loss of material due to selective leaching is an aging effect in brass components with zinc contents in excess of 15%. The tubes of the subject heat exchangers are specified as Admiralty brass. Admiralty brass contains approximately 28% zinc, but has small amounts of antimony, arsenic or phosphorus, which inhibit selective leaching [BAW - 2270, Appendix B, Figure 5]. The Materials Handbook, 14th Edition, pg. 21, states that admiralty metals are noted for good resistance to low-velocity freshwater and seawater. It further states that inhibited admiralty metal and admiralty brass are comprised of 71.5% copper, 28% zinc plus small amounts of lead and iron and either arsenic, antimony or phosphorus. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for brass components/component types of the DG System that are exposed to raw water. Loss of material due to galvanic corrosion is an aging effect in materials in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The brass tubes of the DG System heat exchangers XHE-17 A/B-HE1, 2, 3 are coupled to stainless steel tubesheets. Brass is less cathodic than stainless steel. The channel heads of these heat exchangers are stainless steel with zinc sacrificial anodes, which protects the brass tubes. The tubes of the DG System heat exchangers XEG-1A/B-HE1 are coupled to only carbon steel components. Carbon steel is less cathodic than brass. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for brass components/component types of the DG System that are exposed to raw water. Cracking due to stress corrosion (SCC) is an aging effect for brass and bronze exposed to raw water and where ammonia and ammonium compounds are present. Ammonia and ammonium compounds are often used to control pH or as a cleaning solvent for raw water systems. However, no ammonia chemical treatment of the raw (Service Water System) water is in use [CP-913 states biocide is added]. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for brass components/component types of the DG System that are exposed to a raw water environment. Heat exchanger fouling due to precipitates is an aging effect of foulants in raw water applications and that are alternately wetted and dried

System ID	Age Notes ID	Age Notes
		for any reason. The subject DG System heat exchangers are not expected to be alternately wetted and dried as Service Water is normally flowing through the subject heat exchangers [D-302-221]. As such, heat exchanger fouling due to precipitates is not an aging effect requiring management during the period of extended operation for brass components/component types of the DG System that are exposed to a raw water environment.
DG	A-DG-zd	The relevant conditions could exist in the raw water environment of the DG System for a loss of material due to erosion, crevice corrosion, microbiologically induced corrosion (MIC), or pitting corrosion (heat exchanger channel heads and tubesheets) and for fouling due to biological materials and particulates to occur in stainless steel components exposed to raw water [TR00160-010, Attachment IV]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the stainless steel components/component types in the DG System that are exposed to raw water. As discussed in TR00160-020, the Service Water System Reliability and In Service Testing Program will manage loss of material due to erosion (high velocity), loss of material due to crevice (corrosive environment), microbiologically influenced (corrosive environment), pitting corrosion (corrosive environment) and fouling due to biological materials (microorganisms) and particulates (foulant accumulation) in stainless steel in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component (heat exchanger channel heads and tubesheets) intended function(s) will be maintained under all CLB conditions.
DG	A-DG-ze	The relevant conditions do not exist in the raw water environment of the DG System for the following aging effects to occur in stainless steel components (heat exchanger channel heads and tubesheets) [TR00160-010, Attachment IV]: Cracking due to stress corrosion cracking (SCC) is a potential aging effect for stainless steel components in raw water that occurs through the combined actions of stress, a corrosive environment and a susceptible material. Perry's Chemical Engineering Handbook states that stress corrosion cracking (SCC) is not an aging effect for stainless steel in systems operated at temperatures below 120°F. D-302-221 depicts the raw water operating temperature of 95°F. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a raw water environment. Heat exchanger fouling due to precipitation is an aging effect caused by the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers that are subject to alternate wetting and drying. None of the DG System heat exchangers within the license renewal evaluation boundaries, that are exposed to a raw water environment, are subject to alternate wetting and drying. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a raw water environment.
DG	A-DG-zf	The relevant conditions could exist in the treated water environment of the DG System for loss of material due to general, galvanic, crevice and pitting corrosion and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the DG System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general

System ID	Age Notes ID	Age Notes
		corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion (SCC) (presence of nitrite-based corrosion inhibitor) to occur in carbon steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
DG	A-DG-zg	The relevant conditions do not exist in the treated water environment of the DG System for the following aging effects to occur [TR00160-010, Attachment III]: EPRI Report NSAC-202L-R1 indicates that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F or operated less than 2% of the time. The DG DBD, Section 3.4.2.1 states that the maximum allowable jacket water temperature at the engine outlet is 185°F. Normal design temperature of the jacket water subsystem is shown as 175°F [D-302-353]. As such, the treated water temperatures are < 200°F and erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a treated water environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminates. Per the DG System Engineer, the Jacket Water Head Tanks do not typically change elevation substantially, and other carbon steel components within the license renewal evaluation boundaries, that are exposed to a treated water environment, are not expected to incur alternate wetting and drying [Dwg. D-302-353]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. The only carbon steel components in the DG System heat exchangers in contact with treated water are the shells and heads, neither of which have a heat transfer function. For license renewal purposes, fouling affects heat transfer function, i.e. tubes. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a treated water environment.
DG	A-DG-zh	The relevant conditions could exist in the treated water environment of the DG System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the DG System that are exposed to a treated water environment. Cracking due to stress corrosion (SCC) is included since the DG System DBD, Section 3.4, indicates treated water temperatures could approach 185°F, which is higher than the 140°F threshold for excluding this aging effect in treated water.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion cracking (either oxygen > 100 ppb and temperature > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
DG	A-DG-zi	The relevant conditions do not exist in the treated water environment of the DG System for the following aging effects to occur [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. None of the stainless steel components within the license renewal evaluation boundaries of the DG System, that are exposed to a treated water environment, are subject to temperatures continuously above 482°F [DG DBD]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer component intended function (i.e. tubes). There are no in-scope stainless steel heat exchanger tubes in the DG System in contact with treated water. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminants. None of the stainless steel components within the license renewal evaluation boundaries of the DG System, that are exposed to a treated water environment, are subject to alternate wetting and drying [D-302-353]. As such, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the DG System that are exposed to a treated water environment.
DG	A-DG-zj	The relevant conditions could exist in the treated water environment of the Diesel Generator Services (DG) System for loss of material due to crevice, galvanic, erosion and pitting corrosion, loss of material due to selective leaching, cracking to stress corrosion cracking (SCC), and heat exchanger fouling (tubes only) due to particulates to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all brass/copper/copper alloy components/component types in the DG System that are exposed to the treated water environment. Brass/copper/copper alloy components/component types in the DG System that are exposed to the treated water environment include: arsenical admiralty brass Intercooler tubes; Muntz metal Intercooler tubesheets, admiralty brass tubes in XHE-17A/B-HE1, 2, 3 and XEG-

System ID	Age Notes ID	Age Notes
		1A/B-HE1; brass piping components and copper tubing. Yellow brass (30% zinc and 70% copper), Muntz metal (40% zinc and 60% copper) and copper-zinc alloys containing greater than 15% zinc are susceptible to selective leaching. The tubes of XHE-17A/B-HE1, 2, 3, XEG-1A/B-HE1 and the Intercooler heat exchangers are specified as Admiralty brass. Admiralty brass contains approximately 29% zinc, but has small amounts of antimony, arsenic or phosphorus, which inhibit selective leaching. Copper tubing is not susceptible to selective leaching as it is not an alloy. The Muntz metal Intercooler tubesheets and brass piping components are susceptible to selective leaching. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb), galvanic corrosion (chlorides > 150 ppb, fluorides > 150 ppb) and pitting corrosion (low flow conditions), cracking due to stress corrosion cracking (>15% zinc) to occur. For heat exchanger components (including the brass pipe connecting the heat exchangers), in addition to the Chemistry Program, the new Heat Exchanger Inspections will detect and characterize a loss of material due to erosion-corrosion and selective leaching (corrosive environment), if any. This program and activity, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
DG	A-DG-zk	The relevant conditions do not exist in the treated water environment of the DG System for the following aging effects to occur in brass/copper/copper alloy components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in treated water in locations subject to alternate wetting and drying that may concentrate contaminants. It is assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagram [D-302-353] and the screening report [TR00160-005], this environment is expected to be an environment which will not have cyclic wet and dry conditions and have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for brass/copper/copper alloys components/component types of the DG System that are exposed to a treated water environment.
DG	A-DG-zl	The relevant conditions do not exist in the air-gas environment of the DG System for any aging effects to occur in glass components/component types [TR00160-010, Attachment VI]. Glass is an amorphous inorganic oxide, mostly silica, and cooled to a rigid condition without crystallization. The characteristic properties of glass are its transparency, its hardness and rigidity at ordinary temperatures, its capacity for plastic working at elevated temperatures, and its resistance to weathering and to most chemicals except hydrofluoric acid. The external surfaces of glass will not be subjected to either unusually high temperatures or hydrofluoric acid in the air-gas environment. As such, there are no aging effects requiring management during the period of extended operation for glass components/component types of the DG System that are exposed to an air-gas environment.
DG	A-DG-zm	The relevant conditions could exist in the sheltered environment of the DG System for cracking due to embrittlement for neoprene and rubber exposed to a sheltered environment to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function and thus, require management during the period of extended operation for the neoprene and rubber

System ID	Age Notes ID	Age Notes
		components in the DG System that are exposed to a sheltered environment . As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage cracking due to embrittlement (radiation and themal) for neoprene and rubber flexible couplings and hoses exposed to a sheltered environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-zn	The relevant conditions do not exist in the air-gas environment of the DG System for cracking due to embrittlement for neoprene exposed to air-gas to occur [TR00160-010, Attachment VI]: As identified in the DG System screening report, the Diesel Generators have neoprene flexible couplings. Neoprene products can exhibit the effects of aging by cracking due to drying and embrittlement. This could lead to a loss of pressure boundary. It is probable that the external surfaces of these flexible couplings would exhibit signs of aging before the internal surfaces, due to the nature of this aging mechanism, involving ultraviolet radiation consisting of direct sunlight and fluorescent lighting. Cracked elastomeric components would be replaced upon their discovery during inspections/activities as shown in Note A-DG-zm. As such, cracking due to embrittlement is not an aging effect requiring management during the period of extended operation for components/component types of the DG System for neoprene components exposed to air-gas.
DG	A-DG-zo	The relevant conditions do not exist in the oil/fuel oil environment of the DG System for cracking due to embrittlement for rubber exposed to oil/fuel oil to occur [TR00160-010, Attachment V]: As identified in the DG System screening report, the Diesel Generators have rubber flexible couplings and flexible hoses. Rubber products can exhibit the effects of aging by cracking due to drying and embrittlement. This could lead to a loss of pressure boundary. It is probable that the external surfaces of these flexible couplings would exhibit signs of aging before the internal surfaces, due to the nature of this aging mechanism, which can involve ultraviolet radiation consisting of direct sunlight and fluorescent lighting. Cracked elastomeric components would be replaced upon their discovery during inspections/activities as shown in Note A-DG-zm. As such, cracking due to embrittlement is not an aging effect requiring management during the period of extended operation for components/component types of the DG System exposed to oil/fuel oil.
DG	A-DG-zp	The relevant conditions do not exist in the treated water environment of the DG System for cracking due to embrittlement for rubber exposed to treated water to occur [TR00160-010, Attachment III]: As identified in the DG System screening report, the Diesel Generators have rubber flexible hoses. Rubber products can exhibit the effects of aging by cracking due to drying and embrittlement. This could lead to a loss of pressure boundary. It is probable that the external surfaces of these flexible hoses would exhibit signs of aging before the internal surfaces, due to the nature of this aging mechanism, which can involve ultraviolet radiation consisting of direct sunlight and fluorescent lighting. Cracked elastomeric components would be replaced upon their discovery during inspections/activities as shown in Note A-DG-zm. As such, cracking due to embrittlement is not an aging effect requiring management during the period of extended operation for components/component types of the DG System exposed to treated water.

System ID	Age Notes ID	Age Notes
DG	A-DG-zq	The relevant conditions could exist in the raw water environment of the DG System for loss of material due to erosion, loss of material due to crevice, galvanic, general, microbiologically influenced, pitting corrosion and fouling due to biological materials and particulates in carbon steel piping exposed to raw water [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for the carbon steel piping in the DG System that is exposed to raw water. Loss of material due to galvanic corrosion is a possibility (example: carbon steel piping is in contact with the stainless steel heat exchanger channel heads). Separately, normal operating temperature of raw water (Service Water) is shown as 95°F [D-302-221]. As discussed in TR00160-020, the Service Water System Reliability and In-Service Testing program will manage loss of material due to crevice (stagnant conditions), erosion (particulate matter not controlled), galvanic (electrolytically coupled to more noble metal), general (oxygen and moisture present), microbiologically influenced (groundwater contact), pitting corrosion (stagnant conditions) and fouling due to biological materials (microorganisms) and particulates (foulant accumulation) in carbon steel piping in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DG	A-DG-zr	The relevant conditions do not exist in the raw water environment of the DG System for the following aging effects to occur in carbon steel piping [TR00160-010, Attachment IV]: Heat exchanger fouling due to precipitation is an aging effect caused by the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers that are subject to alternate wetting and drying. None of the DG System heat exchangers within the license renewal evaluation boundaries, that are exposed to a raw water environment, are subject to alternate wetting and drying. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the DG System that are exposed to a raw water environment.
DN	A-DN-a	The relevant conditions do not exist in the sheltered environment of the Demineralized Water - Nuclear Service (DN) System for the following aging effect to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The DN System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [TR00160-003, Attachment VII]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable stainless steel components/component types (piping) of the DN System that are exposed to a sheltered environment.

System ID	Age Notes ID	Age Notes
DN	A-DN-b	The relevant conditions could exist in the treated water environment of the Demineralized Water - Nuclear Service (DN) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the DN System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (if oxygen is > 100 ppb, halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
DN	A-DN-c	The relevant conditions do not exist in the treated water environment of the Demineralized Water - Nuclear Service (DN) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion cracking is an aging effect in treated water environments with temperatures in excess of 140°F. The only stainless steel components within the license renewal evaluation boundaries of the DN System which are exposed to treated water are piping and valves associated with the containment penetration. These components are designed to normal temperatures of < 100°F [D-302-715]. Below 140°F, stress corrosion cracking is not an aging effect requiring management for the stainless steel components/component types of the Demineralized Water - Nuclear Services System exposed to treated water. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. As discussed above, the DN stainless steel components exposed to treated water are designed to temperatures of < 100°F [D-302-715]. Therefore, reduction of fracture toughness due to thermal aging is not an aging mechanism requiring management. Fouling due to particulates is an aging effect for stainless steel heat exchanger sub-components exposed to treated water. There are no heat exchanger sub-components within the license renewal evaluation boundaries of the DN System. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to treated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the DN System which are exposed to wet/dry cycles of treated water. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.
EF	A-EF-a	The relevant conditions do not exist in the oil environment of the Emergency Feedwater System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment V]: Cracking due to stress corrosion cracking (SCC) is an aging effect in an oil environment for aluminum alloys, but not for aluminum [TR00160-010, Attachment V]. As described in TR00160-003, the aluminum identified within the license renewal evaluation boundaries of

System ID	Age Notes ID	Age Notes
		the Emergency Feedwater System (filter head) is not an alloy. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for aluminum in fuel oil, but not for aluminum in lubricating oil [TR00160-010]. As described in TR00160-003, the oil environment of the Emergency Feedwater System is lubricating oil. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to crevice, galvanic and pitting corrosion are aging effects for aluminum in oil and fuel oil under stagnant conditions with water and contaminants. As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to crevice, galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the oil environment. Particulate fouling is an aging effect for aluminum heat exchanger components in lubricating oil environments where the supply originates at the bottom of a tank or reservoir where foulants may settle. As described in TR00160-003 and shown on D-302-085, no aluminum heat exchanger components are located within the the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the oil environment.
EF	A-EF-b	The relevant conditions do not exist in the sheltered environment of the Emergency Feedwater System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for aluminum components in systems with external surface temperatures significantly below the ambient conditions. These surfaces are expected to be wet due to condensation. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for pipe, process tubing and ductwork components that either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. As described in TR00160-010, Attachment VIII, no aluminum pipe, process tubing or ductwork are located within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the aluminum components/component types of the Emergency Feedwater System that are exposed to the sheltered environment.

System ID	Age Notes ID	Age Notes
EF	A-EF-c	The relevant conditions could exist in the sheltered environment of the Emergency Feedwater System for loss of material due to boric acid corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s) and thus requires management during the period of extended operation for all aluminum components/component types in the Emergency Feedwater System that are exposed to the sheltered environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion in aluminum in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-d	The relevant conditions do not exist in the oil environment of the Emergency Feedwater System for the following aging effects to occur in carbon steel/alloy steel components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, galvanic, general and pitting corrosion are aging effects for carbon steel/alloy steel in oil and fuel oil under stagnant conditions with water and contaminants (oxygen for general corrosion). As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to crevice, galvanic, general and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel/alloy steel components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel in fuel oil, but not for carbon steel in lubricating oil [TR00160-010, Attachment V]. As described in TR00160-003, the oil environment of the Emergency Feedwater System is lubricating oil. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the carbon steel components/component types of the Emergency Feedwater System that are exposed to the oil environment. Particulate fouling is an aging effect for carbon steel heat exchanger components in an oil environment where the supply originates at the bottom of a tank or reservoir. Particulate fouling affects only heat transfer surfaces and only the heat transfer function. As described in TR00160-003, Attachment VIII, no carbon steel heat transfer components are located within the evaluation boundaries of the Emergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the carbon steel components of the Emergency Feedwater System that are exposed to the oil environment.
EF	A-EF-e	The relevant conditions do not exist in the sheltered environment of the Emergency Feedwater System for the following aging effects to occur in carbon steel/alloy steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel/alloy steel components in systems with external surface temperatures significantly below the ambient conditions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel/alloy

System ID	Age Notes ID	Age Notes
		steel components/component types of the Emergency Feedwater System that are exposed to the sheltered environment.
EF	A-EF-f	The relevant conditions could exist in the sheltered environment of the Emergency Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel/alloy steel components/component types in the Emergency Feedwater System that are exposed to the sheltered environment. The relevant conditions could also exist in the sheltered environment of the Emergency Feedwater System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable carbon steel/alloy steel components/component types (pipe only) in the Emergency Feedwater System that are exposed to a sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following carbon steel/alloy steel components/component types in the Emergency Feedwater System: heat exchanger shells, orifices, lube oil pipe, pumps, tanks, and valves. Note that the turbine lube oil system is skid-mounted with the turbine [1MS-17-125] and contains no wall penetrations. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
EF	A-EF-g	The relevant conditions do not exist in the oil environment of the Emergency Feedwater System for the following aging effects to occur in brass components/component types [TR00160-010, Attachment V]: Loss of material due to microbiologically influenced corrosion (MIC) and cracking due to stress corrosion cracking (SCC) are aging effects for brass in fuel oil, but not for brass in lubricating oil [TR00160-010, Attachment V]. As described in TR00160-003, the oil environment of the Emergency Feedwater System is lubricating oil. Therefore, loss of material due to MIC and cracking due to SCC are not aging effects requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to crevice, galvanic and pitting corrosion are aging effects for brass in oil and fuel oil under stagnant conditions with water and contaminants. As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to crevice, galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to selective leaching is an aging effect for brass in oil and fuel oil when water is present. As shown on 1MS-17-125, the

System ID	Age Notes ID	Age Notes
		lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the oil environment. Particulate fouling is an aging effect for brass heat exchanger components in lubricating oil environments where the supply originates at the bottom of a tank or reservoir where foulants may settle, and as it circulates through the system may accumulate on heat transfer surfaces. The only brass heat exchanger components within the scope of license renewal for the Emergency Feedwater System are the tubes in the EF Pump Turbine Lube Oil Cooler. As described above, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system in which corrosion products are not likely to form. And as described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating, so any contaminants that may have settled in the reservoir are not normally being transported to the heat exchanger and no significant accumulation on heat transfer surfaces is expected. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the oil environment.
EF	A-EF-h	The relevant conditions do not exist in the treated water environment of the Emergency Feedwater System for the following aging effects to occur in brass components/component types [TR00160-010, Attachment III]: Loss of material due to erosion-corrosion is an aging effect for brass in the treated water environment when subjected to high fluid velocities, constricted flows or rapidly changing flow directions. The only brass components within the scope of license renewal for the Emergency Feedwater System that are exposed to treated water are the tubes in the EF Pump Turbine Lube Oil Cooler. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating, and only the motor-driven pumps are used for normal plant startup and shutdown. The turbine-driven pumps, and therefore the associated oil coolers, are normally operated only for functional testing. With this limited operation, erosion-corrosion should not be a concern in the oil cooler tubes. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the treated water environment. Particulate fouling is an aging effect for brass heat exchanger components in treated water environments where the supply originates at the bottom of a tank or reservoir where foulants may settle, and as it circulates through the system may accumulate on heat transfer surfaces. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating. So, any foulants that may exist in the treated water environment of the Component Cooling Water System are not normally being transported to the lube oil cooler and no significant accumulation on heat transfer surfaces is expected. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the treated water environment.

System ID	Age Notes ID	Age Notes
		Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for brass components in locations subject to alternate wetting and drying that may concentrate contaminants. A review of the EF DBD and the CC DBD reveals that the turbine lube oil coolers are not drained or vented when they are not in service and are thus normally water solid and not subject to drying out. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the treated water environment.
EF	A-EF-ii	The relevant conditions could exist in the treated water environment of the Emergency Feedwater System for loss of material due to crevice, galvanic and pitting corrosion, loss of material due to selective leaching, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all brass components/component types in the Emergency Feedwater System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb), galvanic corrosion (chlorides > 150 ppb, fluorides > 150 ppb) and pitting corrosion (excessive halides), and cracking due to stress corrosion cracking (ammonia and ammonium compounds) to occur in brass in a treated water environment. For heat exchanger components, the new Heat Exchanger Inspections will detect and characterize a loss of material due to selective leaching, if any. The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-j	The relevant conditions do not exist in the treated water environment of the Emergency Feedwater System for the following aging effects to occur in carbon steel/alloy steel components/component types [TR00160-010, Attachment III]: Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel/alloy steel in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams, EF and CC DBDs, and the treated water screening report [TR00160-003, Attachment VIII], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the carbon steel/alloy steel components of the Emergency Feedwater System that are exposed to the treated water environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel/alloy steel when coupled to a material higher in the galvanic series in a treated water environment when chlorides and/or fluorides are in excess of 150 ppb. As described in TR00160-003, Attachment VIII, the only carbon steel/alloy steel components within the license renewal evaluation boundaries of the Emergency Feedwater System are breakdown orifices, pump casings, valve bodies and pipe. As shown on D-302-083 and D-302-085, the orifices, pump casings and carbon steel valve bodies are all in carbon steel pipe, so no galvanic couplings exist for these components. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel orifices, pump casings and valve bodies of the Emergency Feedwater System that are exposed to the treated water environment.

System ID	Age Notes ID	Age Notes
		Loss of material due to erosion-corrosion is an aging effect for carbon steel/alloy steel in treated water when subjected to high fluid velocities, constricted flows or rapidly changing flow directions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup and is not operating. During startup and shutdown operations, the system is used only for short periods of time at the beginning and at the end of the refueling period. With this limited operating time, erosion-corrosion should not be a concern. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components/component types of the Emergency Feedwater System that are exposed to the treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel/alloy steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in Chemistry Procedure CP-615, a main feature of secondary water chemistry is All Volatile Treatment (methoxypropylamine and carbohydrazide, with ammonia as necessary). Nitrite corrosion inhibitors are not used. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components of the Emergency Feedwater System that are exposed to the treated water environment. Particulate fouling is an aging effect for carbon steel/alloy steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or reservoir. Particulate fouling affects only heat transfer surfaces and only the heat transfer function. As described in TR00160-003, Attachment VIII, no carbon steel/alloy steel heat transfer components are located within the evaluation boundaries of the Emergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components of the Emergency Feedwater System that are exposed to the treated water environment.
EF	A-EF-k	The relevant conditions could exist in the treated water environment of the Emergency Feedwater System for loss of material due to crevice, galvanic (pipe only - see Note A-EF-j), general and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s) and thus require management during the period of extended operation for subject carbon steel/alloy steel components/component types in the Emergency Feedwater System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to general corrosion (oxygen > 100 ppb), and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-l	The relevant conditions do not exist in the treated water environment of the Emergency Feedwater System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel in locations

System ID	Age Notes ID	Age Notes
		subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams, EF DBD, and the treated water screening report [TR00160-003, Attachment VIII], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the stainless steel components of the Emergency Feedwater System that are exposed to the treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in treated water with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. According to the information provided in the System Data tables on D-302-083 and D-302-085, the Emergency Feedwater System operates at 95°F. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Emergency Feedwater System that are exposed to the treated water environment. Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel in treated water where temperatures are greater than 482°F. According to the information provided in the System Data tables on D-302-083 and D-302-085, the Emergency Feedwater System operates at 95°F. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Emergency Feedwater System that are exposed to the treated water environment. Particulate fouling is an aging effect for stainless steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or resercoir. As described in TR00160-003, Attachment VIII, and shown on D-302-083 and D-302-085, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Emergency Feedwater System that are exposed to the treated water environment.
EF	A-EF-m	The relevant conditions could exist in the treated water environment of the Emergency Feedwater System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s) and thus require management during the period of extended operation for all stainless steel components/component types in the Emergency Feedwater System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-n	The relevant conditions do not exist in the Reactor Building environment of the Emergency Feedwater System for the following aging effects to occur in carbon steel/alloy steel components/component types [TR00160-010, Attachment IX]:

System ID	Age Notes ID	Age Notes
		Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel/alloy steel components in systems with external surface temperatures significantly below the ambient conditions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup, is not operating and is operated a minimum amount of time. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel/alloy steel components/component types of the Emergency Feedwater System that are exposed to the Reactor Building environment.
EF	A-EF-o	The relevant conditions could exist in the Reactor Building environment of the Emergency Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) and loss of material due to general corrosion to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel/alloy steel components/component types in the Emergency Feedwater System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-p	The relevant conditions do not exist in the yard environment of the Emergency Feedwater System for the following aging effects to occur in carbon steel/alloy steel components/component types [TR00160-010, Attachment XII]: Loss of material due to galvanic corrosion is an aging effect for carbon steel/alloy steel components in systems with external surface temperatures significantly below the ambient conditions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup, is not operating and is operated a minimum amount of time. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components/component types of the Emergency Feedwater System that are exposed to the yard environment.
EF	A-EF-q	The relevant conditions do not exist in the oil environment of the Emergency Feedwater System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment V]: Loss of material due to microbiologically influenced corrosion (MIC) and cracking due to stress corrosion cracking (SCC) are aging effects for stainless steel in fuel oil, but not for stainless steel in lubricating oil [TR00160-010, Attachment V]. As described in TR00160-003, Attachment VIII, the oil environment of the Emergency Feedwater System is lubricating oil. Therefore, loss of material due to MIC and cracking due to SCC are not aging effects requiring management during the period of extended operation for the stainless steel components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to crevice and pitting corrosion are aging effects for stainless steel in oil and fuel oil under stagnant conditions with

System ID	Age Notes ID	Age Notes
		water and contaminants. As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for the stainless steel components/component types of the Emergency Feedwater System that are exposed to the oil environment. Particulate fouling is an aging effect for stainless steel heat exchanger components in an oil environment where the supply originates at the bottom of a tank or reservoir. As described in TR00160-003 and shown on D-302-085, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Emergency Feedwater System that are exposed to the oil environment.
EF	A-EF-r	The relevant conditions do not exist in the oil environment of the Emergency Feedwater System for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, galvanic, general and pitting corrosion are aging effects for cast iron in oil and fuel oil under stagnant conditions with water and contaminants (oxygen for general corrosion). As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water and contaminants are not likely to intrude. Therefore, loss of material due to crevice, galvanic, general and pitting corrosion are not aging effects requiring management during the period of extended operation for the cast iron components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for cast iron in fuel oil, but not for cast iron in lubricating oil [TR00160-010, Attachment V]. As described in TR00160-003, Attachment VIII, the oil environment of the Emergency Feedwater System is lubricating oil. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the cast iron components/component types of the Emergency Feedwater System that are exposed to the oil environment. Loss of material due to selective leaching is an aging effect for gray cast iron in oil and fuel oil under stagnant conditions with the presence of water. As shown on 1MS-17-125, the lubricating oil environment of the Emergency Feedwater System is within a closed recirculating oil system into which water is not likely to intrude. Therefore, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for the cast iron components/component types of the Emergency Feedwater System that are exposed to the oil environment. Particulate fouling is an aging effect for cast iron heat exchanger components in an oil environment where the supply originates at the bottom of a tank or reservoir. As described in TR00160-003, Attachment VIII, and shown on D-302-083 and D-302-085, no cast iron heat exchanger components are located within the license renewal evaluation boundaries of the Ermergency Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the cast iron

System ID	Age Notes ID	Age Notes
		components of the Emergency Feedwater System that are exposed to the oil environment.
EF	A-EF-s	The relevant conditions do not exist in the sheltered environment of the Emergency Feedwater System for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for cast iron components in systems with external surface temperatures significantly below the ambient conditions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup, is not operating and is operated a minimum amount of time. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the cast iron components/component types of the Emergency Feedwater System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for pipe, process tubing and ductwork components that either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. As described in TR00160-010, Attachment VIII, no cast iron pipe, process tubing or ductwork are located within the license renewal evaluation boundaries of the Emergency Feedwater System. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the cast iron components/component types of the Emergency Feedwater System that are exposed to the sheltered environment.
EF	A-EF-t	The relevant conditions could exist in the sheltered environment of the Emergency Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) and loss of material due to general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all cast iron components/component types in the Emergency Feedwater System that are exposed to the sheltered environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in cast iron in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-u	The relevant conditions do not exist in the sheltered environment of the Emergency Feedwater System for the following aging effects to occur in brass components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for brass components in systems with external surface temperatures significantly below the ambient conditions. As described in the EF DBD, Section 2.6.2, during normal plant operation the Emergency Feedwater System is set for automatic startup, is not operating and is operated a minimum amount of time. The system temperature is thus expected to be in equilibrium with ambient temperature, precluding the formation of condensation. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the brass components/component types of the Emergency Feedwater System that are exposed to the sheltered environment.

System ID	Age Notes ID	Age Notes
EF	A-EF-v	The relevant conditions could exist in the sheltered environment of the Emergency Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s) and thus requires management during the period of extended operation for all brass components/component types in the Emergency Feedwater System that are exposed to the sheltered environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in brass in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-w	The relevant conditions could exist in the yard environment of the Emergency Feedwater System for loss of material due to general corrosion to occur [TR00160-010, Attachment XII]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for all carbon steel/alloy steel components/component types in the Emergency Feedwater System that are exposed to the yard environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the yard environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EF	A-EF-x	The relevant conditions do not exist in the sheltered environment of the Emergency Feedwater System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for pipe, process tubing and ductwork components that either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. As described in TR00160-010, Attachment VIII, no stainless steel process tubing (only instrumentation tubing) or ductwork are located within the license renewal evaluation boundaries of the Emergency Feedwater System. And the only stainless steel pipe components are themowells in the EF Pump Turbine lube oil pipe, which do not penetrate any walls. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the stainless steel components/component types of the Emergency Feedwater System that are exposed to the sheltered environment.
EF	A-EF-y	The relevant conditions could exist in the underground environment of the Emergency Feedwater (EF) System for loss of material due to general, galvanic, microbiologically induced, crevice and pitting corrosion to occur [TR00160-010, Attachment XI]. The underground environment is one in which equipment is in contact with soil and groundwater, but these components are usually coated and wrapped to prevent contact with soil or groundwater. For the purposes of license renewal, the coating and/or wrapping are assumed to have failed such that those aging effects associated with carbon steel in contact with soil or groundwater are plausible. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the EF System that are exposed to an underground environment. As discussed in TR00160-020, the activities for the new Buried Piping and Tanks Inspection will manage loss of material due to general, galvanic, microbiologically influenced, crevice and pitting corrosion in carbon steel exposed to an underground environment. This activity,

System ID	Age Notes ID	Age Notes
		when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EX	A-EX-a	The relevant conditions could exist in the sheltered environment of the Extraction Steam (EX) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel and alloy steel components/component types in the EX System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel and alloy steel in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
EX	A-EX-b	The relevant conditions do not exist in the sheltered environment of the Extraction Steam (EX) System for the following aging effects to occur in carbon steel or alloy steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion are aging effects for carbon steel and alloy steel in the sheltered environment when the system internal environment temperature is well below ambient and when the component is insulated. The normal operating temperature at the carbon steel and alloy steel components within the license renewal evaluation boundaries of the EX System is 542°F [D-302-041, D-302-012]. Thus, the internal environment is above ambient and loss of material due to galvanic and pitting corrosion are not aging effects requiring management for the carbon steel and alloy steel components of the EX System exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for vulnerable carbon steel and alloy steel components/component types. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for carbon steel and alloy steel components/component types other than pipe, process tubing, or ductwork and not an aging effect when the piping does not pass through building walls below the 425' elevation. The piping within the license renewal evaluation boundaries of the EX System does not pass out of the Turbine Building [D-302-041]. Therefore, loss of material due to MIC is not an aging effect requiring management.
EX	A-EX-c	The relevant conditions could exist in the treated water environment of the Extraction Steam (EX) System for loss of material due to crevice, erosion, general, and pitting corrosion [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel and alloy steel components/component types in the EX System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb),and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel and alloy steel in a treated water environment. Also, the Flow Accelerated Corrosion Monitoring Program will manage loss of material due to erosion-corrosion. These programs, when performed during the period of extended operation, will provide reasonable assurance that

System ID	Age Notes ID	Age Notes
		the component intended function(s) will be maintained under all CLB conditions.
EX	A-EX-d	The relevant conditions do not exist in the treated water environment of the Extraction Steam (EX) System for the following aging effects to occur in carbon steel and alloy steel components/component types [TR00160-010, Attachment III]: Loss of material due to galvanic corrosion is an aging effect for carbon steel and alloy steel exposed to treated water when in contact with dissimilar metals. There are no other materials in contact with the carbon steel and alloy steel components/component types within the license renewal evaluation boundaries of the EX System [D-302-041, D-302-012]. Carbon steel and alloy steel have similar electromotive properties. Since there are no other components constructed of dissimilar metals in proximity to the EX System components which are in scope, no galvanic bridge is possible. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management for the carbon steel and alloy steel components of the EX System exposed to treated water. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel and alloy steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in CP 632, nitrites are not used for corrosion inhibiting within the Extraction Steam System. Therefore, cracking due to SCC is not an aging effect requiring management. Fouling due to particulates is an aging effect for heat exchanger sub-component heat transfer surfaces constructed of carbon steel and alloy steel and exposed to treated water. There are no heat exchangers within the license renewal evaluation boundaries of the EX System [TR00160-003, Attachment IX]. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel and alloy steel components exposed to treated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the EX System which are exposed to wet/dry cycles of treated water [D-302-041, D-302-012, TR00160-003, Attachment IX]. Therefore, loss of material due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.
FS	A-FS-a	The relevant conditions could exist in the raw water environment of the Fire Service (FS) System for loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching (cast iron only), and fouling due to biological material and particulates [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all alloy steel (including black steel), carbon steel, cast iron, and galvanized steel components/component types in the FS System that are exposed to raw water. As discussed in TR00160-020, the Fire Protection Program - Mechanical will manage loss of material due to crevice, galvanic corrosion, general, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching (cast iron only), and fouling due to biological material and particulates in alloy steel (including black steel), carbon steel, cast iron, and galvanized steel in raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-b	The relevant conditions do not exist in the raw water environment of the Fire Service (FS) System for the following aging effects to occur in

System ID	Age Notes ID	Age Notes
		alloy steel (including black steel), carbon steel, cast iron, and galvanized steel components/component types [TR00160-010, Attachment IV]: Loss of material due to erosion is an aging effect for alloy steel (including black steel), carbon steel, cast iron, and galvanized steel components/component types exposed to raw water systems where high fluid velocities, constricted flow, or rapidly changing flow directions occur. The FS System is a standby system that is normally in a stagnant mode [FS DBD]. The lack of normal fluid movement prohibits erosion from fluid restrictions. Therefore, loss of material due to erosion is not an aging effect requiring management for the alloy steel (including black steel), carbon steel, cast iron, and galvanized steel components of the FS System exposed to the raw water environment. Fouling due to precipitation is an aging effect for alloy steel (including black steel), carbon steel, cast iron, and galvanized steel heat exchanger sub-components exposed to raw water. Fouling effects only the heat transfer surfaces of heat exchangers (i.e., tubes). There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to precipitation is not an aging effect requiring management.
FS	A-FS-c	The relevant conditions could exist in the raw water environment of the Fire Service (FS) System for loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching (brass only), and fouling due to biological material and particulates [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all brass and bronze components/component types in the FS System that are exposed to raw water. As discussed in TR00160-020, the Fire Protection Program - Mechanical will manage loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching, and fouling due to biological material and particulates in brass and bronze exposed to raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-d	The relevant conditions do not exist in the raw water environment of the Fire Service (FS) System for the following aging effects to occur in brass and bronze components/component types [TR00160-010, Attachment IX]: Loss of material due to erosion is an aging effect for brass and bronze components/component types exposed to raw water systems where high fluid velocities, constricted flow or rapidly changing flow directions occur. The FS System is a standby system that is normally in a stagnant mode [FS DBD]. The lack of normal fluid movement prohibits erosion from fluid restrictions. Therefore, loss of material due to erosion is not an aging effect requiring management for the brass and bronze components of the FS System exposed to the raw water environment. Cracking due to stress corrosion (SCC) is an aging effect for brass and bronze exposed to raw water and where ammonia and ammonium compounds are present. Ammonia and ammonium compounds are often used to control pH or as a cleaning solvent for raw water systems. However, no chemical treatment of the FS System water is necessary [FS DBD]. Therefore, cracking due to SCC is not an aging effect requiring management.

System ID	Age Notes ID	Age Notes
		Fouling due to precipitation is an aging effect for brass and bronze heat exchanger sub-components exposed to raw water. Fouling effects only the heat transfer surfaces of heat exchangers (i.e., tubes). There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to precipitation is not an aging effect requiring management.
FS	A-FS-e	The relevant conditions could exist in the raw water environment of the Fire Service (FS) System for loss of material due to crevice, microbiologically influenced, and pitting corrosion and fouling due to biological material and particulates [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the FS System that are exposed to raw water. As discussed in TR00160-020, the Fire Protection Program - Mechanical will manage loss of material due to crevice, microbiologically influenced, and pitting corrosion and fouling due to biological material and particulates in stainless steel exposed to raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-f	The relevant conditions do not exist in the raw water environment of the Fire Service (FS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment IX]: Loss of material due to erosion is an aging effect for stainless steel components/component types exposed to raw water systems where high fluid velocities, constricted flow, or rapidly changing flow directions occur. The FS System is a standby system that is normally in a stagnant mode [FS DBD]. The lack of normal fluid movement prohibits erosion from fluid restrictions. Therefore, loss of material due to erosion is not an aging effect requiring management for the stainless steel components of the FS System exposed to the raw water environment. Fouling due to precipitation is an aging effect for stainless steel heat exchanger sub-components exposed to raw water. Fouling effects only the heat transfer surfaces of heat exchangers (i.e., tubes). There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to precipitation is not an aging effect requiring management. Stress corrosion cracking (SCC) is a type of corrosive attack that occurs through the combined actions of stress (both applied and residual tensile stresses), a corrosive environment and a susceptible material. Elimination or reduction in any of these three factors will decrease the likelihood of SCC occurring. When evaluating the aging effects for stainless steel components exposed to a raw water environment, it is conservatively assumed that all austenitic stainless steels and nickel-base alloys contain the necessary stresses to initiate SCC and IGA, if subjected to a corrosive environment. Perry's Chemical Engineers' Handbook cites a threshold temperature of 120°F, even in the presence of concentrated chlorides. Therefore, cracking due to SCC or IGA is an aging effect requiring system specific evaluation for stainless steels exposed to raw water at temperatures greater than 120°F.

System ID	Age Notes ID	Age Notes
		The FS System operates at ambient conditions and is less than the threshold temperature of 120°F stated above for SCC to occur. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management for the stainless steel components of the FS System exposed to the raw water environment.
FS	A-FS-g	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Fire Service (FS) System for the following aging effects to occur in carbon steel, cast iron, galvanized steel and stainless steel components/component types [TR00160-010, Attachment VII]: Loss of material due to boric acid corrosion is an aging effect for carbon steel, cast iron, and galvanized steel components/component types exposed to ventilation air from the Reactor Building environment. None of the carbon steel, cast iron, or galvanized steel components/component types within the license renewal evaluation boundaries of the FS System are exposed to ventilation air associated with the Reactor Building [TR00160-004, Attachment I and flow diagrams]. Therefore, loss of material due to boric acid corrosion is not an aging effect requiring management for the carbon steel, cast iron, and galvanized steel components/component types of the FS System exposed to the ventilation* environment. Loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel, cast iron, galvanized steel and stainless steel exposed to ventilation air when alternate cycles of wetting and drying occur. None of the carbon steel, cast iron, galvanized steel or stainless steel components/component types within the license renewal evaluation boundaries of the FS System are exposed to alternate cycles of wetting and drying [TR00160-004, Attachment I and flow diagrams]. Therefore, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management. Loss of material due to galvanic corrosion is an aging effect for carbon steel, cast iron and galvanized steel components/component types in wetted locations of ventilation air systems and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The FS System is normally in a standby condition during plant operation. None of the carbon steel, cast iron or galvanized steel components within the license renewal evaluation boundaries, that are exposed to a ventilation* environment, are in contact with any wetted locations [TR00160-004, Attachment I and flow diagrams]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel, cast iron or galvanized steel components/component types of the FS System that are exposed to a ventilation* environment. Loss of material due to general corrosion is an aging effect for carbon steel, cast iron and galvanized steel components/component types in ventilation air systems exposed to moist and oxygenated air. Oxygen alone, or water free from dissolved oxygen does not corrode carbon and low alloy steels to any appreciable extent. The FS System is normally in a standby condition during plant operation. None of the carbon steel, cast iron or galvanized steel components within the license renewal evaluation boundaries, that are exposed to a ventilation* environment, are in contact with any moist air [TR00160-004, Attachment I and flow diagrams]. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel, cast iron or galvanized steel components/component types of the FS System that are exposed to a ventilation* environment.

System ID	Age Notes ID	Age Notes
		Fouling due to particulates is an aging effect for carbon steel, cast iron, galvanized steel, and stainless steel heat exchanger sub-components exposed to the ventilation* environment. There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to particulates is not an aging effect requiring management.
FS	A-FS-h	The relevant conditions could exist in the yard environment of the Fire Service (FS) System for loss of material due to galvanic and general corrosion [TR00160-010, Attachment XII] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all brass (galvanic corrosion only), carbon steel, cast iron (including "iron"), and copper (galvanic corrosion only) components/component types in the FS System that are exposed to the yard environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to galvanic corrosion and general corrosion in brass, carbon steel, cast iron (including "iron") and copper exposed to the yard environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-ii	The relevant conditions do not exist in the oil/fuel oil environment of the Fire Service (FS) System for the following aging effects to occur in brass and copper components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching, and cracking due to stress corrosion (SCC) are aging effects for brass and copper exposed to oil/fuel oil in stagnant conditions conducive to water pooling and contaminants. The brass and copper components exposed to oil/fuel oil within the license renewal evaluation boundaries of the FS System are limited to flex hoses, instrumentation tubing and valves associated with the Diesel-Operated Fire Pump [TR00160-004, Attachment I and flow diagrams]. Water and contaminants tend to collect in low spots such as tanks. Since the subject components are not conducive to water pooling, loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to selective leaching, and cracking due to SCC are not aging effects for the brass and copper components/component types of the FS System which are exposed to oil/fuel oil. Fouling due to particulates is an aging effect for brass and copper heat exchanger sub-components exposed to oil/fuel oil. There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to particulates is not an aging effect requiring management.
FS	A-FS-j	The relevant conditions could exist in the oil/fuel oil environment of the Fire Service (FS) System for loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion [TR00160-010, Attachment V] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the FS System that are exposed to the oil/fuel oil environment. Only loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components/component types

System ID	Age Notes ID	Age Notes
		other than tanks. Loss of material due crevice, galvanic, general, and pitting corrosion are aging effects for carbon steel exposed to oil/fuel oil under stagnant conditions in locations conducive to water pooling (i.e., tanks). As discussed in TR00160-020, the Chemistry Program will manage loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion in carbon steel exposed to the oil/fuel oil environment by managing the relevant conditions. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-k	The relevant conditions do not exist in the oil/fuel oil environment of the Fire Service (FS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment V]: Fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components exposed to oil/fuel oil. There are no heat exchangers within the license renewal evaluation boundaries of the FS System [TR00160-004, Attachment I and flow diagrams]. Therefore, fouling due to particulates is not an aging effect requiring management for the carbon steel components/component types of the FS System exposed to oil/fuel oil.
FS	A-FS-l	The relevant conditions could exist in the sheltered environment of the Fire Service (FS) System for loss of material due to boric acid corrosion [TR00160-010, Attachment X] to occur but only for those components in the Auxiliary, Fuel and Intermediate Buildings. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for all brass, bronze, and copper components/component types in the FS System that are exposed to the sheltered environment of the Auxiliary Building. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in brass, bronze, and copper exposed to the sheltered environment of the Auxiliary, Fuel and Intermediate Buildings. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-m	The relevant conditions do not exist in the sheltered environment of the Fire Service (FS) System for the following aging effects to occur in brass, bronze, and copper components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for brass, bronze, and copper exposed to the sheltered environment when the external surface of the component is exposed to continuous moisture. The internal environment of the FS System is raw water and the system is normally stagnant [FS DBD]. Thus, the system temperature is normally at ambient conditions so no condensation forms on the external surfaces of components. With no condensation present, the electrolyte needed to cause galvanic corrosion is not present. Therefore, loss of material due to galvanic corrosion is not an aging effect for the brass, bronze, and copper components of the FS System exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion is an aging effect for vulnerable brass, bronze, and copper components/component types. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for brass, bronze,

System ID	Age Notes ID	Age Notes
		and copper components/component types other than pipe, process tubing, or ductwork and not an aging effect when the piping does not pass through building walls below the 425' elevation. The only brass, bronze, or copper pipe, process tubing, or ductwork within the license renewal evaluation boundaries of the FS System is tubing associated with the Diesel-Operated Fire Pump [TR00160-004, Attachment I and flow diagrams]. This tubing is located in the Circulating Water Intake Structure and does not pass through building walls [FS DBD]. Therefore, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management.
FS	A-FS-n	The relevant conditions do not exist in the sheltered environment of the Fire Service (FS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for vulnerable stainless steel components/component types. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for stainless steel components/component types other than pipe, process tubing, or ductwork and not an aging effect when the piping does not pass through building walls below the 425' elevation. The only stainless steel pipe, process tubing, or ductwork within the license renewal evaluation boundaries of the FS System is the pipe associated with the fuel oil supply to the Diesel-Operated Fire Pump. This pipe is located in the Circulating Water Intake Structure and does not pass through building walls [TR00160-004, Attachment I and flow diagrams]. Therefore, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management for the stainless steel components of the FS System exposed to the sheltered environment.
FS	A-FS-o	The relevant conditions could exist in the sheltered environment of the Fire Service (FS) System for loss of material due to boric acid corrosion (only for those components in the Auxiliary, Fuel and Intermediate Buildings), general corrosion (carbon steel, black steel, and cast iron only), and microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X] . If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel (including black steel), cast iron and galvanized steel components/component types in the FS System that are exposed to the sheltered environment. Loss of material due to microbiologically induced corrosion (MIC) is only an aging effect requiring management for the carbon steel (including black steel), cast iron, and galvanized steel pipe, process tubing and ductwork which passes between buildings below the 425' elevation. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel (including black steel), cast iron and galvanized steel exposed to the sheltered environment of the Auxiliary, Fuel Handling and Intermediate Buildings, while the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FS	A-FS-p	The relevant conditions do not exist in the sheltered environment of the Fire Service (FS) System for the following aging effects to occur in carbon steel (including black steel), cast iron and galvanized steel components/component types [TR00160-010, Attachment X]:

System ID	Age Notes ID	Age Notes
		Loss of material due to galvanic corrosion is an aging effect for carbon steel (including black steel) and cast iron exposed to the sheltered environment when the external surface of the component is exposed to continuous moisture. The internal environment of the FS System is raw water and the system is normally stagnant [FS DBD]. Thus, the system temperature is normally at ambient conditions, so no condensation forms on the external surfaces of components. With no condensation present, the electrolyte needed to cause galvanic corrosion is not present. Therefore, loss of material due to galvanic corrosion is not an aging effect for the carbon steel (including black steel) and cast iron components of the FS System exposed to the sheltered environment. Loss of material due to pitting corrosion is an aging effect for carbon steel in the sheltered environment when the internal environment is below ambient and when the component is insulated. As described above, the FS System is normally stagnant and at ambient conditions [FS DBD] so that condensation is not present on system components. Therefore, loss of material due to pitting corrosion is not an aging effect requiring management.
FS	A-FS-q	The relevant conditions do not exist in the air-gas environment of the Fire Service (FS) System for the following aging effects to occur in brass, bronze, and carbon steel (including black steel and iron) components/component types [TR00160-010, Attachment VI]: Loss of material due to galvanic corrosion, general corrosion (carbon steel, black steel, and iron only), selective leaching (brass and bronze only), and loss of material and cracking due to corrosive impacts of alternate wetting and drying are aging effects for the pertinent materials when exposed to the sheltered environment and subject to continuous moisture. The brass, bronze, and carbon steel components within the license renewal evaluation boundaries of the FS System which are exposed to air-gas are limited to those associated with either the exhaust of the Diesel-Operated Fire Pump or with the carbon dioxide extinguishing system. The FS System is normally not operating and the raw water internal to the system is normally stagnant [FS DBD]. Therefore, the raw water is normally at ambient conditions and does not cause condensation to form. The Diesel-Operated Fire Pump is normally not running and thus, not producing exhaust gas. And the carbon dioxide extinguishing system contains dry, contaminant free carbon dioxide, but is not pressurized unless activated in the event of an emergency [FS DBD]. Thus, the FS System components exposed to air-gas are not normally subject to moisture or wet conditions. Therefore, loss of material due to galvanic and general corrosion, loss of material due to selective leaching, and loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management for the the brass, bronze, and carbon steel (including black steel and iron) of the FS System exposed to the air-gas environment.
FS	A-FS-r	The relevant conditions could exist in the Reactor Building environment of the Fire Service (FS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion (carbon steel only) to occur [TR00160-010, Attachment IX] . If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for brass and carbon steel components/component types in the FS System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in brass and carbon steel exposed to the Reactor Building. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.

System ID	Age Notes ID	Age Notes
FS	A-FS-s	The relevant conditions do not exist in the Reactor Building environment of the Fire Service (FS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects for brass (galvanic only) and carbon steel in the Reactor Building environment when the internal environment is below ambient. The internal environment of the FS System is raw water and the system is normally stagnant [FS DBD]. Thus, the system temperature is normally at ambient conditions so no condensation forms on the external surfaces of components. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects for carbon steel components of the FS System exposed to the Reactor Building environment.
FS	A-FS-t	Aging effects for concrete (cement) are discussed relevant to structural components in TR00170-003. Some structural components are exposed to raw water from the Monticello Reservoir or from the Service Water Pond. Thus, aging effects applicable to concrete, in general, are applicable to the cement lining of the Fire Service (FS) System main header piping. The relevant conditions do not exist in the raw water environment of the FS System for the following aging effects to occur in cement-lined ductile iron components/component types [TR00170-003, Section 6.4]: Loss of material and cracking due to freeze-thaw are aging effects for concrete (cement) exposed to cycles of freezing. The only concrete (cement) component/component type within the license renewal evaluation boundaries of the FS System is the underground portion of the system main header [TR00160-004, Attachment I]. Since this pipe is below grade and the concrete (cement) is the interior lining of the pipe (insulated by the ductile iron) the pipe is not subject to freezing. Therefore, loss of material and cracking due to freeze-thaw are not aging effects requiring management for the concrete (cement) components/component types in the FS System exposed to raw water. Loss of material due to abrasion and cavitation is an aging effect for for concrete (cement) exposed to continuously flowing water. The only concrete (cement) component/component type within the license renewal evaluation boundaries of the FS System is the underground portion of the system main header [TR00160-004, Attachment I]. The FS System is a standby system that is normally in a stagnant mode [FS DBD]. Therefore, loss of material due to abrasion and cavitation is not an aging effect requiring management. Loss of material, cracking, and change in material properties due to elevated temperatures are aging effects for concrete (cement) exposed to continuous temperatures in excess of 150°F. The FS System is designed for a maximum operating temperature of 150°F [FS DBD]. Therefore, loss of material, cracking, and change in material properties due to elevated temperatures are not aging effects requiring management. Loss of material and change in material properties due to aggressive chemicals are aging effects for concrete (cement) subject to highly acidic water or soil. The groundwater and reservoir at VCSNS have been analyzed and found to be non-aggressive [TR00170-003, Section 6.4.1.4]. Therefore, loss of material and change in material properties due to aggressive chemicals are not aging effects requiring management. Loss of material due to corrosion of embedded steel is an aging effect for concrete (cement) when steel rebar or reinforcement is used. The

System ID	Age Notes ID	Age Notes
		only concrete (cement) component/component type within the license renewal evaluation boundaries of the FS System is the underground portion of the system main header which is cement-lined ductile iron [TR00160-004, Attachment I]. Since the ductile iron portion (exterior) of the main system header has no aging effects requiring management and since the concrete (cement) is used as a liner and is not structural, loss of material due to corrosion of embedded steel is not an aging effect requiring management. Cracking due to reaction with aggregates is an aging effect for concrete (cement) fabricated in certain parts of the country prior to 1960. Concrete (cement) at VCSNS was manufactured after 1960 and is not considered to be subject to reaction with aggregates [TR00170-003, Section 6.4.2.2]. Therefore, cracking due to reaction with aggregates is not an aging effect requiring management. Cracking due to shrinkage and settlement are aging effects for structural concrete (cement). The only concrete (cement) component/component type within the license renewal evaluation boundaries of the FS System is the underground portion of the system main header [TR00160-004, Attachment I]. Since the main system header is not a structural component, it is not subject to shrinkage and settlement. Therefore, cracking due to shrinkage and settlement are not aging effects requiring management. Cracking due to fatigue is an aging effect for concrete (cement) exposed to high frequency cycles stress from thermal transients or from vibration. The only concrete (cement) component/component type within the license renewal evaluation boundaries of the FS System is the underground portion of the system main header [TR00160-004, Attachment I]. Reservoir water does not undergo rapid thermal transients and FS System water is drawn from the reservoir. Also, the main system header is buried below grade and thus, not subject to vibrational wear. Therefore, cracking due to fatigue is not an aging effect requiring management. Change in material properties due to leaching of calcium hydroxide is an aging effect for concrete (cement) exposed to water containing calcium ions. Leaching is minmized when low permeability concrete (cement) is used as it is at VCSNS [TR00170-003, Section 6.4.3.1]. Therefore, change in material properties due to leaching is not an aging effect requiring management. Change in material properties due to irradiation embrittlement is an aging effect for concrete (cement) in environments subject to long-term radiation exposure. The amount of exposure has been quantified at VCSNS and buried concrete (cement) was determined to be subject to negligible long-term exposure [TR00170-003, Table 6.1-2]. Therefore, change in material properties due to irradiation embrittlement is not an aging effect requiring management.
FS	A-FS-u	The relevant conditions could exist in the underground environment of the Fire Service (FS) System for loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion to occur [TR00160-010, Attachment XI]. The underground environment is one in which equipment is in contact with soil and groundwater, but these components are usually coated and wrapped to prevent contact with soil or groundwater. For the purposes of license renewal, the coating and/or wrapping are assumed to have failed such that those aging effects associated with carbon steel in contact with soil or groundwater are plausible. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for cast iron and ductile iron components/component types in the FS System that are exposed to the underground environment.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the activities for the Buried Piping and Tanks Inspection will manage loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion in cast iron and ductile iron exposed to the underground environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FW	A-FW-a	The relevant conditions do not exist in the sheltered environment of the Feedwater System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel components in systems with external surface temperatures significantly below the ambient conditions. As described in the FW DBD (Section 3.1.1), and as shown in the System Data table on D-302-083, during normal plant operation the Feedwater System operates at temperatures significantly higher than ambient conditions, precluding the formation of condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the Feedwater System that are exposed to the sheltered environment.
FW	A-FW-b	The relevant conditions could exist in the sheltered environment of the Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the Feedwater System that are exposed to the sheltered environment. The relevant conditions could also exist in the sheltered environment of the Feedwater System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable carbon steel components/component types (pipe only) in the Feedwater System that are exposed to the sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following carbon steel components/component types in the Feedwater System: flow venturis and valves. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion for carbon steel in the sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
FW	A-FW-c	The relevant conditions do not exist in the treated water environment of the Feedwater System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the treated water screening report

System ID	Age Notes ID	Age Notes
		[TR00160-003, Attachment X], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the Feedwater System. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the carbon steel components of the Feedwater System that are exposed to the treated water environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel when coupled to a material higher in the galvanic series in a treated water environment, chlorides and fluorides are in excess of 150 ppb, and the ratio of cathodic area to anodic area is not small. As described in TR00160-003, Attachment X, the only carbon steel components within the license renewal evaluation boundaries of the Feedwater System are flow venturis, valve bodies and pipe. Since the pipe constitutes a much larger surface area than any more cathodic component it contacts, galvanic corrosion is not a concern for pipe. As shown on D-302-083, the carbon steel valve bodies are in carbon steel pipe, so no galvanic couplings exist for these components. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel pipe and valve bodies of the Feedwater System that are exposed to the treated water environment. See Note A-FW-d for carbon steel venturi components. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel/alloy steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in Chemistry Procedure CP-615, a main feature of secondary water chemistry is All Volatile Treatment (methoxypropylamine and carbohydrazide, with ammonia as necessary). Nitrite corrosion inhibitors are not used. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for the carbon steel components of the Feedwater System that are exposed to the treated water environment. Particulate fouling is an aging effect for carbon steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or reservoir. As described in TR00160-003, Attachment X, and shown on D-302-085, no carbon steel/alloy steel heat exchanger components are located within the license renewal evaluation boundaries of the Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components of the Feedwater System that are exposed to the treated water environment.
FW	A-FW-d	The relevant conditions could exist in the treated water environment of the Feedwater System for loss of material due to crevice, galvanic (carbon steel venturi components only), general and pitting corrosion, and loss of material due to erosion-corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus require management during the period of extended operation for all carbon steel components/component types in the Feedwater System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb), loss of material due to general corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb, fluorides > 150 ppb), and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur in carbon steel in the treated water environment; and the existing Flow Accelerated Corrosion Program will manage loss of material due to erosion-corrosion. These programs, when continued into the period of extended

System ID	Age Notes ID	Age Notes
		operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
FW	A-FW-e	The relevant conditions do not exist in the Reactor Building environment of the Feedwater System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel components in systems with external surface temperatures significantly below the ambient conditions. As described in the FW DBD (Section 3.1.1), and as shown in the System Data table on D-302-083, during normal plant operation the Feedwater System operates at temperatures significantly higher than ambient conditions, precluding the formation of condensation. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the Feedwater System that are exposed to the Reactor Building environment.
FW	A-FW-f	The relevant conditions could exist in the Reactor Building environment of the Feedwater System for loss of material due to boric acid corrosion (aggressive chemical attack) and loss of material due to general corrosion to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the Feedwater System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion for carbon steel in the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
FW	A-FW-g	The relevant conditions do not exist in the treated water environment of the Feedwater System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the treated water screening report [TR00160-003, Attachment X], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the Feedwater System. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the stainless steel components of the Feedwater System that are exposed to the treated water environment. Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel in treated water where temperatures are greater than 482°F. According to the information provided in the System Data table on D-302-083, the highest temperature in the Feedwater System during normal operation is 436°F. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Feedwater System that are exposed to the treated water environment.

System ID	Age Notes ID	Age Notes
		Particulate fouling is an aging effect for stainless steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or reservoir. As described in TR00160-003 and shown on D-302-083, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Feedwater System that are exposed to the treated water environment.
FW	A-FW-h	The relevant conditions could exist in the treated water environment of the Feedwater System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus require management during the period of extended operation for all stainless steel components/component types in the Feedwater System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to SCC (either dissolved oxygen > 100 ppb and temperature > 200°F, or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel in the treated water environment. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
FW	A-FW-ii	The relevant conditions do not exist in the treated water environment of the Feedwater System for the following aging effects to occur in nickel-based alloy components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the treated water screening report [TR00160-003, Attachment X], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the Feedwater System. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the nickel-based alloy components of the Feedwater System that are exposed to the treated water environment. Particulate fouling is an aging effect for nickel-based alloy heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or resercoir. As described in TR00160-003, Attachment X, and shown on D-302-083, no nickel-based alloy heat exchanger components are located within the license renewal evaluation boundaries of the Feedwater System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Feedwater System that are exposed to the treated water environment.
FW	A-FW-j	The relevant conditions could exist in the treated water environment of the Feedwater System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus require management during the period of extended operation for all nickel-based alloy components/component types in the Feedwater System that are exposed to the treated water environment.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100ppb, chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to SCC (either dissolved oxygen > 100 ppb and temperature > 200°F, or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in nickel-based alloys in the treated water environment. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
FW	A-FW-k	The relevant conditions do not exist in the sheltered environment of the Feedwater System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel pipe, process tubing and ductwork components that either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. As described in TR00160-010, Attachment X, no stainless steel pipe, process tubing (only instrumentation tubing) or ductwork are located within the license renewal evaluation boundaries of the Feedwater System. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the stainless steel components/component types of the Feedwater System that are exposed to the sheltered environment.
GS	A-GS-a	The relevant conditions could exist in the treated water environment of the Gland Sealing Steam (GS) System for loss of material due to general, crevice, pitting, galvanic and erosion corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the GS System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (if oxygen > 100 ppb), loss of material due to crevice corrosion (if oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen > 100 ppb, and either halogens > 150 ppb or sulfates > 100 ppb), and loss of material due to galvanic corrosion (if chlorides > 150 ppb and/or fluorides > 150 ppb) to occur in carbon steel in a treated water environment. Also, the existing Flow-Accelerated Corrosion Monitoring Program will manage loss of material due to erosion-corrosion of carbon steel in a treated water environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
GS	A-GS-b	The relevant conditions do not exist in the treated water environment of the Gland Sealing Steam (GS) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the GS System flow diagrams and screening report [TR00160-003, Attachment XI], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the GS System. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the GS System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
		Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel components exposed to treated water in plant systems using nitrite-based corrosion inhibitors. The GS System does not utilize a nitrite-based corrosion inhibitor [CP-632]. As such, cracking due to nitrite-induced SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the GS System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the GS System that are exposed to a treated water environment [TR00160-003, Attachment XI]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the GS System that are exposed to a treated water environment.
GS	A-GS-c	The relevant conditions could exist in the sheltered environment of the Gland Sealing Steam (GS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the GS System that are exposed to a sheltered environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion of carbon steel in a sheltered environment. Also, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion of carbon steel in a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
GS	A-GS-d	The relevant conditions do not exist in the sheltered environment of the Gland Sealing Steam (GS) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring management for carbon steel components when the internal environment is significantly below ambient temperatures. Those portions of the GS System that are within the license renewal evaluation boundaries operate at temperatures greater than 200°F as shown in the System Design Data table [D-302-141]. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the GS System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Therefore, loss of material due to MIC is not an applicable aging effect for carbon steel piping in the sheltered environment of the GS System [D-302-141].

System ID	Age Notes ID	Age Notes
HR	A-HR-a	The relevant conditions could exist in the sheltered environment of the Hydrogen Removal (HR) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the HR System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
HR	A-HR-b	The relevant conditions do not exist in the sheltered environment of the Hydrogen Removal (HR) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the safety-related portion of the HR System is in a standby condition, and all of the carbon steel components within the license renewal evaluation boundaries that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the safety-related portion of the HR System is in a standby condition, and all of the carbon steel components within the license renewal evaluation boundaries that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if the susceptible components either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Since there are no applicable HR System

System ID	Age Notes ID	Age Notes
		components below 425' elevation, MIC is not a concern. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to a sheltered environment.
HR	A-HR-c	The relevant conditions could exist in the Reactor Building environment of the Hydrogen Removal (HR) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the HR System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
HR	A-HR-d	The relevant conditions do not exist in the Reactor Building environment of the Hydrogen Removal (HR) System for the following aging effects to occur [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the safety-related portion of the HR System is in a standby condition, and all of the carbon steel components within the license renewal evaluation boundaries that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to a Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the safety-related portion of the HR System is in a standby condition, and all of the carbon steel components within the license renewal evaluation boundaries that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to a Reactor Building environment.
HR	A-HR-e	The relevant conditions do not exist in the sheltered environment of the Hydrogen Removal (HR) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating

System ID	Age Notes ID	Age Notes
		experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if the susceptible components either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Since there are no applicable HR System components below 425' elevation, MIC is not a concern. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the HR System that are exposed to a sheltered environment.
HR	A-HR-f	The relevant conditions do not exist in the air-gas environment of the Hydrogen Removal (HR) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the safety-related portion of the HR System is not operating, and is in a standby and isolated condition [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. Hence, none of the stainless steel components within the license renewal evaluation boundaries that are exposed to an air-gas environment, are subject to alternate wetting and drying that may concentrate contaminates. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the HR System that are exposed to an air-gas environment. Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. During normal plant operation, the safety-related portion of the HR System is not operating, and is in a standby and isolated condition [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. Hence, none of the stainless steel components within the license renewal evaluation boundaries that are exposed to an air-gas environment, are subject to wetted locations. Also, a review of system data shows that the maximum expected temperature the stainless steel components would be exposed to is 90°F [Dwg. D-302-861]. As such, cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the HR System that are exposed to an air-gas environment.
HR	A-HR-g	The relevant conditions do not exist in the air-gas environment of the Hydrogen Removal (HR) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to general corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment. Oxygen alone, or water free from dissolved oxygen does not corrode carbon and low alloy steels to any appreciable extent. That is, the occurrence of general corrosion depends on the presence of both moisture and oxygen, and is accentuated by contaminants. During normal plant operation, the safety-related portion of the HR System is not operating, and is in a standby and isolated condition [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. All of the carbon steel components within the license renewal evaluation boundaries that are exposed to an air-gas environment, are in contact with either an air-gas mixture of nitrogen (used to purge the Hydrogen Analyzer and

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		sample lines) or an air-gas environment in the remaining lines (isolated from the containment atmosphere). The nitrogen gas environment is considered dry and clean, with no significant levels of contaminants. The remaining air-gas environment is also isolated and not exposed to moisture or contaminants. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the safety-related portion of the HR System is not operating, and is in a standby and isolated condition [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. Hence, none of the carbon steel components within the license renewal evaluation boundaries that are exposed to an air-gas environment, are subject to wetted locations. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the safety-related portion of the HR System is not operating, and is in a standby and isolated condition [Dwg. D-302-861, TR00160-006, Attachment II and PASS DBD]. Hence, none of the carbon steel components within the license renewal evaluation boundaries that are exposed to an air-gas environment, are subject to alternate wetting and drying that may concentrate contaminates. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the HR System that are exposed to an air-gas environment.
IA	A-IA-a	The relevant conditions do not exist in the air-gas environment of the Instrument Air Supply (IA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VI]: Except for the possibility of a moist internal environment in one localized area of the IA System, as described in Note A-IA-r, all of the remaining internal environment, within the license renewal evaluation boundaries of the IA System, is an oil-free, filtered and dried compressed air, referred to as an air-gas environment. Carbon steel is susceptible to loss of material due to general corrosion in moist air or gas. Both oxygen and moisture must be present, because oxygen alone or water free of dissolved oxygen does not corrode iron to any practical extent. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types within the license renewal evaluation boundaries of the IA System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Instrument air is oil-free, filtered and dried compressed air, without a

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		significant amount of moisture. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the IA System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the IA System that are exposed to an air-gas environment.
IA	A-IA-b	The relevant conditions do not exist in the sheltered environment of the Instrument Air Supply (IA) System for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for cast iron components in systems with external surface temperatures significantly below ambient conditions and condensation occurs. The Instrument Air System temperatures are near or above ambient conditions [D-302-273, 274] in the sheltered environment. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the cast iron components/component types of the IA System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an applicable aging effect in the sheltered environment for piping, process tubing, and ductwork component types if they either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. The only IA System components manufactured of cast iron are valves. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the cast iron components/component types of the IA System that are exposed to the sheltered environment.
IA	A-IA-c	The relevant conditions could exist in the Reactor Building environment of the Instrument Air Supply (IA) System for loss of material due to general corrosion and loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types (pipe and valves) in the IA System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion (oxygen and moisture) and the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water) in carbon steel in a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
IA	A-IA-d	The relevant conditions do not exist in the Reactor Building environment of the Instrument Air Supply (IA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for

System ID	Age Notes ID	Age Notes
		carbon steel in the Reactor Building environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry. The IA System operates at temperatures which are not well below the Reactor Building environment ambient temperature [D-302-273 depicts system temperatures of 125°F and ambient, also see D-302-274]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the IA System that are exposed to a Reactor Building environment.
IA	A-IA-e	The relevant conditions do not exist in the sheltered environment of the Instrument Air Supply (IA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel components in systems with external surface temperatures significantly below ambient conditions and condensation occurs. The Instrument Air System temperatures are near or above ambient conditions [D-302-273, 274] in the sheltered environment. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the IA System that are exposed to the sheltered environment.
IA	A-IA-f	The relevant conditions could exist in the sheltered environment of theInstrument Air Supply (IA) System for loss of material due to boric acid corrosion (aggressive chemical attack), general corrosion and microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the IA System that are exposed to the sheltered environment. Loss of material due to MIC is an applicable aging effect in the sheltered environment for carbon steel pipe. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water), and the activities for Inspections for Mechanical Components, will manage loss of material due to general corrosion (oxygen and moisture) for carbon steel in the sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC (groundwater contact) in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
IA	A-IA-g	The relevant conditions do not exist in the air-gas environment of the Instrument Air Supply (IA) System for the following aging effects to occur [TR00160-010, Attachment VI]: Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. The stainless steel components within the license renewal evaluation boundaries of the IA System, that are exposed to an air-gas environment, are at temperatures less than 200°F [D-302-273, 274] and instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel

System ID	Age Notes ID	Age Notes
		components/component types of the IA System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the IA System that are exposed to an air-gas environment.
IA	A-IA-h	The relevant conditions could exist in the sheltered environment of the Instrument Air Supply (IA) System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe and tubing) in the IA System that are exposed to a sheltered environment. Loss of material due to MIC is not an applicable aging effect for stainless steel valves in the IA System. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components exposed to a sheltered environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
IA	A-IA-j	The relevant conditions do not exist in the air-gas environment of the Instrument Air Supply (IA) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to galvanic corrosion is an aging effect for copper and copper alloy components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the IA System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect for copper alloys that do not contain any inhibiting elements, and are exposed to a moist air or gas environment in wetted locations. In particular, copper-zinc alloys containing greater than 15% zinc are susceptible to selective leaching under these conditions. The likelihood of wetted locations appearing in the IA System is very remote. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper alloy components/component types of the IA System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper and copper alloy components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material/cracking due to corrosive

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		impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper and copper alloy components/component types of the IA System that are exposed to an air-gas environment.
IA	A-IA-k	The relevant conditions do not exist in the sheltered environment of the Instrument Air Supply (IA) System for the following aging effects to occur in brass/copper/copper alloy components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect requiring system specific evaluation for brass/copper/copper alloys in the sheltered environment in systems with normal operating temperatures well below ambient conditions and condensation occurs. Portions of the IA System are in operation during normal plant operation and accident operation, and they operate at temperatures which are greater than the sheltered environment ambient temperature [D-302-273, 274]. The subject brass/copper/copper alloy components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for brass/copper/copper alloy components/component types of the IA System that are exposed to a sheltered environment.
IA	A-IA-l	The relevant conditions do not exist in the air-gas environment of the Instrument Air Supply (IA) System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment VI]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for aluminum components/component types of the IA System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the IA System that are exposed to an air-gas environment.
IA	A-IA-m	The relevant conditions do not exist in the sheltered environment of the Instrument Air Supply (IA) System for the following aging effects to occur in aluminum components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect requiring system specific evaluation for aluminum in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Portions of the IA System are in operation during normal plant operation and accident operation, and they operate at temperatures which are greater than the sheltered environment ambient temperature [D-302-274, 274]. The subject aluminum components are always at temperatures near or above ambient and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for aluminum components/component types of the IA System that are exposed to a sheltered environment.

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		Loss of material due to microbiologically influenced corrosion (MIC) is an applicable aging effect in the sheltered environment for piping, process tubing, and ductwork component types susceptible to external MIC if they either enter a building from outside or pass between buildings included in the sheltered environment below the 425' elevation. The only IA System components manufactured of aluminum are valves. Therefore, loss of material due to MIC is an not aging effect requiring management during the period of extended operation for the aluminum components/component types of the IA System that are exposed to the sheltered environment.
IA	A-IA-n	The relevant conditions do not exist in the air-gas environment of the Instrument Air Supply (IA) System for the following aging effects to occur in cast iron components/component types [TR00160-010, Attachment VI]: Cast iron can be susceptible to loss of material due to general corrosion as an aging effect in moist air or gas. Both oxygen and moisture must be present because oxygen alone or water free of dissolved oxygen does not corrode iron to any practical extent. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for cast iron components/component types within the license renewal evaluation boundaries of the IA System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the IA System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the IA System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect for gray cast iron components in contact with a moist air or gas environment. This form of corrosion is unique to gray cast irons and is commonly referred to as graphitic corrosion. Instrument air is oil-free, filtered and dried compressed air, without a significant amount of moisture. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the IA System that are exposed to an air-gas environment.
IA	A-IA-o	The relevant conditions could exist in the sheltered environment of the Instrument Air Supply (IA) System for loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for cast iron components/component types in the IA System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking

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		borated water), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion (oxygen and moisture) for cast iron in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
IA	A-IA-p	The relevant conditions could exist in the sheltered environment of the Instrument Air Supply (IA) System for loss of material due to boric acid corrosion (aggressive chemical attack) and microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for brass/copper/copper alloy components/component types in the IA System that are exposed to the sheltered environment. Loss of material due to MIC is an applicable aging effect in the sheltered environment for copper tubing. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water) for brass/copper/copper alloy in the sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
IA	A-IA-q	The relevant conditions could exist in the sheltered environment of the Instrument Air Supply (IA) System for loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for aluminum components/component types in the IA System that are exposed to the sheltered environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water) for aluminum in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
IA	A-IA-r	The relevant conditions could exist in the air-gas environment of the Instrument Air Supply (IA) System for loss of material due to general corrosion to occur [TR00160-010, Attachment VI]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types (pipe and fittings, and valves) in the IA System that are exposed to an air-gas environment. Loss of material due to general corrosion is an applicable aging effect for carbon steel components exposed to a moist air or gas environment. The only location within the license renewal boundaries of the IA System, where components could possibly be exposed to this type of environment is in the vicinity of Penetration No. 319 [Dwg. D-302-273]. As discussed in TR00160-020, the Service Air System Inspection will assess the condition of pertinent components to detect and characterize a loss of material due to general corrosion (oxygen and moisture) in carbon steel in an air-gas environment, if any. This activity is a one-time inspection and will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under all CLB conditions.

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LR	A-LR-a	The relevant conditions could exist in the Reactor Building environment of the RB Leak Rate Testing (LR) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the LR System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
LR	A-LR-b	The relevant conditions do not exist in the Reactor Building environment of the RB Leak Rate Testing (LR) System for the following aging effects to occur [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-811 and TR00160-006, Attachment IV]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-811 and TR00160-006, Attachment IV]. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a Reactor Building environment.
LR	A-LR-c	The relevant conditions could exist in the sheltered environment of the RB Leak Rate Testing (LR) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the LR System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel

System ID	Age Notes ID	Age Notes
		exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
LR	A-LR-d	The relevant conditions do not exist in the sheltered environment of the RB Leak Rate Testing (LR) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-811 and TR00160-006, Attachment IV]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. All of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their external surfaces [Dwg. D-302-811 and TR00160-006, Attachment IV]. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The LR System has five containment penetrations: XRP0201, XRP0210, XRP0211, XRP0212 and XRP0216 [Dwg. D-302-811]. The corresponding elevation of these penetrations is: 449', 445', 445', 445' and 436' [CHAMPS and STP-215.006]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a sheltered environment.
LR	A-LR-e	The relevant conditions do not exist in the ventilation* environment of the RB Leak Rate Testing (LR) System for the following aging effects to occur. Aging effects/mechanisms in a ventilation* environment are identical to those for a ventilation environment [TR00160-010, Attachment VII].

System ID	Age Notes ID	Age Notes
		Loss of material due to boric acid corrosion (aggressive chemical attack) is an aging effect for carbon steel components in wetted locations of ventilation air systems exposed to air from the Reactor Building environment. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD, FSAR, Section 6.2.6]. The internal surfaces of all carbon steel components, within the license renewal evaluation boundaries, are exposed to air from the Reactor Building environment only during the performance of leak rate testing [Dwg. D-302-811 and TR00160-006, Attachment IV], which is performed on a very infrequent basis. Also, this testing does not produce any wetted locations. As such, loss of material due to boric acid corrosion (aggressive chemical attack) is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a ventilation* environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components in ventilation air systems subject to alternate wetting and drying that may concentrate contaminates. The LR System is not in service while the plant is in operation, and is isolated with blank flanges and closed test connection valves [RB DBD, FSAR, Section 6.2.6]. The internal surfaces of all carbon steel components, within the license renewal evaluation boundaries, are exposed to a ventilation* environment only during the performance of leak rate testing [Dwg. D-302-811 and TR00160-006, Attachment IV], which is performed on a very infrequent basis. Also, none of these surfaces is subject to alternate wetting and drying during testing or normal plant operation. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a ventilation* environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components in wetted locations of ventilation air systems and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. Components in the LR System include an air dryer, moisture separator, aftercooler and portable compressors that enable the system to pressurize the Reactor Building with dry and compressed air, and also, remove moisture and other impurities from the compressed air [FSAR Section 6.2.6.1.5 and Dwg. D-302-811]. The LR System is not in service while the plant is in operation, and subsequent to the completion of testing, it is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. The internal surfaces of all carbon steel components, within the license renewal evaluation boundaries, are exposed to a ventilation* environment only during the performance of leak rate testing. These surfaces are generally at the same temperature as ambient conditions, and therefore, are not susceptible to the formation of condensation on their surfaces [Dwg. D-302-811 and TR00160-006, Attachment IV]. Also, none of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a ventilation* environment, are exposed to any wetted locations. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a ventilation* environment. Loss of material due to general corrosion is an aging effect for carbon steel components in ventilation air systems exposed to moist and oxygenated air. Oxygen alone, or water free from dissolved oxygen does not corrode carbon and low alloy steels to any appreciable extent. Components in the LR System include an air dryer, moisture separator, aftercooler and portable compressors that enable the system to pressurize the Reactor Building with dry and compressed air, and also, remove moisture and other impurities from the compressed air

System ID	Age Notes ID	Age Notes
		[FSAR Section 6.2.6.1.5 and Dwg. D-302-811]. The LR System is not in service while the plant is in operation, and subsequent to the completion of testing, it is isolated with blank flanges and closed test connection valves [RB DBD and FSAR, Section 6.2.6]. The internal surfaces of all carbon steel components, within the license renewal evaluation boundaries, are exposed to a ventilation* environment only during the performance of leak rate testing [Dwg. D-302-811 and TR00160-006, Attachment IV]. This environment is clean, dry air. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a ventilation* environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (e.g., build-up of dust, dirt and debris) on the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the LR System that are exposed to a ventilation* environment [Dwg. D-302-811 and TR00160-006, Attachment IV]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the LR System that are exposed to a ventilation* environment.
MB	A-MB-a	The relevant conditions could exist in the sheltered environment of the Main Steam Dump (MB) System or loss of material due to boric acid corrosion (aggressive chemical attack) and general corrosion [TR00160-010, Attachment X] to occur. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the MB System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MB	A-MB-b	The relevant conditions do not exist in the sheltered environment of the Main Steam Dump (MB) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects for carbon steel in the sheltered environment when the system internal environment temperature is well below ambient. The normal operating temperature at the carbon steel components within the license renewal evaluation boundaries of the MB System is 542 - 545°F [D-302-031, D-302-012]. Thus, the internal environment is above ambient and loss of material due to galvanic and pitting corrosion are not aging effects requiring management for the carbon steel components of the MB System exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for vulnerable carbon steel components/component types. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for carbon steel components/component types other than pipe, process tubing, or ductwork and not an aging effect when the piping does not pass through building walls below the 425' elevation. The piping within the license renewal evaluation boundaries of the MB System does not pass through building walls below 425' [D-302-031]. Therefore, loss of material due to MIC is not an aging effect requiring management.
MB	A-MB-c	The relevant conditions could exist in the treated water environment of the Main Steam Dump (MB) System for loss of material due to

System ID	Age Notes ID	Age Notes
		crevice, erosion, general, and pitting corrosion [TR00160-010, Attachment III] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for carbon steel components/component types in the MB System that are exposed to treated water. Loss of material due to erosion-corrosion is not an aging effect requiring management for instrumentation tubing and tube fittings due to low flow / stagnant conditions. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to general corrosion (if oxygen > 100 ppb),and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides/ fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel in a treated water environment. Also, the Flow Accelerated Corrosion Monitoring Program will manage loss of material due to erosion-corrosion. These programs, when performed during the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MB	A-MB-d	The relevant conditions do not exist in the treated water environment of the Main Steam Dump (MB) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to galvanic corrosion is an aging effect for carbon steel exposed to treated water when in contact with dissimilar metals. A review of TR00160-003, Attachment XIV and associated flow diagrams revealed that there are no other materials in contact with the carbon steel components/component types within the license renewal evaluation boundaries of the MB System. Since there are no other components constructed of dissimilar metals in proximity to the MB System components which are in scope, no galvanic bridge is possible. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management for the carbon steel components of the MB System exposed to treated water. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in CP 632, nitrites are not used for corrosion inhibiting within the Main Steam Dump System. Therefore, cracking due to SCC is not an aging effect requiring management. Fouling due to particulates is an aging effect for heat exchanger sub-component heat transfer surfaces constructed of carbon steel and exposed to treated water. There are no heat exchangers within the license renewal evaluation boundaries of the MB System [TR00160-003, Attachment XIV and associated flow diagrams]. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel and alloy steel components exposed to treated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the MB System which are exposed to wet/dry cycles of treated water [TR00160-003, Attachment XIV and associated flow diagrams]. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management.
MS	A-MS-a	The relevant conditions could exist in the sheltered environment of the Main Steam (MS) System for loss of material due to boric acid corrosion (aggressive chemical attack), general corrosion and microbiologically influenced corrosion (MIC) [pipe only] to occur [TR00160-

System ID	Age Notes ID	Age Notes
		010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the MS System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for vulnerable carbon steel components/component types. MIC is not an aging effect for components other than pipe, process tubing and ductwork and not an aging effect if the component does not pass through building walls below the 425' elevation. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) and the Inspections for Mechanical Components manage loss of material due to general corrosion for carbon steel in a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations.These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MS	A-MS-b	The relevant conditions do not exist in the sheltered environment of the Main Steam (MS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring management for carbon steel components when the internal environment is significantly below ambient temperatures. Those portions of the MS System that are within the license renewal evaluation boundaries operate at temperatures between 215°F and 600°F as shown in the System Design Data table [D-302-011]. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the MS System that are exposed to the sheltered environment.
MS	A-MS-c	The relevant conditions could exist in the treated water environment of the Main Steam (MS) System for loss of material due to crevice, galvanic, general and pitting corrosion, and erosion-corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the MS System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen > 100 ppb and chlorides > 150 ppb), galvanic corrosion (if chlorides > 150 ppb and/or fluorides > 150 ppb), general corrosion (if oxygen > 100 ppb) pitting corrosion (if oxygen > 100 ppb, and either halogens > 150 ppb or sulfates > 100 ppb), while the existing Flow Accelerated Corrosion Monitoring Program will manage the conditions required for loss of material due to erosion-corrosion to occur in carbon steel in a treated water environment. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MS	A-MS-d	The relevant conditions do not exist in the treated water environment of the Main Steam (MS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect in locations subject to alternate wetting and

System ID	Age Notes ID	Age Notes
		drying where contaminants may concentrate. Based upon a review of the system flow diagrams and the treated water systems screening report [TR00160-003, Attachment X], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the MS System. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for the carbon steel components of the MS System that are exposed to treated water. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel in treated water systems which use a nitrite based corrosion inhibitor. The MS System does not use nitrite corrosion inhibitors [CP 632]. Therefore, cracking due to SCC is not an aging effect requiring management. Heat exchanger fouling due to particulates is an aging effect for carbon steel heat exchanger heat transfer surfaces (tubes) exposed to treated water. There are no heat exchangers within the license renewal evaluation boundaries of the MS System [TR00160-003, Attachment XIII]. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management.
MS	A-MS-e	The relevant conditions could exist in the Reactor Building environment of the Main Steam (MS) System for loss of material due to boric acid corrosion (aggressive chemical attack) and loss of material due to general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the MS System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) for carbon steel in a Reactor Building environment. Also, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MS	A-MS-f	The relevant conditions do not exist in the Reactor Building environment of the Main Steam (MS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring management for carbon steel components when the internal environment is significantly below ambient temperatures. Those portions of the MS System that are within the license renewal evaluation boundaries operate at temperatures between 215°F to 600°F as shown in the System Design Data table on D-302-011. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the MS System that are exposed to the Reactor Building environment.
MS	A-MS-g	The relevant conditions could exist in the treated water environment of the Main Steam (MS) System for loss of material due to crevice and pitting corrosion, and cracking due stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the MS System that are exposed to treated water.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen > 100 ppb, and either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to SCC (if oxygen > 100 ppb with temperature > 200°F or with chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with temperature > 140°F) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MS	A-MS-h	The relevant conditions do not exist in the treated water environment of the Main Steam (MS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. A review of the treated water systems screening report [TR00160-003, Attachment XIII] and associated references determined that are no cast austenitic stainless steel components within the license renewal evaluation boundaries of the MS System. Therefore reduction of fracture toughness due to thermal aging is not an aging effect requiring management for the stainless steel components/component types of the MS System which are exposed to treated water. Heat exchanger fouling due to particulates is an aging effect for stainless steel heat exchanger heat transfer surfaces (tubes) exposed to treated water. There are no heat exchangers within the license renewal evaluation boundaries of the MS System [TR00160-003, Attachment XIII]. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect in locations subject to alternate wetting and drying where contaminants may concentrate. Based upon a review of the system flow diagrams and the treated water systems screening report [TR00160-003, Attachment X], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the MS System. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management.
MS	A-MS-ii	The relevant conditions could exist in the treated water environment of the Main Steam (MS) System for loss of material due to general, crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel/alloy steel components/component types in the MS System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (oxygen > 100 ppb), crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel/alloy steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
MS	A-MS-j	The relevant conditions do not exist in the treated water environment of the Main Steam (MS) System for the following aging effects to occur

System ID	Age Notes ID	Age Notes
		[TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel/alloy steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the steam traps within the MS System are not subject to alternate wetting and drying. The environment within these traps is normally closed and isolated with no opportunity for wetting and drying to occur. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel/alloy steel components/component types of the MS System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the MS System that are exposed to a treated water environment. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel/alloy steel components/component types of the MS System that are exposed to a treated water environment. Cracking due to stress corrosion (SCC) is an aging effect for carbon steel/alloy steel components exposed to treated water in plant systems using nitrite-based corrosion inhibitors. The MS System does not utilize a nitrite-based corrosion inhibitor [CP-632]. As such, cracking due to nitrite-induced SCC is not an aging effect requiring management during the period of extended operation for carbon steel/alloy steel components/component types of the MS System that are exposed to a treated water environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel/alloy steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. All of the piping connections with the steam traps in the MS System [D-302-121 and D-302-122], that could possibly be involved as a galvanic couple, are also made of carbon steel [SP-337 (902X)]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel/alloy steel components/component types of the MS System that are exposed to a treated water environment. Loss of material due to erosion-corrosion, also known as flow-accelerated corrosion (FAC), is an aging effect for carbon steel/alloy steel components exposed to treated water (water and/or steam) in locations subject to high fluid velocities, constricted flows or rapidly changing flow directions. The body material of the steam traps has been identified in CHAMPS as forged steel, A182, F11. The chemical composition of this alloy steel corresponds to a chromium-molybdenum alloy steel, which exhibits characteristics similar to stainless steel with regards to corrosion resistance. A number of studies have reported that the chromium content in steel has a significant effect on resistance to wall thinning [WCAP-14757, Section 3.3.1]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel/alloy steel components/component types of the MS System that are exposed to a treated water environment.
MS	A-MS-k	The relevant conditions could exist in the sheltered environment of the Main Steam (MS) System for loss of material due to general

System ID	Age Notes ID	Age Notes
		corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel/alloy steel components/component types in the MS System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel/alloy steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel/alloy steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
MS	A-MS-l	The relevant conditions do not exist in the sheltered environment of the Main Steam (MS) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring management for carbon steel/alloy steel components when the internal environment is significantly below ambient temperatures. Those portions of the MS System, that are within the license renewal evaluation boundaries (i.e., traps), operate at temperatures significantly above ambient temperatures, as shown in the System and Design Data Tables [D-302-121 and -122]. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel/alloy steel components/component types of the MS System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel/alloy steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components/component types (i.e., traps) of the MS System that are exposed to a sheltered environment [D-302-121 and D-302-122].
MS	A-MS-m	The relevant condition could exist in the ventilation* environment (same aging effects as a ventilation environment) of the Main Steam (MS) System for loss of material due to general corrosion to occur [TR00160-010, Attachment VI]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for all carbon steel components/component types in the MS System that are exposed to a ventilation* environment. As discussed in TR00160-020, the Preventive Maintenance Activities - Terry Turbine will manage loss of material due to general corrosion in carbon steel exposed to the ventilation* environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
MS	A-MS-n	The relevant conditions do not exist in the ventilation* environment (same aging effects as a ventilation environment) of the Main Steam

System ID	Age Notes ID	Age Notes
		(MS) System for the following aging effects to occur [TR00160-010, Attachment VII]: Loss of material due to boric acid corrosion (aggressive chemical attack) is only an aging effect requiring management for those carbon steel components in ventilation air system wetted locations exposed to Reactor Building air. A review of TR00160-003 demonstrates that, within the license renewal evaluation boundaries of the MS System, there are no carbon steel components with a ventilation* environment in the Reactor Building. Therefore, loss of material due to boric acid corrosion (aggressive chemical attack) is not an aging effect requiring management during the period of extended operation for all carbon steel components/component types of the MS System exposed to the ventilation* environment. Heat exchanger fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components. Fouling only affects the heat transfer surfaces of heat exchangers (i.e., tubes). A review of TR00160-003 demonstrates that there are no carbon steel heat exchanger tubes within the license renewal evaluation boundaries of the MS System, with a ventilation* environment. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the MS System exposed to the ventilation* environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminants. This would only be a concern in ventilation air environments in locations susceptible to aqueous accumulation. A review of TR00160-003 demonstrates that during normal plant operation, all of the carbon steel components exposed to a ventilation* environment and within the license renewal evaluation boundaries of the MS System, are isolated from the main portion of the MS System and vented to the atmosphere. TR00160-010, Attachment VII states that normal maintenance and operation activities are not considered as alternate wetting and drying, unless occurring on a frequent basis. Consequently, the argument can be made that the carbon steel components in the ventilation* environment are not subject to alternate wetting and drying that may concentrate contaminants, during both normal plant operation and maintenance testing. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for all carbon steel components/component types of the MS System exposed to the ventilation* environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a ventilation* environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. A review of TR00160-003 demonstrates that during normal plant operation, all of the carbon steel components exposed to a ventilation* environment and within the license renewal evaluation boundaries of the MS System, are isolated from the main portion of the MS System and vented to the atmosphere. Also, the temperature of the ventilation* environment is not significantly below ambient temperatures that would result in condensation on the component surfaces. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for all carbon steel components/component types of the MS System exposed to the ventilation* environment.
MU	A-MU-a	The relevant conditions do not exist in the treated water environment of the Reactor Makeup Water Supply System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]:

System ID	Age Notes ID	Age Notes
		Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel in treated water where temperatures are greater than 482°F. According to the information provided in the System Data table on D-302-791, the highest temperature in the Reactor Makeup Water Supply System during normal operation is 200°F. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Reactor Makeup Water Supply System that are exposed to the treated water environment. Particulate fouling is an aging effect for stainless steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or resercoir. As described in TR00160-003, Attachment XVI, and shown on D-302-791, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the Reactor Makeup Water Supply System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the stainless steel components of the Reactor Makeup Water Supply System that are exposed to the treated water environment.
MU	A-MU-b	The relevant conditions could exist in the treated water environment of the Reactor Makeup Water Supply System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) and corrosive impacts of alternate wetting and drying to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus require management during the period of extended operation for all stainless steel components/component types in the Reactor Makeup Water Supply System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100ppb, chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to SCC (either dissolved oxygen > 100 ppb and temperature > 200°F, or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel in the treated water environment. The new Above Ground Tank Inspection will assess conditions in order to detect and characterize the corrosive impacts of alternate wetting and drying to occur in stainless steel in the treated water environment, if any. This program/activity, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
MU	A-MU-c	The relevant conditions could exist in the sheltered environment of the Reactor Makeup Water Supply (MU) System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe only) in the MU System that are exposed to the sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following stainless steel components/component types in the MU System: orifices, pumps, instrumentation components (tube and tube fittings) and valves. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC for stainless steel in a sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the

System ID	Age Notes ID	Age Notes
		component intended function(s) will be maintained under all CLB conditions.
MU	A-MU-d	The relevant conditions do not exist in the ventilation* environment of the MU System for the following aging effects to occur [TR00160-010, Attachment VII]: Fouling due to particulates is an aging effect for stainless steel heat exchanger sub-components. Fouling effects only the heat transfer surfaces of heat exchangers (i.e., tubes). A review of TR00160-003 revealed that there are no stainless steel heat exchanger tubes within the license renewal evaluation boundaries of the MU System. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the MU System that are exposed to a ventilation * environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for stainless steel components subject to alternate wetting and drying that may concentrate contaminants. The tank is subject to this aging effect, and discussed in the treated water environment (See Note A-MU-g).
ND	A-ND-a	The relevant conditions could exist in the borated water environment of the Nuclear Drains (ND) System for loss of material due to crevice corrosion and loss of material due to pitting corrosion to occur [TR00160-010, Attachment II]. The ND DBD states the Reactor Building sump discharge is designed to collect spillage from the Reactor Building, which could include borated water. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject stainless steel components/component types in the Nuclear Drains System that are exposed to a borated water environment. As discussed in TR00160-020, the Liquid Waste System Inspection will assess the condition of pertinent components in order to detect and characterize, if any, a loss of material due to crevice corrosion and loss of material due to pitting corrosion in stainless steel in a water environment that could contain borated water or other contaminants. This activity is a one-time inspection and when performed will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under CLB conditions.
ND	A-ND-b	The relevant conditions do not exist in the borated water environment of the Nuclear Drains System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the Screening Report [TR00160-002], the subject piping is expected to be water-solid and there are no alternately wetted and dried borated water environments for the stainless steel components within the license renewal boundaries of the Nuclear Drains System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the Nuclear Drains System that are exposed to a borated water environment. Reduction in fracture toughness is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. The ND System operates at no higher than 100°F, per Flow Diagram D-302-821. As such, reduction in

System ID	Age Notes ID	Age Notes
		fracture toughness is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the ND System that are exposed to a borated water environment. Stress corrosion cracking (SCC) is a potential aging effect for stainless steel components in borated water environments with temperatures in excess of 140°F. The Nuclear Drains System is normally at an operating temperature no higher than 100°F [D-302-821], with SCC not a concern below 140°F. As such, stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the ND System that are exposed to a borated water environment. Precipitation fouling of heat exchangers in a borated water environment is caused by precipitation of borated compounds. There are no heat exchanger components subject to license renewal in the ND System. As such, fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the ND System that are exposed to a borated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. There are no heat exchangers in the subject portions of the ND System. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Nuclear Drains System that are exposed to a borated water environment.
ND	A-ND-c	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the ND System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VII]: The ND System DBD Section 3.6.4.1 states a safety related 8-inch drain is provided between the Reactor Building refueling canal and the Reactor Building sump. This path allows Reactor Building spray water falling into the canal to reach the recirculation sumps during the recirculation mode of operation. This piping is depicted on Drawing E-304-834, Rev. 4. Blind flanges are in place during refueling operations or when the fuel transfer canal is filled. Blind flanges are removed for normal plant operation at all times. Thus, the subject pipe internal surface is dry during normal power operation and herein called the ventilation* environment. The subject piping is flanged closed during refueling operation. Loss of material due to crevice, pitting and microbiologically influenced corrosion and stress corrosion cracking have been conservatively considered to be aging effects requiring system specific evaluation for stainless steel in the ventilation environment in systems which have wetted locations. The subject portion of the ND System is not in a wetted location of the ventilation environment. The subject piping and valves are considered to be dry during normal operation. As such, loss of material due to crevice, pitting and microbiologically influenced corrosion and stress corrosion cracking are not aging effects requiring management during the period of extended operation for this 8-inch drain stainless steel piping of the ND System exposed to a ventilation* environment.
ND	A-ND-d	The relevant conditions do not exist in the borated water environment of the Nuclear Drains System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]:

System ID	Age Notes ID	Age Notes
		Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for stainless steel in the sheltered environment for piping, tubing and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (I.e., underground, embedded) below the 425' elevation. There are no components in the ND system matching these requirements (ref. 304-824). Therefore, loss of material due to microbiologically influenced corrosion is not an aging effect requiring management during the period of extended operation for the stainless steel components/component types of the ND System that are exposed to the sheltered environment.
NG	A-NG-a	The relevant conditions could exist in the Reactor Building environment of the Nitrogen Blanketing (NG) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the NG System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
NG	A-NG-b	The relevant conditions do not exist in the Reactor Building environment of the Nitrogen Blanketing (NG) System for the following aging effects to occur [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. None of the carbon steel components within the license renewal evaluation boundaries of the NG System, that are exposed to a Reactor Building environment, are in contact with components made of a different material [Dwg. D-302-311 and TR00160-006, Attachment V]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to a Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the NG System has a maximum system temperature of 120°F [Dwg. D-302-311], thus demonstrating that all carbon steel components within the license renewal evaluation boundaries, that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to a Reactor Building environment.
NG	A-NG-c	The relevant conditions do not exist in the air-gas environment of the Nitrogen Blanketing (NG) System for the following aging effects to occur [TR00160-010, Attachment VI]:

System ID	Age Notes ID	Age Notes
		Loss of material due to general corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment. Oxygen alone, or water free from dissolved oxygen does not corrode carbon and low alloy steels to any appreciable extent. That is, the occurrence of general corrosion depends on the presence of both moisture and oxygen, and is accentuated by contaminants. All of the carbon steel components within the license renewal evaluation boundaries of the NG System, that are exposed to an air-gas environment, are in contact with compressed nitrogen gas [Dwg. D-302-311 and TR00160-006, Attachment V]. This environment is considered dry and clean, with no significant levels of contaminants. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. None of the carbon steel components within the license renewal evaluation boundaries of the NG System, that are exposed to an air-gas environment, are in contact with components made of a different material [Dwg. D-302-311 and TR00160-006, Attachment V]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. All of the carbon steel components within the license renewal evaluation boundaries of the NG System, that are exposed to an air-gas environment, are in contact with compressed nitrogen gas. This environment is considered dry and clean, with no significant levels of contaminants. Also, none of the above-noted carbon steel components are subject to alternate wetting and drying that may concentrate contaminants [Dwg. D-302-311 and TR00160-006, Attachment V]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to an air-gas environment.
NG	A-NG-d	The relevant conditions could exist in the sheltered environment of the Nitrogen Blanketing (NG) System for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the NG System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
NG	A-NG-e	The relevant conditions do not exist in the sheltered environment of the Nitrogen Blanketing (NG) System for the following aging effects to occur [TR00160-010, Attachment X]:

System ID	Age Notes ID	Age Notes
		Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. None of the carbon steel components within the license renewal evaluation boundaries of the NG System, that are exposed to a sheltered environment, are in contact with components made of a different material [Dwg. D-302-311 and TR00160-006, Attachment V]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the NG System has a maximum system temperature of 120°F [Dwg. D-302-311], thus demonstrating that all carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The NG System has one (1) containment penetration: XRP0313 [Dwg. D-302-311]. The corresponding elevation of this penetration is: 445' [CHAMPS and Dwg. 1MS06-039]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the NG System that are exposed to a sheltered environment.
RC	A-RC-a	The relevant conditions do not exist in the oil environment of the Reactor Coolant (RC) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment IV]: Loss of material due to crevice and pitting corrosion are aging effects for stainless steel components exposed to oil in locations subject to water pooling and contaminants. A review of the applicable flow diagram [D-302-606] reveals that none of the stainless steel components of the RC System exposed to oil are likely to collect water in low spots since all are subject to high ambient conditions which would cause evaporation of moisture. Therefore, loss of material due to crevice and pitting corrosion are not aging effects requiring management for the stainless steel components of the Reactor Coolant System which are exposed to oil. Loss of material due to microbiologically influenced corrosion (MIC) and cracking due to stress corrosion cracking (SCC) are aging effects for stainless steel exposed to fuel oil environments. The oil environment within the license renewal evaluation boundaries of the Reactor

System ID	Age Notes ID	Age Notes
		Coolant System is lubricating oil for the RCP motor oil collection system. Therefore, loss of material due to microbiologically influenced corrosion and cracking due to stress corrosion cracking are not aging effects requiring management. Fouling due to particulates is an aging effect for stainless steel heat exchanger components exposed to lubricating oil. None of the stainless steel components within the license renewal evaluation boundaries of the Reactor Coolant System which are exposed to oil are sub-components of heat exchangers. Therefore, fouling due to particulates is not an aging effect requiring management.
RC	A-RC-b	The relevant conditions could exist in the borated water environment of the RC System for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the RC System that are exposed to a borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb), and cracking due to stress corrosion cracking (if oxygen is > 100 ppb when T > 200°F or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with T > 140°F) to occur in stainless steel in a borated water environment. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC	A-RC-c	The relevant conditions do not exist in the borated water environment of the RC System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Reduction in fracture toughness due to thermal aging is an aging effect for cast austentitic stainless steel (CASS) exposed to continuous temperatures greater than 482°F. A review of valve drawings and the borated water screening report [TR00160-002, Attachment XIII] revealed that Non-Class 1 valve bodies within the license renewal evaluation boundaries of the RC System are stainless steel (not CASS). According to the VCSNS Pipe Line Specification [SP-545], the only cast austenitic stainless steel piping components are "RC Loop" welding fittings associated with piping line listing 2501. The VCSNS FSAR describes the RC loops as only Class 1 components (the reactor vessel, steam generators, reactor coolant pumps, loop piping and valves). Thus, no Non-Class 1 components are constructed of cast austentitic stainless steel. Therefore, reduction in fracture toughness due to thermal aging is not an aging effect requiring management for the stainless steel components of the RC System exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to borated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the RC System which are exposed to wet/dry cycles. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management. Fouling due to precipitation and particulates are aging effects for stainless steel heat exchanger sub-components exposed to borated water. None of the stainless steel components of the RC System exposed to borated water are heat exchangers sub-components. Therefore,

System ID	Age Notes ID	Age Notes
		fouling due to precipitation and particulates are not aging effects requiring management.
RC	A-RC-d	The relevant conditions do not exist in the treated water environment of the RC System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VIII]: Cracking due to stress corrosion cracking is an aging effect for stainless steel exposed to treated water when oxygen is present at temperatures above 200°F or when temperatures exceed 140°F in the presence of other contaminants. A loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and/ior pitting corrosion (if oxygen is > 100 ppb, halogens > 150 ppb or sulfates > 100 ppb) is an applicable aging effect in stainless steel in a treated water environment. However, the stainless steel instrumentation tubing and fittings associated with reactor vessel water level measurement is not exposed to conditions that would result in the onset or propogation of stress corrosion cracking, crevice corrosion, or pitting corrosion. The reactor vessel water level measurement instrumentation is filled with demineralized, de-aerated water and is isolated from the RC System borated water with diaphragms on each end [TR00160-002, Attachment XIII]; there is no means of air (oxygen) or other contaminant intrusion to the treated water. With respect to the containment isolaton portions of the PRT spray header, D-302-602 indicates that both design and upset temperature is below 140°F such that cracking would not occur, as described in TR00160-010, Attachment III. Therefore, cracking due to stress corrosion cracking is not an aging effect requiring management for the stainless steel components of the RC System exposed to treated water. Also, loss of material due to crevice corrosion and/or pitting corrosion is not an aging effect requiring management for the reactor vessel water level instrumentation tubing and components (See Note A-RC-f regarding crevice and pitting corrosion of the PRT spray header components. Reduction in fracture toughness due to thermal aging is an aging effect for cast austentitic stainless steel (CASS) exposed to treated water at temperatures above 482°F. A review of SP-545 and TR00160-002, Attachment XIII revealed that the instrumentation tubing and fittings associated with reactor vessel water level measurement are not constructed of CASS and are sufficiently isolated from the hot RC System that normal operating temperatures are below 482°F. With respect to the CASS PRT spray header isolation valve, D-302-602 design and upset temperatures provide reasonable assurance that normal operating temperatures are well below 482°F. Thus, reduction in fracture toughness due to thermal aging is not an aging effect requiring management for the stainless steel portions of the Non-Class 1 Reactor Coolant System that are exposed to treated water. Fouling due to particulates is an aging effect for stainless steel heat exchanger sub-components exposed to treated water. None of the stainless steel components of the RC System exposed to treated water are heat exchangers sub-components. Therefore, fouling due to particulates is not an aging effect requiring management. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to treated water and subject to cycles of wetting and drying. There are no mechanical components/component types within the license renewal evaluation boundaries of the RC System which are exposed to wet/dry cycles. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.

System ID	Age Notes ID	Age Notes
RC	A-RC-e	The relevant conditions could exist in the sheltered environment of the RC System for loss of material due to microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe) in the RC System that are exposed to the sheltered environment. Loss of material due to MIC is not an aging effect requiring management in the sheltered environment for the following stainless steel components: orifices, tube and tube fittings, and valve bodies. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in stainless steel in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC	A-RC-f	The relevant conditions could exist in the treated water environment of the Reactor Coolant System (Non-Class 1 PRT Spray Header) for a loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging mechanisms could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the RC System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (if oxygen is > 100 ppb, halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC	A-RC-g	The relevant conditions do not exist in the Air-Gas environment of the PRT Vent/N2 header portion of the Reactor Coolant (RC) System for the following aging effects to occur [TR00160-010, Attachment VI]: Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. The contaminants in the air-gas environment are realistically assumed to be insufficient to result in corrosion otherwise. However, a nitrogen (N2) blanket is maintained in the Pressurizer Relief Tank (PRT) and the same line can be used to vent the gases (below rupture pressure 100 psig) to the Gaseous Waste Processing (WG) system [RC DBD, Section 4.5]. As such the environment inside the containment isolation portion of the PRT Vent/N2 header is a gas that is mostly dry nitrogen with some absorbed moisture and other stored gases from the PRT. The normal water temperature inside the PRT is 120°F [RC DBD, Section 2.8] and the design & upset temperature for the nitrogen supply line is 150°F and 180°F respectively [E-302-742]. As such, the threshold temperature of 200°F for SCC/IGA to occur is not reached and , cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel pipe and valves of the RC System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminants. The stainless steel components within the license renewal evaluation boundaries of the RC System, that are exposed to an air-gas environment, consist of piping and valves [Dwgs. E-302-602]. As described above, the PRT Vent/N2 header portion of the RC system is exposed mostly to dry

System ID	Age Notes ID	Age Notes
		nitrogen with some absorbed moisture and other gases from the PRT. Irrespective of whether or not the gas environment is dry or moist, none of the above-noted stainless steel components that are in contact with the various gaseous effluents are subject to alternate wetting and drying that may concentrate contaminants. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the RC System that are exposed to an air-gas environment.
RC1a	A-RC1a-a	The relevant conditions could exist in the borated water environment of the Reactor Vessel and CRDM pressure boundary for a loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC), including Intergranular Attack (IGA), and/or for cracking due to the service loading growth of fabrication flaws to occur [TR00160-010, Attachment II, WCAP-14581, Section 3.2.2 & 3.2.3] in non-cladding stainless steel Reactor Vessel and CRDM pressure boundary sub-components exposed to borated water. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all non-cladding stainless steel sub-components of the Reactor Vessel and CRDM pressure boundary that are exposed to borated water. SCC has been observed in high-purity water (i.e. low sulfates and halogens -- less than 100 ppb and 150 ppb respectively) at temperatures greater than 200°F and dissolved oxygen levels greater than 100 ppb. Additionally, stainless steel, particularly at welds, is susceptible to the growth of fabrication flaws (microscopic damage) due to service loading that leads to cracking at the most highly affected locations [WCAP-14581, Section 3.2]. As such, flaw growth is conservatively considered an aging effect requiring management for subject Reactor Vessel and CRDM pressure boundary sub-components. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb with temperatures >200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb with temperatures >140°F) to occur in stainless steel in a borated water environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking, including cracking due to flaw growth at welds, for applicable sub-components and will supplement the Chemistry Program for management of stress corrosion cracking. The ISI Plan manages cracking through a combination of visual, surface and volumetric examinations for applicable sub-components. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1a	A-RC1a-b	The relevant conditions do not exist in the borated water environment of the Reactor Vessel and CRDM pressure boundary for the following aging effects to occur in stainless steel [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components when exposed to temperatures at or above 482°F. Stainless steel sub-components of the Reactor Vessel and CRDM pressure boundary include safe ends, CRDM latch and rod travel housings, CRDM cap and plugs, bottom instrumentation flux thimbles and guide tubes, and cladding for the

System ID	Age Notes ID	Age Notes
		vessel shell, flanges, domes, and nozzles. Safe ends and cladding are forged and weld deposited austenitic stainless steel, respectively [E-676413]. Bottom instrumentation components are austenitic stainless steel, but not cast [WCAP-14581, 1MS-94B-179, 1MS-44-014]. CRDM rod travel housings, caps and plugs are also austenitic stainless steel, but not cast [FSAR Table 5.2-8]. The CRDM latch housings are cast austenitic stainless steel (CASS), SA-351 Gr. CF8 [FSAR Table 5.2-8]. However, the CRDM latch housing is extremely low in molybdenum content and has been centrifugally cast, as described in WOG-01-204, "Transmittal of LCM/LR Program Deliverables: Identification of Materials and Fabrication Method for CRDM Latch Housings", dated September 17, 2001. In accordance with the screening criteria in a NRC letter (Grimes to Walters at NEI), "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components", dated May 19, 2000 [LRI 98-0030], centrifugally cast CASS components with a low molybdenum content are not susceptible to thermal aging. Since only the CRDM latch housings, of the stainless steel sub-components of the Reactor Vessel and CRDM pressure boundary exposed to borated water, are constructed of cast austenitic stainless steel and the molybdenum content and fabrication method of these sub-components is that that they are not susceptible to thermal aging, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation. Fouling due to particulates is an aging effect for heat exchanger sub-components where the supply originates at the bottom of a tank. Fouling due to precipitation is an aging effect for heat exchanger sub-components in systems when the component is subject to alternate wetting and drying. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). The Reactor Vessel sub-components serve only pressure boundary functions as described above. With no heat transfer component intended function, fouling due to particulates or precipitation is not an aging effect requiring management for the stainless steel sub-components of the Reactor Vessel and CRDM pressure boundary which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel in locations that may concentrate contaminants. As described above, there are no Reactor Vessel or CRDM pressure boundary sub-components subject to alternate wetting and drying. Therefore, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the stainless steel sub-components of the Reactor Vessel which are exposed to borated water. Reduction of fracture toughness due to radiation (nuetron) embrittlement is an aging effect requiring evaluation in the beltline region of the vessel (e.g. adjacent to active fuel assemblies). However, the CRDM/Instrumentation/Vent pipe safe ends and CRDM housings/cap/plug are not considered to be susceptible to radiation embrittlement because of their physical distance from the core (active fuel assemblies). As such, reduction of fracture toughness due to radiation embrittlement is not an aging effect requiring management during the period of extended operation for non-cladding stainless steel portions of the Reactor Vessel and CRDM pressure boundary exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. This time-dependent deformation of materials under static loads occurs at temperatures in excess of 0.4 to 0.5 times the melting point. In PWR vessel environments, the operating temperatures are sufficiently below the creep range. Furthermore, no significant effect of irradiation on creep of RPV associated materials has been identified. [WCAP-14581, Section 3.2.7.1] For operating temperatures of 800°F for alloy steels and 1000°F for austenitic stainless steels and nickel-based alloys, creep is not significant for any PWR pressure vessel component [TR-104305]. Reactor vessel design temperature of 650°F [1MS-94B-036], ensures that components in the same vicinity will not

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		be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the subject Reactor Vessel and CRDM pressure boundary sub-components. Loss of material due to mechanical wear of the BMI flux thimbles and BMI guide tubes (counduits) from metal-to-metal contact could occur during insertion, retraction, and repositioning of the Nuetron Detector (flux mapping) instrumentation [WCAP-14581 Section 3.2.5]. However, loss of material due to wear, either mechanical or flow-induced, is unlikely for the BMI guide tubes and is therefore not an aging effect requiring management during the period of extended operation. Due to the thickness of guide tube (conduit) walls in comparision to the much smaller BMI thimble tube thickness [1MS-44-016-3], mechanical or flow-induced wear between the inner surface of the guide tubes and thimble tube might cause a loss of material to the thinner thimble tube but the guide tube loss of material would be insignificant in terms of loss of component intended function. Refer to the appropriate portion of Attachment IV (database designator RC1b) for a further discussion of BMI thimble wear.
RC1a	A-RC1a-c	The relevant conditions could exist in the borated water environment of the Reactor Vessel for loss of material due to crevice and pitting corrosion, cracking due to primary water stress corrosion cracking (PWSCC) and stress corrosion cracking/intergranular attack (SCC/IGA) to occur [TR00160-010, Attachment II], as well as for cracking due to flaw growth to occur in applicable sub-components [WCAP-14581, Sections 3.2.2 and 3.2.3]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all nickel-based alloy sub-components of the Reactor Vessel and CRDM pressure boundary that are exposed to borated water. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides are >150 ppb), and loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides are >150 ppb and/or sulfates are >100 ppb) and stress corrosion cracking/intergranular attack (oxygen > 100 ppb with temperatures above 200°F or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with temperatures > 140°F) to occur in nickel-based alloys (including cladding) exposed to a borated water environment. With regard to nickel-based alloy cladding, maintenance of the cladding material precludes detrimental aging effects for the base/ferritic metal (i.e., alloy steel). Cracking at welded joints due to the growth of fabrication flaws, including previously undetected flaws, from the service (cyclic) loading over the life of the component, is an aging effect requiring management for sub-components such as the Reactor Vessel nozzles. The existing "In-Service Inspection (ISI) Plan", as described in TR00160-020, manages cracking through a combination of visual, surface, and volumetric examinations. Additionally, the ASME Section XI, ISI Examination Category B-N-2 requires visual examinations of integrally welded core support structures on the vessel interior. These inspections will detect crack-like indications of the core support pads, such as due to SCC or PWSCC, if extensive. [WCAP-14581, Section 3.2.4]. As such, the existing ISI Plan is also credited for management of PWSCC in the core support pads (also known as core support lugs, keyways, and/or clevises). In accordance with the recent Loop “A” hot leg repair, safe-end/buttering for that outlet nozzle has been replaced with thermally treated Alloy 690, which is considered to be resistant to PWSCC [WCAP-15663], and therefore is not strictly included in the specific program (Alloy 600). As such, the existing "In-Service Inspection (ISI) Plan" will manage cracking of this nozzle.

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		As described in TR00160-020, the "Alloy 600 Aging Management Program", when enhanced to address all Class 1 locations of either Alloy 600 or 82/182 weld material, will manage cracking due to primary water stress corrosion cracking for the applicable Reactor Vessel and CRDM pressure boundary sub-components, including CRDM housing (head adapter) penetration tubes, instrumentation penetration tubes, BMI penetration tubes, vent pipe penetration tube, and inlet/outlet nozzle safe-ends/buttering. Additionally, VCSNS has been ranked for the potential for PWSCC of the Reactor Vessel top (closure) head nozzles using the criteria stated in NRC Bulletin 2001-01 [2001-01], with the determination that VCSNS falls into the NRC category of plants considered to have a low susceptibility (i.e. greater than 30 EFPY from the ONS3 condition) to PWSCC of the Reactor Vessel top (closure) head nozzles [RC-01-0155]. These programs, when continued/implemented during the period of extended operation, will provide reasonable assurance that aging effects will be managed and the component intended function(s) will be maintained under all CLB conditions.
RC1a	A-RC1a-d	The relevant conditions do not exist in the borated water environment of the Reactor Vessel for the following aging effects to occur in nickel-based alloys [TR00160-010, Attachment II]: Fouling due to particulates is an aging effect for heat exchanger sub-components where the supply originates at the bottom of a tank. Fouling due to precipitation is an aging effect for heat exchanger sub-components in systems when the component is subject to alternate wetting and drying. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). The Reactor Vessel sub-components serve only pressure boundary functions as described above. With no heat transfer component intended function, fouling due to particulates or precipitation is not an aging effect requiring management for the stainless steel sub-components of the Reactor Vessel and CRDM pressure boundary which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect requiring evaluation for nickel-based alloys in locations that may concentrate contaminants and result in crevice and/or pitting corrosion and/or stress corrosion cracking (SCC). As described above, there are no Reactor Vessel and CRDM pressurer boundary sub-components subject to alternate wetting and drying. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the nickel-based alloy sub-components of the Reactor Vessel and CRDM pressure boundary which are exposed to borated water. Reduction of fracture toughness due to radiation (nuetron) embrittlement is an aging effect requiring evaluation primarily in the beltline region of the vessel (e.g. adjacent to active fuel assemblies). However, the nickel-based alloy subcomponents of the Reactor Vessel and CRDM pressure boundary (e.g. head penetration tubes, nozzle safe ends/buttering, core support pads, etc.) are not considered to be susceptible to radiation embrittlement because of their physical distance from the core (active fuel assemblies). As such, reduction of fracture toughness due to radiation embrittlement is not an aging effect requiring management during the period of extended operation for nickel-based alloy portions of the Reactor Vessel and CRDM pressure boundary exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. This time-dependent deformation of materials under static loads occurs at temperatures in excess of 0.4 to 0.5 times the melting point. In PWR vessel environments, the operating temperatures are sufficiently below the creep range. Furthermore, no significant effect of

System ID	Age Notes ID	Age Notes
		irradiation on creep of RPV associated materials has been identified. [WCAP-14581, Section 3.2.7.1] For operating temperatures of 800°F for alloy steels and 1000°F for austenitic stainless steels and nickel-based alloys, creep is not significant for any PWR pressure vessel component [TR-104305]. Reactor vessel design temperature of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the subject Reactor Vessel and CRDM pressure boundary sub-components. Loss of material due to mechanical wear of the BMI flux thimbles and BMI guide tubes (counduits) from metal-to-metal contact could occur during insertion, retraction, and repositioning of the Nuetron Detector (flux mapping) instrumentation [WCAP-14581 Section 3.2.5]. However, loss of material due to wear, either mechanical or flow-induced, is unlikely for the BMI guide tubes, or more particularly the nickel-based alloy RV bottom head penetration tubes to which the guide tubes are attached, and is therefore not an aging effect requiring management during the period of extended operation. Due to the thickness of guide tube (conduit) walls in comparision to the much smaller BMI thimble tube thickness [1MS-44-016-3], mechanical or flow-induced wear between the inner surface of the guide tubes and thimble tube might cause a loss of material to the thinner thimble tube but the guide tube and head penetration tube loss of material would be insignificant in terms of loss of component intended function. Refer to the appropriate portion of Attachment IV (database designator RC1b) for a further discussion of BMI thimble wear.
RC1a	A-RC1a-e	The relevant conditions could exist in the Reactor Building environment of the Reactor Vessel for loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX and WCAP-14581]. Additionally, the relevant conditions could exist for a loss of mechanical closure integrity due to stress relaxation, stress corrosion cracking, and/or wear of the closure studs, nuts, and washers to occur. While mechanical wear is not an aging related mechanism, wear of bolting assemblies and/or flange material from relative motion due to either loss of preload or infrequent removal/installation could result in a loss of mechanical closure integrity and/or loss of material. Such degradation (mechanical wear) is a concern during the present operating term and is considered to be a license renewal concern for Class 1 components only. If left unmanaged, these effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon and alloy steel sub-components of the Reactor Vessel that are exposed to the Reactor Building environment. As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion for carbon and alloy steel (including studs, nuts and washers) that are exposed to the Reactor Building environment. Also, the existing In-Service Inspection (ISI) Plan, a combination of visual and volumetric examinations, will manage loss of material for the closure head and vessel flanges due to wear. The existing "Reactor Head Closure Stud Program", including the applicable portions of ISI, will manage the loss of mechanical closure integrity due to wear, stress relaxation, or stress corrosion cracking of the closure studs, nuts, and washers. These programs/activities, when continued during the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1a	A-RC1a-	The relevant conditions do not exist in the Reactor Building environment of the Reactor Vessel for the following aging effects to occur in

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	f	carbon and alloy steel [TR00160-010, Attachment IX]: General corrosion is normally characterized by uniform attack resulting in material dissolution and sometimes corrosion product buildup. General corrosion requires an aggressive environment and susceptible material in that environment. Class 1 bolting material exhibit a greater amount of surface material loss from exposure to the Reactor Building atmosphere than do base metals. However, since the external surface temperatures of Class 1 components, such as the Reactor Vessel, are significantly elevated (greater than 212°F) and are insulated [RC DBD], slower acting general corrosion is not considered significant enough to cause a loss of component intended function during the period of extended operation. Loss of material due to galvanic corrosion is an aging effect for carbon and alloy steel components normally exposed to wetted locations and electrolytically coupled to a material higher on the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the carbon and alloy steel components within the license renewal evaluation boundaries of the Reactor Vessel exposed to the Reactor Building environment are subject to Reactor Coolant System operating temperatures from within. Thus, these components are generally well above ambient temperatures and are not susceptible to the formation of condensation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management for the carbon and alloy steel sub-components of the Reactor Vessel that are exposed to the Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for carbon and alloy steel external surfaces which are insulated, but otherwise exposed to the sheltered environment when the system internal environment operates at well below ambient temperatures. As described above, the carbon and alloy steel sub-components of the Reactor Vessel are generally at temperatures well above ambient resulting in the absence of condensation. Therefore, loss of material due to pitting corrosion is not an aging effect requiring management for the carbon and alloy steel sub-components of the Reactor Vessel that are exposed to the Reactor Building environment.
RC1a	A-RC1a-g	The relevant conditions could exist in the borated water environment of the Reactor Vessel for a loss of material due to crevice and pitting corrosion, and/or cracking due to stress corrosion cracking/intergranular attack (SCC/IGA) to occur to occur in stainless steel cladding material [TR00160-010, Attachment II]. Additionally, the relevant conditions could exist such that the above aging effects propagate through the cladding to the base (ferritc) or weld metal, as well as for a reduction of fracture toughness due to irradiation embrittlement and/or cracking due to flaw growth [WCAP-14581, Section 3.2] to occur in susceptible locations. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for stainless steel clad alloy steel sub-components of the Reactor Vessel including the shell, heads, flanges and nozzles. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides are >150 ppb), and loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides are >150 ppb and/or sulfates are >100 ppb) and stress corrosion cracking/intergranular attack (oxygen > 100 ppb with temperatures above 200°F or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with temperatures > 140°F) to occur in stainless steel cladding exposed to a borated water environment. Maintenance of the cladding material precludes detrimental aging effects for the base/ferritic metal (i.e., alloy steel).

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		Reduction of fracture toughness due to irradiation embrittlement is an aging effect which requires management during the period of extended operation primarily for the sub-components in the Reactor Vessel core region (beltline), as the most limiting sub-components with respect to the greatest fluence. As described in TR00160-020, the existing "Reactor Vessel Surveillance Program", with maintenance of the pressure and temperature limits, inputs from fluence and uncertainty calculations, and monitoring of elapsed effective full power operating time, will manage the reduction of fracture toughness due to irradiation embrittlement in the most limiting regions with respect to radiation damage. Additionally, a proposed enhancement to the program will provide confirmation that the materials in the upper/nozzle shell course of the Reactor Vessel will not become limiting materials with respect to radiation damage during the period of extended operation. Cracking at welded joints due to the growth of fabrication flaws, including previously undetected flaws, from the service (cyclic) loading over the life of the component, is an aging effect requiring management for sub-components such as the Reactor Vessel nozzles. The existing "In-Service Inspection (ISI) Plan" manages cracking through a combination of visual, surface, and volumetric examinations, and therefore supplements the existing Chemistry Program for SCC of applicable sub-components. These programs, including proposed enhancements to the "Reactor Vessel Surveillance Program", when continued/implemented during the period of extended operation will provide reasonable assurance that these aging effects will be managed and the component intended function maintained under all CLB conditions for the stainless steel clad alloy steel Reactor Vessel sub-components.
RC1a	A-RC1a-h	The relevant conditions do not exist in the borated water environment of the Reactor Vessel for the following aging effects to occur in stainless steel clad alloy steel that is exposed to borated water [TR00160-010, Attachment II and WCAP-14581, Section 3.2]: Loss of material due to erosion-corrosion, also known as flow accelerated corrosion (FAC), is an aging effect for alloy steel exposed to borated water in locations of high fluid velocity, constricted flow, or fluid directional changes. The potential for erosion-corrosion is minimized for the Reactor Vessel sub-components by control of the operating environment (chemistry, design fluid velocities, and design single-phase flow) and the use of corrosion-resistant materials (austenitic stainless steel cladding) [WCAP-14581, Section 3.2.10]. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Reactor Vessel which are exposed to borated water. Loss of material due to galvanic corrosion is an aging effect requiring evaluation for carbon and low steels in a wetted location, where chlorides and/or flourides exceed 150 ppb, when coupled to a material higher on the galvanic series (more cathodic). Loss of material due to general corrosion is an aging effect requiring evaluation for carbon and low alloy steels in wetted locations where dissolved oxygen exceeds 100 ppb. A review of the Reactor Vessel vendor manual [1MS-94B-036] and associated drawings verified that the alloy steel sub-components of the Reactor Vessel, that are in contact with borated water, are clad with either nickel-based alloy or with austenitic stainless steel. The presence of this cladding precludes the borated water from directly contacting the alloy steel sub-components. Furthermore, the absense of an electrolyte between alloy steel and stainless steel cladding precludes galvanic corrosion of said alloy steel. As such, loss of material due to galvanic and/or general corrosion is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Reactor Vessel which are exposed to borated water.

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		Fouling due to particulates is an aging effect for heat exchanger sub-components where the supply originates at the bottom of a tank. Fouling due to precipitation is an aging effect for heat exchanger sub-components in systems when the component is subject to alternate wetting and drying. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). The Reactor Vessel sub-components serve only pressure boundary functions as described above. With no heat transfer component intended function, fouling due to particulates or precipitation is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Reactor Vessel and CRDM pressure boundary which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect for alloy steel and stainless steel cladding in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion cracking of susceptible materials. As described above, there are no Reactor Vessel sub-components subject to alternate wetting and drying. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the alloy steel or stainless steel cladding sub-components of the Reactor Vessel which are exposed to borated water. Reduction of fracture toughness due to thermal aging (embrittlement) of cast austenitic stainless steel (CASS) normally exposed to temperatures greater than or equal to 482 °F is an aging effect requiring evaluation for license renewal. While Reactor Vessel temperatures are well above 482°F (650°F) [RC DBD], the stainless steel cladding material is not CASS [1MS-94B-036]. Therefore, a reduction of fracture toughness due to thermal aging is not an aging effect requiring management for alloy steel or stainless steel cladding sub-components of the Reactor Vessel which are exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. This tiime-dependent deformation of materials under static loads occurs at temperatures in excess of 0.4 to 0.5 times the melting point. In PWR vessel environments, the temperatures of operation (design temperature less than 650°F) are sufficiently below the creep range. Furthermore, no significant effect of irradiation on creep of RPV materials has been identified. The U.S. NRC has accepted this conclusion. [WCAP-14581, Section 3.2.7] As such, distortion/deformation (changes in dimensions) due to creep is not an aging effect requiring management for subject Reactor Vessel sub-components during the period of extended operation. Cladding degradation (loss of material) as a result of local mechanical surface abrasion is an aging effect requiring evaluation for Reactor Vessel sub-components [WCAP-14581, Section 3.2.8]. Westinghouse has identified a worn area in the cladding of one RPV, but this is a unique situation. The cladding was removed as a result of local mechanical abrasion of the surface by loose parts of a detached material surveillance capsule. RPVs at other plants have also had cladding removed for the purposes of underclad crack evaluation. In both cases, the degradation mechanism of concern is the corrosion of the exposed base metal through breaches in the cladding. [WCAP-14581, Section 3.2.8.1] Cladding degradation has been eliminated as an age-related degradation mechanism of concern for license renewal. Furthermore, the idenitified cases of cladding loss that has occurred in Westinghouse RPVs in operation has resulted from event-related mechanical damage and wear. Since cladding erosion rates are small, degradation of cladding by mechanisms other than event driven occurences during plant operation is not anticipated. [WCAP-14581, Section 3.2.8.2] Therefore, cladding degradation expected to occur in the RPVs has no significance for age-related material loss effects and is not an aging effect requiring management during the period of

System ID	Age Notes ID	Age Notes
		extended operation for stainless steel clad alloy steel sub-components of the Reactor Vessel. Underclad cracking in the heat affected zones (HAZ) of SA-508, Class 2 forgings and plate due to reheat cracking as a result of post weld heat treatment is an aging effect requiring evaluation for stainless steel clad alloy steel Reactor Vessel sub-components [WCAP-14581, Section 3.2.9]. Two types of underclad cracking have been identified. Reheat cracking has occurred as a result of postweld heat treatment of austenitic steel cladding applied using high-heat-input welding processes on ASME SA-508, Class 2 forgings. Cold cracking has occurred in ASME SA-508, Class 3 forgings after deposition of the second and third layers of cladding that had no pre-heating nor post-heating applied during the cladding procedure. As described in the "Materials of Construction" portion of this Attachment, the VCSNS Reactor Vessel is not constructed of ASME SA-508, Class 3 material, and the inlet/outlet nozzles, Closure head flange, and Reactor Vessel flange are the only sub-components that are SA-508, Class2 forgings subect to AMR. The high-heat-input welding processes effecting reheat cracking, based upon tests of both laboratory samples and clad nozzle cutouts, include strip clad and manual inert gas (MIG) cladding processes. Testing also revealed that reheat cracking did not occur with one-wire and two-wire submerged arc cladding processes [NUMARC 90-04, WCAP-7733, and/or WCAP-11722]. A review of available Reactor Vessel heat treatment and welding material historical data (uncontrolled - See Westinghouse office material and/or Guy Kennedy) provided confirmation that high-heat-input weld process, as described above, were not utilized on VCSNS Reactor Vessel sub-components. Loss of material due to erosion from severe fluid flow, impingement of steam or fluid, or impingement of abrasives due to fluid flow has been identified as an aging effect requiring evaluation for Reactor Vessel sub-components [WCAP-14581, Section 3.2.10]. Erosion is the degradation of material resulting from severe fluid flow, impingement of steam or fluid directly on a surface, or impingement of abrasives due to fluid flow. Surface material is dislodged by these flow mechanisms and carried away by the fluid. The potential for erosion degradation in RPVs is minimized by controls on the PWR operating environment coupled with the use of corrosion-resistant stainless steels and Ni-Cr-Fe alloys on interior surfaces. There is a potential for erosion damage in the vessel and head flange O-ring seating surfaces in the presence of steam flow resulting from steam flow leakage. Localized leaks past the outer O-rings have been known to cause minimal erosion damage on the flange seating surface. [WCAP-14581, Section 3.2.10.2] The presence of stainless steel cladding, as described in the "Materials of Construction" portion of this attachment, precludes the borated water from directly contacting the alloy steel sub-components. Additionally, the minimal damage that has been attributed to erosion due to O-ring leakage is a concern both in the present and extended operating term, and is therefore not strictly age-related degradation. Furthermore, any such damage is repaired by either blending or welding in the near term. With PWR chemistry controls, fluid velocities, single phase flow, and erosion-resistant materials, erosion is not a significant age-related degradation mechanism. As such, loss of material due to erosion is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Reactor Vessel which are exposed to borated water.
RC1a	A-RC1a-ii	Technical report TR00160-010, Attachment IX did not identify any aging effects requiring evaluation for stainless steel components exposed to a Reactor Building environment. However, WCAP-14581, Section 3.2.4.2, identified chloride-induced stress corrosion cracking (SCC) of stainless steel BMI guide tubes at one Westinghouse plant. This document further states that "the potential for chloride-induced SCC may be virtually eliminated by maintaining addequate cleanliness in the seal table and other BMI areas." Furthermore, the document also states that "In the cases where chloride-induced SCC resulted in through-wall leaks, the amount of leakage was quite small. … These leaks in no way jeopardized the ability to run or shutdown the plant."

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		Based on the above discussion, cleanliness of the seal table and BMI areas is an operational practice issue and not an aging mechanism or effect requiring management. Additionally, a review of VCSNS plant Non-Conformance Notices (NCNs) and Condition Evaluation Reports (CERs), which document component failures/problems, did not identify any failures related to guide tube cracking. As such, external cracking due to chloride-induced SCC is not an aging effect requiring management during the period of extended operation for stainless steel BMI guide tubes that are exposed to the Reactor Building environment.
RC1a	A-RC1a-j	Additionally, while not identified as an aging effect requiring evaluation in either TR00160-010 or WCAP-14581, certain industry references address loss of material due to mechanical wear of control rod drive head penetration flange bolting during assembly/disassembly as being age related degradation requiring management [NUREG-1801, Chapter IV, Item A2.2-f]. However, the type of CRDMs in use at VCSNS have threaded connections, rather than bolted flange connections [1MS-43-144]. These threaded connections are considered to be less susceptible to mechanical damage and to subsequent leakage that the bolted flange connections of concern in GALL. Furthermore, mechanical damage during infrequent assembly/disassembly is maintenance-related rather than age-related degradation, but has been conservatively addressed during the period of extended operation for certain Class 1 components at VCSNS, consistent with the appropriate WCAP.
RC1b	A-RC1b-a	The relevant conditions could exist for stainless steel in the borated water environment of the Reactor Vessel Internals for loss of material due to crevice and pitting corrosion, cracking due to stress corrosion cracking (SCC), and/or for irradiation assisted stress corrosion cracking (IASCC) to occur for stainless stee susceptible locations. If left unmanaged, these aging effects could result in loss of the component intended function and, thus, require management during the period of extended operation for the stainless steel sub-components of the Reactor Vessel Internals exposed to borated water. WCAP 14577 Rev. 1-A discussion in 3.1.3 sets a threshold of 1x10e21 n/cm2 fluence levels for Irradiation-Assisted Stress SCC (IASCC). Based on the WCAP 14577 Rev. 1-A discussion in 3.1.1.2 only the following components will see above 1x10e21 n/cm2 fluence levels: Lower Core Plate And Fuel Alignment, Lower Support Plate, Lower Support Columns, Core Barrel, Baffle and Former and bolts, Neutron Panels, Bottom Mounted Instrumentation (BMI) Columns, BMI Flux Thimbles, Upper Core Plate (UCP) And Fuel Alignment Pins. The SER 3.2.3 does not agree with the 1x10e21 n/cm2 fluence threshold level, but has concluded management of the most limiting components provides an acceptable Aging Management Program. The plausibility of the occurrence of loss of material due to crevice and pitting corrosion and of cracking due to stress corrosion cracking, whether intergranular, transgranular, or Intergranular Attack, can be directly related to the dissolved oxygen levels and other contaminant levels in the bulk fluid. Control of the fluid environment (e.g. maintaining dissolved oxygen concentrations below 100 ppb, etc.) will manage the loss of material due to crevice and pitting corrosion by minimizing the presence of contaminants and/or oxidizing agents in the fluid and thus preclude corrosion on the Reactor Vessel Internals. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100

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		ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in stainless steel in a borated water environment. As described in TR00160-020, the Reactor Vessel Internals Inspection will manage cracking due to IASCC of material in susceptible locations. Continuation/implementation of these programs during the period of extended operation will provide reasonable assurance that these aging effects will be managed and the component intended functions will be maintained under all CLB conditions.
RC1b	A-RC1b-b	The relevant conditions do not exist in the borated water environment of the Reactor Vessel Internals for the loss of material/cracking due to corrosive impacts of alternate wetting and drying, particulate fouling, reduction of fracture toughness due to thermal aging, and loss of material due erosion to occur. As such, no aging management is required for said aging effects on stainless steel or nickel based alloy sub-components of the Internals that are exposed to borated water. The Reactor Vessel Internals do not contain borated water in the vapor phase and there are no locations susceptible to alternate (cyclic) wetting and drying which would concentrate contaminants. No heat transfer surfaces are part of the Reactor Vessel Internals. Additionally, the supply for the Reactor Coolant system does not originate from the bottom of a tank. There are no cast austenitic stainless steel sub-components of the Reactor Vessel Internals that are subject to aging management review. Therefore, reduction of fracture toughness due to thermal aging will not result in loss of the component intended function during the period of extended operation. As such, loss of material/cracking, particulate fouling, and reduction of fracture toughness due to thermal aging are not aging effects which require management during the period of extended operation for stainless steel Reactor Vessel Internals subcomponents exposed to borated water. Lastly, erosion is a mechanical action of a fluid and/or particulate matter on a metal surface. General erosion occurs under high velocity conditions, turbulence and impingement, with geometric factors being extremely important. However, erosion of the Reactor Vessel Internals components is not plausible due to the filtration of the primary water prior to injection in the Reactor Coolant system, minimizing particles in the fluid. The minimal amount of particles in the borated water precludes the loss of material due to erosion. As such, loss of material due to erosion is not a plausible aging effect for the Reactor Vessel Internals sub-components.
RC1b	A-RC1b-c	The relevant conditions could exist for nickel-based alloys in the borated water environment of the Reactor Vessel for loss of material due to crevice and pitting corrosion and cracking due to primary water stress corrosion cracking (PWSCC) and stress corrosion cracking/intergranular attack (SCC/IGA) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all nickel-based alloy sub-components of the Reactor Vessel that are exposed to borated water. However, due to the nature of the design, the failure of the clevis insert or its bolts would not result in a failure of the intended function [WCAP 14577 Rev. 1-A Section 3.1.2.2]. Additionally the clevis inserts experience low and essentially compressive stress [WCAP 14577 Rev. 1-A Section3.1.2.2]. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in nickel-based alloy in a borated water environment. The Reactor Vessel Internals Inspection program and The Chemistry Program will manage cracking, such as due to PWSCC. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended

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		function(s) will be maintained under all CLB conditions.
RC1b	A-RC1b-d	A change in dimensions (also known as distortion/deformation) due to Void Swelling or Irradiation Creep (Baffle/Former Bolts) only occurs in areas that experience high neutron irradiation. These areas are in close proximity to the core. The Reactor Vessel Internals Inspection will manage the dimensional changes due to void swelling and/or irradiation creep for applicable sub-components. Based on the WCAP-14577 Rev. 1-A discussion in 3.1.1.2 only the following components will see above 1x10e21 n/cm2 fluence levels: Lower Core Plate And Fuel Alignment, Lower Support Plate, Lower Support Columns, Core Barrel, Baffle and Former and bolts, Neutron Panels, Bottom Mounted Instrumentation (BMI) Columns, BMI Flux Thimbles, Upper Core Plate (UCP) And Fuel Alignment Pins. SER 3.2.10 does not identify a fluence threshold level, but that management of the most limiting components provides an acceptable Aging Management Program.
RC1b	A-RC1b-e	Reduction of Fracture Toughness due to irradiation embrittlement only occurs in areas that experience high neutron irradiation. These areas are in close proximity to the core. The Reactor Vessel Internals Inspection program will manage the Loss of Fracture Toughness due to Neutron irradiation Embrittlement for applicable sub-components. Based on the WCAP discussion in 3.1.1.2 only the following components will see above 1x10E21 n/cm2 fluence levels: Lower Core Plate And Fuel Alignment, Lower Support Plate, Lower Support Columns, Core Barrel, Baffle and Former and bolts, Neutron Panels, Bottom Mounted Instrumentation (BMI) Columns, BMI Flux Thimbles, Upper Core Plate (UCP) And Fuel Alignment Pins. Thus only for these components does the WCAP identify Reduction of Fracture Toughness due to Irradiation Embrittlement as a valid Aging Mechanism. The SER 3.2.1 does not agree with the 1x10E21 n/cm2 fluence threshold level, but has concluded management of the most limiting components provides an acceptable Aging Management Program.
RC1b	A-RC1b-f	Loss of Material due to wear only occurs in areas that experience relative motion between components. These components are alignment devices, the Holddown Spring, or the BMI flux mapping Thimbles. The Reactor Vessel Internals Inspection program will manage the wear on the alignment devices and the Holddown Spring. Thimble wear in the borated water environment will be covered by the Bottom Mounted Instrumentation Inspection. Additionally, loss of mechanical closure integrity due to stress relaxation, stress corrosion cracking, and or wear of bolted closures is an aging effect requiring evaluation for the In-Core Thermocouple seal assemblies. Stress relaxation (loss of preload) of bolting materials is a concern at the elevated temperatures at which the Reactor Coolant System operates. Stress corrosion cracking is a concern for high strength bolting (> 150 ksi) materials in Class 1 closure applications. Wear of bolted closures is a concern due to relative motion during infrequent (periodic) disassembly and reassembly operations. [WCAP-14575-A, Sections 3.2.6 and 3.2.7 (SER Section 3.3.1). The design temperature for the Reactor Coolant System is 650°F [RC DBD]. The thermocouple seal, referred to as Core Exit Thermocouple Nozzle Assembly (CETNA), is a fastener assemby including studs, nuts pins and other threaded parts [1MS-94B-1205], and is torgued to roughly 300 ft-lbs upon assembly each refueling outage [1MS-94B-1205, Section 6.4] However, the seal assembly is not strictly a bolt and, therefore not susceptible to SCC of high strength bolting. The existing "In-Service Inspection (ISI) Plan" will manage the loss of mechanical closure integrity due to either high temperature stress relaxation or to assemby/disassembly wear through a combination of visual and surface inspections. Continuation/iplementation of these programs during the period of extended operation will provide reasonable assurance that these aging effects will be managed an that the component intended function(s) will be maintained under all CLB conditions.
RC1b	A-RC1b-	Loss of Preload due to Stress Relaxation can occur for bolting material in a high temperature environment, due to the high residual stresses

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	g	on the bolting material. In a similar manner, the Holddown Spring can lose its preload due to the potential high residual stresses. The Reactor Vessel Internals Inspection will manage the Loss of Preload due Stress Relaxation on bolting and the Holddown Spring.
RC1c	A-RC1c-a	As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and either halogens > 150 ppb or sulfates > 100 ppb), and stress corrosion cracking (either oxygen > 100 ppb or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel exposed to either a borated water or a treated water environment. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-b	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effects of cracking at welded joints (due to growth of fabrication flaws resulting from service loadings), and reduction of fracture toughness (due to thermal aging of pump casings and valve bodies) for stainless steel exposed to a borated water environment through a combination of visual, surface, and volumetric inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-c	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effects of loss of mechanical closure integrity (due to stress relaxation, stress corrosion cracking, and/or wear) for alloy steel exposed to the Reactor Building environment through a combination of visual and surface inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-d	As discussed in TR00160-020, the one-time Small Bore Class 1 Piping Inspection will augment the Inservice Inspection (ISI) Plan to detect and characterize the aging effect of cracking at welded joints (due to growth of fabrication flaws resulting from service loading), if any, for small-bore Class 1 stainless steel piping (piping of < 4 inch size) exposed to a borated water environment. This one-time inspection will assess the condition of small bore piping in order to assure that the applicable aging effects will not result in loss of the intended functions during the period of extended operation and to provide reasonable assurance that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-e	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effect of loss of mechanical closure integrity (due to stress relaxation, stress corrosion cracking, and/or wear) for stainless steel exposed to the Reactor Building environment through a combination of visual and surface inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-f	Not used.
RC1c	A-RC1c-g	The relevant conditions do not exist in the borated water environment of the Class 1 RCS piping, fittings, and valves for loss of material/cracking due to the corrosive impacts of alternate wetting and drying or fouling due to particulates to occur. Therefore, the aging effects listed above do not require aging management programs for stainless steel in a borated water environment.

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		Loss of material/cracking due to the corrosive impacts of alternate wetting and drying is an aging effect for locations that periodically dry out. The Class 1 piping, valves, and pumps are part of the Reactor Coolant System and are maintained filled with system fluid during normal operation. Therefore, loss of material/cracking due to alternate wetting and drying is not an aging effect requiring management for the Class 1 piping, valves, and pumps. Particulate fouling is an aging effect for heat exchangers where the system fluid comes from the bottom of a tank. Heat exchangers are not included within the evaluation boundaries of the Class 1 piping, valves, and pumps. Therefore, particulate fouling is not an aging effect requiring management for the Class 1 piping, valves, and pumps.
RC1c	A-RC1c-h	The relevant conditions do not exist in the Reactor Building environment of the Class 1 RCS piping, fittings, and valves for loss of mechanical closure integrity due to wear for the flange surfaces of bolted Class 1 closures to occur. Therefore, the aging effects listed above do not require aging management programs for stainless steel in a Reactor Building environment. Loss of mechanical closure integrity is an aging effect for bolted Class 1 closures. The effect of aging must be considered as it applies to the bolting materials. However, wear of the flange surfaces is not considered to be an aging effect requiring management. A properly bolted closure contains margin such that some loss of preload will not permit relative motion between the flange surfaces. Loss of preload could cause minor leakage at the flange that would indicate the condition but would not be permitted to progress to the point at which relative motion between the flange surfaces could occur and result in wear. Therefore, loss of mechanical closure integrity due to wear is not an aging effect requiring management during the period of extended operation for the flange surfaces of bolted Class 1 closures.
RC1c	A-RC1c-j	The relevant conditions do not exist in the Reactor Building environment of the Class 1 RCS piping, fittings, and valves for loss of material due to general, galvanic, or pitting corrosion to occur. Therefore, the aging effects listed above do not require aging management programs for alloy steel in a Reactor Building environment. Loss of material due to general corrosion is an aging effect for low alloy steel in contact with moist air. The alloy steel bolting materials are subject to a moist air environment. The bolting on the reactor coolant piping, valves, and pumps is subject to elevated temperatures during operation that prevent moisture from condensing on the components. The bolting on the cooling water supply to the reactor coolant pump thermal barrier may be subject to some condensation due to lower operating temperatures. However, the material used for the bolting is chromium-molybdenum alloy steel which is resistant to general corrosion. Therefore, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for the alloy steel components exposed to the Reactor Building environment. Loss of material due to galvanic corrosion is an aging effect in wetted locations when in contract with a material higher in the galvanic series. The external surfaces of the Reactor Coolant Pump main flange bolting are not normally in a wetted condition. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the alloy steel components exposed to the Reactor Building environment.

System ID	Age Notes ID	Age Notes
		Loss of material due to pitting corrosion is an aging effect in insulated systems having an operating temperature below ambient Reactor Building conditions. The alloy steel bolting is not insulated and typically operates above Reactor Building ambient conditions. Therefore, loss of material due to pitting corrosion is not an aging effect requiring management for the extended period of operation for the alloy steel components exposed to the Reactor Building environment.
RC1c	A-RC1c-k	As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage the aging effect of loss of material (due to boric acid corrosion) for alloy steel exposed to the Reactor Building environment through visual inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that this aging effect will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1c	A-RC1c-l	The relevant conditions do not exist in the borated water environment of the Class 1 RCS piping, fittings, and valves for reduction of fracture toughness due to thermal aging to occur for specific components fabricated from cast austenitic stainless steel (CASS) materials. Reduction in fracture toughness (thermal embrittlement) due to thermal aging is an aging effect for CASS in locations where temperatures continuously exceed 482 degrees F. The Reactor Coolant System is designed to operate at 650 degrees F. The Class 1 components fabricated from CASS are the reactor coolant loop piping elbows, the 45 degree accumulator nozzle, and certain Class 1 valve bodies. In a May 9, 2000 letter, Christopher I. Grimes, Chief License Renewal and Standardization Branch clarified that not all CASS components are subject to thermal aging. The fittings in the reactor coolant loop piping fabricated from CASS were evaluated using the acceptance criteria set forth in the above NRC letter. The screening criteria is supported by the SER for WCAP-14575-A which concludes that if the screening criteria are met the material is determined "not susceptible" and no additional inspections or evaluations are required because the material has adequate toughness. Based on the material chemistry [WCAP-13206 Revision 2] for the VCSNS reactor coolant loop piping, the elbows in the hot legs, cold legs, and crossover legs are not susceptible to reduction in fracture toughness due to thermal aging. The elbows have a low molybdenum content and have delta ferrite levels of less than 20%. The material chemistry for the 45 degree accumulator nozzles was not contained in WCAP-13206. The original material certifications for the nozzle heat numbers were retrieved and indicated delta ferrite levels of less than 20%. The certifications did not specify a molybdenum content (left blank) which could be construed as trace amounts or just not documented. Based on the material specification for SA-351 CF8A, the molybdenum is a maximum of 0.50% thereby classifying the nozzles as having a low molybdenum content. Therefore, the 45 degree accumulator nozzles are not susceptible to reduction in fracture toughness due to thermal aging. The NRC letter referenced above concludes that screening for susceptibility to thermal aging is not required for valve bodies and the current ASME Code inspection requirements are sufficient. Therefore, the existing ASME Section XI examinations are credited for managing aging of valve bodies formed of CASS material.
RC1d	A-RC1d-a	As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and either halogens > 150 ppb or sulfates > 100 ppb), and stress corrosion cracking (either oxygen > 100 ppb or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel exposed to

System ID	Age Notes ID	Age Notes
		either a borated water or a treated water environment. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1d	A-RC1d-b	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effects of cracking at welded joints (due to growth of fabrication flaws resulting from service loadings), and reduction of fracture toughness (due to thermal aging) for stainless steel exposed to a borated water environment through a combination of visual, surface, and volumetric inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions. Reduction in fracture toughness (thermal embrittlement) due to thermal aging is an aging effect for CASS in locations where temperatures continuously exceed 482 degrees F. The Reactor Coolant System is designed to operate at 650 degrees F. The Class 1 components fabricated from CASS are the reactor coolant pump casing and main closure flange. In a May 9, 2000 letter, Christopher I. Grimes, Chief License Renewal and Standardization Branch clarified that not all CASS components are subject to thermal aging. The NRC letter concludes that screening for susceptibility to thermal aging is not required for the reactor coolant pumps and the current ASME Code inspection requirements are sufficient. Therefore, the existing ASME Section XI examinations are credited for managing aging of pump components formed of CASS material.
RC1d	A-RC1d-c	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effects of loss of mechanical closure integrity (due to stress relaxation, stress corrosion cracking, and/or wear) for alloy steel exposed to the Reactor Building environment through a combination of visual and surface inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1d	A-RC1d-d	As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and either halogens > 150 ppb or sulfates > 100 ppb), and stress corrosion cracking (either oxygen > 100 ppb or chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel exposed to a borated water environment. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions. As discussed in TR00160-020, the one-time Small Bore Class 1 Piping Inspection will augment the Inservice Inspection (ISI) Plan to detect and characterize the aging effect of cracking (due to flaw growth at welds) for small-bore Class 1 stainless steel piping (piping of < 4 inch size) exposed to a borated water environment. This one-time inspection will either verify that there are no aging effects requiring management for the subject components or assure that appropriate corrective actions will be taken so that the component intended function(s) is ensured during the period of extended operation.
RC1d	A-RC1d-e	As discussed in TR00160-020, the existing Boric Acid Corrosion Surveillances will manage the aging effect of loss of material (due to boric acid corrosion) for alloy steel exposed to the Reactor Building environment through visual inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that this aging effect will be managed for the license renewal

System ID	Age Notes ID	Age Notes
		period and that the component intended functions will be maintained under all CLB conditions.
RC1d	A-RC1d-f	As discussed in TR00160-020, the existing Inservice Inspection Plan will manage the aging effect of loss of bolt preload (due to stress relaxation) for stainless steel exposed to the Reactor Building environment through a combination of visual and surface inspections. Continuation of this existing program through the extended period of operation will provide reasonable assurance that these aging effects will be managed for the license renewal period and that the component intended functions will be maintained under all CLB conditions.
RC1d	A-RC1d-g	The relevant conditions do not exist in the borated water environment of the Reactor Coolant Pumps for loss of material/cracking due to the corrosive impacts of alternate wetting and drying or fouling due to particulates to occur. Additionally, the pump casing is not susceptible to cracking due to flaw growth at welds. Therefore, the listed aging effects do not require aging management programs for stainless steel in a borated water environment as described below. Loss of material/cracking due to the corrosive impacts of alternate wetting and drying is an aging effect for locations that periodically dry out. The Class 1 piping, valves, and pumps are part of the Reactor Coolant System and are maintained filled with system fluid during normal operation. Therefore, loss of material/cracking due to alternate wetting and drying is not an aging effect requiring management for the Class 1 piping, valves, and pumps. Particulate fouling is an aging effect for heat exchangers where the system fluid comes from the bottom of a tank. Heat exchangers are not included within the evaluation boundaries of the Class 1 piping, valves, and pumps. Therefore, particulate fouling is not an aging effect requiring management for the Class 1 piping, valves, and pumps. Flaw growth occuring at welded connections, due to thermal, mechanical or cyclic loading, may result in crack initiation and growth in Class 1 components [TR00160-010, Attachment XIII]. However, the only pressure boundary weld associated with the CASS RCP casing is the weld between main closure flange and piping (which is addressed with the piping). As such, the RCPs are not susceptible to flaw growth and aging management is not required.
RC1d	A-RC1d-h	The relevant conditions do not exist in the treated water environment of the Reactor Coolant Pump for loss of material/cracking due to the corrosive impacts of alternate wetting and drying, reduction of fracture toughness due to thermal aging, or fouling due to particulates to occur. Therefore, the listed aging effects do not require aging management programs for stainless steel in a treated water environment. Reduction of fracture toughness due to thermal aging (embrittlement) is an aging effect for cast austenitic stainless steel normally exposed to temperatures greater than or equal to 482ºF. The thermal barrier heat exchanger tubing/pipe and pipe flanges are not formed from cast austenitic material. Therefore, reduction of fracture toughness is not an aging effect for the stainless steel components subject to the treated water environment. Loss of material/cracking due to the corrosive impacts of alternate wetting and drying is an aging effect for locations that periodically dry out. The thermal barrier pipe/tubing is maintained filled with component cooling system fluid during normal operation. Therefore, loss of material/cracking due to alternate wetting and drying is not an aging effect requiring management for the stainless steel components subject to the treated water environment.

System ID	Age Notes ID	Age Notes
		Particulate fouling is an aging effect for heat exchangers where the system fluid comes from the bottom of a tank. This aging mechanism affects the heat transfer function of the heat exchangers. The thermal barrier heat exchangers do not have an intended function of heat transfer. Therefore, particulate fouling is not an aging effect requiring management for the stainless steel components subject to the treated water environment.
RC1d	A-RC1d-j	The relevant conditions do not exist in the Reactor Building environment of the Class 1 RCS piping, fittings, and valves for loss of mechanical closure integrity due to wear for the flange surfaces of bolted Class 1 closures to occur. Therefore, the listed aging effects do not require aging management programs for stainless steel in a Reactor Building environment. Loss of mechanical closure integrity is an aging effect for bolted Class 1 closures. The effect of aging must be considered as it applies to the bolting materials. However, wear of the flange surfaces is not considered to be an aging effect requiring management. A properly bolted closure contains margin such that some loss of preload will not permit relative motion between the flange surfaces. Loss of preload could cause minor leakage at the flange that would indicate the condition but would not be permitted to progress to the point at which relative motion between the flange surfaces could occur and result in wear. Therefore, loss of mechanical closure integrity due to wear is not an aging effect requiring management during the period of extended operation for the flange surfaces of bolted Class 1 closures.
RC1d	A-RC1d-k	The relevant conditions do not exist in the Reactor Building environment of the Reactor Coolant Pump for loss of material due to general, galvanic, or pitting corrosion to occur. Therefore, the listed aging effects do not require aging management programs for alloy steel in a Reactor Building environment. Loss of material due to general corrosion is an aging effect for low alloy steel in contact with moist air. The alloy steel bolting materials are subject to a moist air environment. The bolting on the reactor coolant piping, valves, and pumps is subject to elevated temperatures during operation that prevent moisture from condensing on the components. The bolting on the cooling water supply to the reactor coolant pump thermal barrier may be subject to some condensation due to lower operating temperatures. However, the material used for the bolting is chromium-molybdenum alloy steel which is resistant to general corrosion. Therefore, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for the alloy steel components exposed to the Reactor Building environment. Loss of material due to galvanic corrosion is an aging effect in wetted locations when in contract with a material higher in the galvanic series. The external surfaces of the Reactor Coolant Pump main flange bolting are not normally in a wetted condition. Therefore, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the alloy steel components exposed to the Reactor Building environment. Loss of material due to pitting corrosion is an aging effect in insulated systems having an operating temperature below ambient Reactor Building conditions. The alloy steel bolting is not insulated and typically operates above Reactor Building ambient conditions. Therefore, loss of material due to pitting corrosion is not an aging effect requiring management for the extended period of operation for the alloy steel components exposed to the Reactor Building environment.

System ID	Age Notes ID	Age Notes
RC1e	A-RC1e-a	The relevant conditions could exist in the Reactor Building environment for carbon and low-alloy steel sub-components of the Pressurizer to experience loss of material due to boric acid corrosion and for cracking of the support skirt to lower head weld to occur due to flaw growth. If left unmanaged, these aging effects could result in loss of the component intended function(s) and thus requires management during the period of extended operation for all carbon and low-alloy steel Pressurizer sub-components. As described in TR00160-020, the "Boric Acid Corrosion Surveillances" respond to Generic Letter 88-05 and consolidate several house keeping procedures that will serve to manage loss of material due to boric acid corrosion. This includes potential leakage from Pressurizer nozzles, nozzle-to-vessel welds, nozzle-to-safe end welds and manway bolting. {Renewal Applicant Action Items 3.2.2.1-2, 3.3.2.1-1} Additionally, the existing "In-Service Inspection (ISI) Plan", as discussed in TR00160-020, will manage cracking of Pressurizer welds and pressure boundary components through a combination of visual, surface, and volumetric examinations. This includes the external integral support (support skirt/lower head interface). These existing activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB design conditions.
RC1e	A-RC1e-b	The relevant conditions do not exist in the Reactor Building environment of the Pressurizer cubicle for loss of material due to general, galvanic or pitting corrosion to occur for carbon and low alloy steel Pressurizer sub-components. General corrosion is normally characterized by uniform attack resulting in material dissolution and sometimes corrosion product buildup. General corrosion requires an aggressive environment and susceptible material in that environment. Class 1 bolting material exhibit a greater amount of surface material loss from exposure to the Reactor Building atmosphere than do base metals. However, since the external surface temperatures of Class 1 components are significantly elevated (greater than 212°F) and are insulated [RC DBD], any degradation of external surfaces due to general corrosion is unlikely and would be in- significant with regard to causing a loss of component intended function for these components during the period of extended operation. Loss of material due to galvanic corrosion is an aging effect under certain conditions for carbon or low alloy steel in wetted locations when coupled with a material higher in the galvanic series. In the Reactor Building environment, components in systems with external surface temperatures significantly below the ambient conditions are expected to be wet due to the formation of condensation. As described in the system design basis document [RC DBD], the Reactor Coolant System normally operates at temperatures that significantly exceed ambient conditions, and external surfaces are not susceptible to the formation of condensation. Therefore, since there is no electrolyte present externally, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for the carbon and low alloy steel components of the Class 1 portions of the Reactor Coolant System exposed to the Reactor Building environment. Likewise, although the Pressurizer components are insulated, the lack of the formation of condensation precludes external pitting corrosion. Additionally, certain Class 1 components have been conservatively considered to be susceptible to a loss of material (loss of mechanical

System ID	Age Notes ID	Age Notes
		closure integrity) due to mechanical wear of closure bolting during assembly/disassembly as described in the appropriate portion of this technical report. This conservative approach to applicable Class 1 components is consistent with the applicable WCAP or other industry reference, even though this type of mechanical damage is an example of maintenance rather than age-related degradation. However, in the case of the Pressurizer manway, operating experience consistent with pertinent industry references [WCAP-14574-A; NUREG-1801, Chapter IV] does not support the susceptibility of manway closure bolting to wear of the bolting during assembly/disassembly that might result in a loss of intended function. As described in WCAP-14574-A, Section 3.6 and accepted in the SER enclosed therein, "In general, the pressurizer is not susceptible to wear due to lack of relative motion."
RC1e	A-RC1e-c	The relevant conditions could exist in the borated water environment of the Pressurizer for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC) and/or flaw growth from service loadings to occur for stainless steel. If left unmanaged, these aging effects could result in loss of the component intended function and, thus, require management during the period of extended operation for the stainless steel sub-components of the Pressurizer exposed to borated water. The plausibilty of the occurrence of loss of material due to crevice and pitting corrosion and of cracking due to stress corrosion cracking, whether intergranular (IGSCC), transgranular (TGSCC), or Intergranular Attack (IGA) that does not require an existing stress, can be directly related to the dissolved oxygen levels and other contaminant levels in the bulk fluid. Control of the fluid environment (e.g. maintaining dissolved oxygen concentrations below 100 ppb, etc.) will manage the loss of material due to crevice and pitting corrosion and/or stress corrosion cracking by minimizing the presence of contaminants and/or oxidizing agents in the fluid and thus preclude corrosion on the internal surfaces of the Pressurizer {Renewal Applicant Action Item 3.2.2.1-1}. The welding of penetration nozzles and other Pressurizer sub-components may have created highly stressed regions in the weld and adjacent base metal areas that are considered to be the most susceptible to cracking. Likewise, cracking at welded joints that could propagate to the base ferritic and/or weld metal from the cladding may occur due to service loading (e.g. thermal fatigue). The weld metal between the surge nozzle and the vessel lower head is subjected to the maximum number of stress cycles. [NUREG-1801, Item VI.C2.5-c] Management of cracking due to SCC in the Pressurizer requires both control of the fluid environment and periodic inspections/examinations to further manage Pressurizer clad cracking. The same periodic inspections/examinations will address the propagation of clad cracking to the base ferritic and weld metal due to service loading. {Renewal Applicant Action Items 3.3.2.2-1 and 3.3.2.2-2} Although the stainless steel heater support plates (SA-240, Type 304) and surge nozzle retaining basket (SA-167, Type 304) are not a direct part of the Pressurizer pressure boundary and are not subject to aging management review, the welds of these internal supports to the Pressurizer cladding surface could conservatively grow into the adjacent pressure boundary during the period of extended operation. However, these welds were performed by Westinghouse during initial fabrication using procedures and quality assurance requirements that prevented sensitization which could render the weld materials and heat affected zones susceptible to IGSCC [WCAP-14574-A, SER pg. 46]. A search of plant records (e.g. Task Sheets, Maintenance Work Requests (MWRs), etc.) did not identify any indication of field activities that would have resulted in sensitization of these weld areas. Additionally, the heater support plate welds fall into Item B8.20 of ASME Section XI Examination Category B-H. The welds, located in the bottom head of the Pressurizer, where the maximum stress cycles are considered to occur, are considered a “Bottom Head Integral Support Attachment Weld” and were examined through magnetic particle examination (MT)

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		during the first Ten Year Inservice Inpsections [MWR 89V0045, ISI Report VCSM-946] with the result of “No Recordable Indications” {Renewal Applicant Action Item 3.3.2.2-3} Due to the maximum stress cycles being located in the lower head, the heater support plate welds are considered to be representative of other integral non-pressure boundary welds. As discussed in TR00160-020, the existing "Chemistry Program", will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb), and stress corrosion cracking/intergranular attack (oxygen > 100 ppb at Temperatures > 200°F or halogens > 150 ppb and/or sulfates > 100 ppb at Temperatures >140°F) to occur in stainless steel cladding exposed to a borated water environment and thus manage crevice and pitting corrosion of the base and weld metal underneath the cladding. The existing "In-Service Inspection (ISI) Plan", as discussed in TR00160-020, will manage cracking of Pressurizer welds and pressure boundary components through a combination of visual, surface, and volumetric examinations. Continuation of these programs during the period of extended operation will provide reasonable assurance that these aging effects will be managed and the component intended functions will be maintained under all CLB conditions.
RC1e	A-RC1e-d	The relevant conditions do not exist in the borated water environment of the Pressurizer for a loss of material/cracking due to corrosive impacts of alternate wetting and drying, particulate fouling, precipitation fouling, reduction of fracture toughness due to thermal aging to occur and/or the occurrence would not result in loss of component intended function. Additionally, as documented in WCAP-14574-A, and accepted through the enclosed SER, a loss of material due to erosion or wear and/or distortion due to creep is either not plausible or will not result in a loss of component function. As such, no aging management is required for said aging effects on stainless steel sub-components of the Pressurizer that are exposed to borated water. Although the Pressurizer contains borated water in both the liquid and vapor phase, it is a closed volume and there are no locations susceptible to alternate (cyclic) wetting and drying which would concentrate contaminants [RC DBD and 1MS-94B-018]. The only heat transfer surfaces that are part of the Pressurizer assembly are the heaters which are not part of the Reactor Coolant pressure boundary and are not subject to aging management review. Additionally, the supply for the Reactor Coolant system does not originate from the bottom of a tank. The only cast austenitic steel sub-components of the Pressurizer assembly is the spray head (ASTM A296 Grade CF8M). However, the spray head is a non-pressure boundary portion of the assembly and is not subject to aging management review. Therefore, reduction of fracture toughness of the spray head due to thermal aging will not result in loss of the component intended function during the period of extended operation. As such, loss of material/cracking, particulate fouling, precipitation fouling, and reduction of fracture tougness are not aging effects which require management during the period of extended operation for stainless steel Pressurizer subcomponents exposed to borated water. Also, erosion is a mechanical action of a fluid and/or particulate matter on a metal surface. General erosion occurs under high velocity conditions, turbulence and impingement, with geometric factors being extremely important. [WCAP-14574-A] The Pressurizer spray line inlet connections extend into the cold leg piping in the form of a scoop so that the velocity head of the reactor coolant loop flow adds to the spray driving force [RCS DBD, Section 2.3.1.4]. The surge line, which is attached to the bottom of the Pressurizer, connects the pressurizer to the hot leg of a reactor coolant loop [RCS DBD, Section 2.3.2.2], well away from locations of maximum fluid velocity. Erosion of the associated components (e.g. spray & surge nozzles, thermal sleeves, and safe ends) is not plausible due to the filtration of the primary

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		water prior to injection in the Reactor Coolant system, minimizing particles in the fluid. The minimal amount of particles in the borated water precludes the loss of material due to erosion at the surge and spray nozzle safe ends and thermal sleeves {Renewal Applicant Action Item 3.2.5-1}. In general, the Pressurizer is not susceptible to wear due to lack of relative motion. However, due to differential thermal expansion between the pressurizer shell and the heaters, some mechanical wear is possible at the heater well to support plate interface. Mechanical wear in this location could result in thinning of the sheath wall and subsequent electrical failure. [WCAP-14574-A, Section 3.6.2] Since there is a redundant pressure boundary at the heater connection [1MS-94B-018, 1MS-07-117-3], failure of the sheath would not impact the ability of the Pressurizer to maintain pressure boundary integrity. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14574-A, Section 3.7]. Sub-components in the Pressurizer will not be exposed to temperatures in the creep range. As such, loss of material due to erosion, loss of material due to wear, and distortion due to creep are not plausible aging effects for the subject Pressurizer sub-components and do not require management during the period of extended operation. Also, certain sub-components of the Pressurizer, lacking fabrication welds, are not considered to be susceptible to flaw growth at welds (resulting in crack initiation and growth) even though the welds connecting these sub-components to the Pressurizer assembly are susceptible to flaw growth and are managed as described in note A-RC1e-c. This includes sub-components such as the instrumentation tubing, tube couplings and immersion heater assemblies.
RC1e	A-RC1e-e	Loss of mechanical closure integrity and cracking due to stress corrosion of low alloy steel bolting material were identified in WCAP-14574-A as aging effects applicable for Pressurizer manway closure materials. The relevant conditions could exist in the Reactor Building atmosphere for the Pressurizer manway bolting for a loss of mechanical closure integrity due to stress relaxation and/or loss of preload and/or cracking due to stress corrosion cracking to occur. If left unmanaged, loss of mechanical closure integrity and cracking (which ultimately is exidenced by a loss of closure integrity) could result in a loss of component intended function, and thus requires management during the period of extended operation. The potential to develop SCC in bolting materials will be minimized if the yield strength of the material is held to less than 150 ksi or the hardness is less than 32 on the Rockwell C hardness scale [WCAP-14574-A, SER 3.2.2.3.2]. The Pressurizer manway cover bolting material (SA-193 Grade B7) has a minimum yield strength of 105 ksi. However, an NRC concern that is currently being addressed by the industry is that the minimum yield strength criteria in ASME Specification SA-193, Grade B7 or equivalent does not in itself preclude a quenched and tempered low-alloy steel from developing SCC, especially if the acceptable yield strength is greater than 150 ksi. Pressurizer manway bolting material is examined as part of the existing inservice inspections as examination category B-G-2 [MWR 89V0045, ISI Report 83A0291]. The existing "In-Service Inspection (ISI) Plan" will continue to manage loss of mechanical closure integrity due to stress

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		relaxation, loss of bolting material, or loss of preload and cracking due to stress corrosion for low alloy steel bolting {Renewal Applicant Action Items 3.2.2.3.2-1 and 3.3.2.2-1}. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB design conditions. Additionally, certain Class 1 components have been conservatively considered to be susceptible to a loss of material (loss of mechanical closure integrity) due to mechanical wear of closure bolting during assembly/disassembly as described in the appropriate portion of this technical report. This conservative approach to applicable Class 1 components is consistent with the applicable WCAP or other industry reference, even though this type of mechanical damage is an example of maintenance rather than age-related degradation. However, in the case of the Pressurizer manway, operating experience consistent with pertinent industry references [WCAP-14574-A; NUREG-1801, Chapter IV] does not support the susceptibility of manway closure bolting to wear of the bolting during assembly/disassembly that might result in a loss of intended function. As described in WCAP-14574-A, Section 3.6 and accepted in the SER enclosed therein, "In general, the pressurizer is not susceptible to wear due to lack of relative motion."
RC1e	A-RC1e-f	The relevant conditions could exist in the borated water environment of the Pressurizer for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC), primary water stress corrosion cracking (PWSCC) and/or flaw growth from service loadings to occur for nickel-based alloys. If left unmanaged, these aging effects could result in loss of the component intended function and, thus, require management during the period of extended operation for the Inconel 82/182 weld metal at the connection of safe ends to the Pressurizer relief, safety, spray and surge nozzles. The plausibilty of the occurrence of loss of material due to crevice and pitting corrosion and of cracking due to stress corrosion cracking, whether intergranular, transgranular, or Intergranular Attack, can be directly related to the dissolved oxygen levels and other contaminant levels in the bulk fluid. Additionally, the welding of nozzles and other Pressurizer sub-components may create highly stressed regions in the weld and adjacent base metal areas that are considered to be the most susceptible to cracking. Control of the fluid environment (e.g. maintaining dissolved oxygen concentrations below 100 ppb, etc.) will manage the loss of material due to crevice and pitting corrosion and/or cracaking due to SCC by minimizing the presence of contaminants and/or oxidizing agents in the fluid and thus preclude corrosion on the internal surfaces of the Pressurizer {Renewal Applicant Action Item 3.2.2.1-1}. PWSCC of Alloy 600 has been a generic concern of the nuclear power plant industry for reactor, steam generator, and pressurizer components. In the case of Alloy 600 weld metal (such as 82/182), however, the experience has been different. The finer-grained, cast microstructure in the weld is significantly different from the base metal and displayed superior resistance to PWSCC. [WCAP-14574-A, Section 2.6.2] Service experience to date with the use of Inconel 82/182 weld materials and stainless steel safe ends in Westinghouse pressurizers has been excellent. However, recognition by the industry of the potential for PWSCC of Inconel 82/182 weld metal [WCAP-14574-A, Section 3.2.2] leads to the conservative requirement for an aging management program. Additionally, cracking at welded joints may occur at the nozzle to safe end welds due to service loading that results in flaw growth. As with

System ID	Age Notes ID	Age Notes
		PWSCC, an aging management program is required to address the potential for cracking due to flaw growth during the period of extended operation. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in stainless steel in a borated water environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking due to flaw growth at welds for applicable sub-components. The ISI Plan manages cracking through a combination of visual, surface and volumetric examinations and will supplement the Chemistry Program for management of stress corrosion cracking for applicable sub-components. The existing "Alloy 600 Aging Management activities", with enhancements to incorporate the Pressurizer nozzle to safe end welds, catalogues all nickel-based alloy pressure boundary items and utilizes the existing "Inservice Inspection Plan" to manage cracking by PWSCC at these locations. Continuation of these programs during the period of extended operation will provide reasonable assurance that these aging effects will be managed and the component intended functions will be maintained under all CLB conditions.
RC1e	A-RC1e-g	The relevant conditions do not exist in the borated water environment of the Pressurizer for the loss of material/cracking due to corrosive impacts of alternate wetting and drying, particulate fouling (silting), and precipitation fouling to occur and/or the occurrence would not result in loss of component intended function. Additionally, as documented in WCAP-14574-A, and accepted through the enclosed SER, a loss of material due to erosion or wear and/or distortion due to creep is either not plausible or will not result in a loss of component function. As such, no aging management is required for said aging effects on nickel-based alloys in the Pressurizer that are exposed to borated water. Although the Pressurizer contains borated water in both the liquid and vapor phase, it is a closed volume and there are no locations susceptible to alternate (cyclic) wetting and drying which would concentrate contaminants [RC DBD and 1MS-94B-018]. The only heat transfer surfaces that are part of the Pressurizer assembly are the heaters which are not part of the Reactor Coolant pressure boundary and are not subject to aging management review. Additionally, the supply for the Reactor Coolant system does not originate from the bottom of a tank. Also, erosion is a mechanical action of a fluid and/or particulate matter on a metal surface. General erosion occurs under high velocity conditions, turbulence and impingement, with geometric factors being extremely important. [WCAP-14574-A] The Pressurizer spray line inlet connections extend into the cold leg piping in the form of a scoop so that the velocity head of the reactor coolant loop flow adds to the spray driving force [RC DBD, Section 2.3.1.4]. The surge line, which is attached to the bottom of the Pressurizer, connects the pressurizer to the hot leg of a reactor coolant loop [RC DBD, Section 2.3.2.2], well away from locations of maximum fluid velocity. However, erosion of the associated components (e.g. spray & surge nozzles, thermal sleeves, and safe ends) is not plausible due to the filtration of the primary

System ID	Age Notes ID	Age Notes
		water prior to injection in the Reactor Coolant system, minimizing particles in the fluid. The minimal amount of particles in the borated water precludes the loss of material due to erosion at the surge and spray nozzle safe ends and thermal sleeves {Renewal Applicant Action Item 3.2.5-1}. In general, the Pressurizer is not susceptible to wear due to lack of relative motion. However, due to differential thermal expansion between the pressurizer shell and the heaters, some mechanical wear is possible at the heater well to support plate interface. Mechanical wear in this location could result in thinning of the sheath wall and subsequent electrical failure. [WCAP-14574-A, Section 3.6.2] No nickel-based alloy portions of the Pressurizer are asssociated with this connection. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14574-A, Section 3.7]. Sub-components in the Pressurizer will not be exposed to temperatures in the creep range. As such, loss of material due to erosion, loss of material due to wear, and distortion due to creep are not plausible aging effects for the subject Pressurizer sub-components and do not require management during the period of extended operation.
RC1f	A-RC1f-a	The relevant conditions could exist in the Reactor Building environment for a loss of material and/or loss of mechanical closure integrity due to boric acid corrosion (aggressive chemical attack) to occur for subject carbon and low alloy steel sub-components of the Steam Generators. While this aging mechanism is of primary concern in the areas around the tubeplate, channel head and primary manways/nozzles of each Steam Generator, leakage from other systems in or above the vicinity of the Steam Generators could conservatively result in the accumulation of boric acid crystals on other Steam Generator surfaces. Also, the conditions could exist for a loss of mechanical closure integrity due to stress relaxation or stress corrosion cracking of Steam Generator closure bolting. If left unmanaged, these aging effects could result in loss of the component intended function and thus require management during the period of extended operation for all carbon and low-alloy steel Steam Generator sub-components exposed to ambient Reactor Building conditions. As described in TR00160-020, the "Boric Acid Corrosion Surveillances" respond to Generic Letter 88-05 and consolidate several house keeping procedures that will serve to manage loss of material due to boric acid corrosion. Also, the "In-Service Inspection (ISI) Plan" will manage loss of mechanical closure integrity due to stress relaxation or to stress corrosion cracking for low alloy steel bolting/closure material. These existing activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB design conditions. Both the primary and secondary side Steam Generator closure bolting material (SA-193 Grade B7 and SA-194 Grade 7) have a minimum yield strength of 105 ksi. However, an NRC concern that is currently being addressed by the industry is that the minimum yield strength criteria in ASME Specification SA-193, Grade B7 or equivalent does not in itself preclude a quenched and tempered low-alloy steel from developing SCC, especially if the acceptable yield strength is greater than 150 ksi. As discussed above, Steam Generator closure bolting material is included in the existing ISI plan as appropriate.

System ID	Age Notes ID	Age Notes
RC1f	A-RC1f-b	The relevant conditions do not exist in the Reactor Building environment in the vicinity of Class 1 components for a loss of material due to general corrosion, galvanic corrosion or pitting corrosion to occur in carbon and low alloy steel sub-components. General corrosion is normally characterized by uniform attack resulting in material dissolution and sometimes corrosion product buildup. General corrosion requires an aggressive environment and susceptible material in that environment. Class 1 bolting material exhibit a greater amount of surface material loss from exposure to the Reactor Building atmosphere than do base metals. However, since the external surface temperatures of Class 1 components, such as the Steam Generators, are significantly elevated (greater than 212°F) and are insulated [RC DBD], any degradation of external surfaces due to general corrosion is unlikely and would be in- significant with regard to causing a loss of component intended function for these components during the period of extended operation. Loss of material due to galvanic corrosion is an aging effect under certain conditions for carbon or low alloy steel in wetted locations when coupled with a material higher in the galvanic series. In the Reactor Building environment, Class 1 component external surface temperatures are elevated to the point that the detrimental effects of moisture/wetting are insignificant. As described in the system design basis document [RC DBD], the Reactor Coolant System normally operates at temperatures that significantly exceed ambient conditions, and external surfaces are not susceptible to the formation of condensation or collection of moisture/wetting. Likewise, although the Steam Generator sub-components are insulated, the lack of the condensation or other forms of moisture/wetting precludes external pitting corrosion. As such, loss of material due to general, galvanic, or pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon and low alloy steel sub-components of the Class 1 portion of the Reactor Coolant System exposed to the ambient Reactor Building environment. Additionally, certain Class 1 components have been conservatively considered to be susceptible to a loss of material (loss of mechanical closure integrity) due to mechanical wear of closure bolting during assembly/disassembly as described in the appropriate portion of this technical report. This conservative approach to applicable Class 1 components is consistent with the applicable WCAP or other industry reference, even though this type of mechanical damage is an example of maintenance rather than age-related degradation. However, in the case of the Steam Generator manways and inspection ports, operating experience consistent with pertinent industry references [WCAP-14757; NUREG-1801, Chapter IV, Section D1] does not support the susceptibility of closure bolting to wear of the bolting during assembly/disassembly that might result in a loss of intended function. The focus of discussions related to wear of steam generator sub-components that require evaluation for license renewal is on the interfaces of components whose relative motion is not completely restrained.
RC1f	A-RC1f-c	The relevant conditions could exist in the borated water (primary side) environment of the Steam Generators for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion cracking (SCC) and/or flaw growth at welds from service loadings to occur for alloy steel sub-components clad with austenitic stainless steel. If left unmanaged, these aging effects could result in loss of the component intended function and, thus, require management during the period of extended operation for the stainless steel clad alloy steel sub-components of the Steam Generators that are exposed to borated water.

System ID	Age Notes ID	Age Notes
		The plausibilty of the occurrence of loss of material due to crevice and pitting corrosion and of cracking due to stress corrosion cracking, whether intergranular (IGSCC / along the grain), transgranular (TGSCC / across the grain), or Intergranular Attack (IGA) that does not require an existing stress, can be directly related to the dissolved oxygen levels and other contaminant levels in the bulk fluid. Control of the fluid environment (e.g. maintaining dissolved oxygen concentrations below 100 ppb, etc.) will manage the loss of material due to crevice and pitting corrosion and/or stress corrosion cracking by minimizing the presence of contaminants and/or oxidizing agents in the fluid and thus preclude corrosion on the primary side internal surfaces of the Steam Generators. The welding of penetration nozzles and other Steam Generator sub-components may have created highly stressed regions in the weld and adjacent base metal areas that are considered to be the most susceptible to cracking due to flaw growth. Likewise, cracking at welded joints that could propagate to the base ferritic metal from the cladding may occur due to the growth of fabrication flaws from service loading (e.g. thermal fatigue). Management of cracking due to cracking for primary side Steam Generator sub-components requires both control of the fluid environment and periodic inspections/examinations to further manage Steam Generator clad/weld cracking. The same periodic inspections/examinations will address the propagation of clad cracking to the base ferritic and weld metal due to service loading. As discussed in TR00160-020, the existing "Chemistry Program", will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb), and stress corrosion cracking/intergranular attack (oxygen > 100 ppb at Temperatures > 200°F or halogens > 150 ppb and/or sulfates > 100 ppb at Temperatures >140°F) to occur in stainless steel cladding exposed to a borated water environment and thus manage crevice and pitting corrosion of the base and weld metal underneath the cladding. The existing "In-Service Inspection (ISI) Plan", as discussed in TR00160-020, will manage cracking of Steam Generator welds and pressure boundary components through a combination of visual, surface, and volumetric examinations. Continuation of these programs during the period of extended operation will provide reasonable assurance that these aging effects will be managed and the component intended functions will be maintained under all CLB conditions.
RC1f	A-RC1f-d	The relevant conditions do not exist in the borated water environment of the Steam Generators for the following aging effects to occur in alloy steel clad with austenitic stainless steel [TR00160-010, Attachment II]: Loss of material due to erosion-corrosion, also known as flow accelerated corrosion (FAC), is an aging effect for alloy steel exposed to borated water in locations of high fluid velocity, constricted flow, or fluid directional changes. The potential for erosion-corrosion is minimized for the Steam Generator sub-components, particularly on the primary side, by control of the operating environment (chemistry, design fluid velocities, and design single-phase flow) and the use of corrosion-resistant materials (austenitic stainless steel cladding). Additionally, loss of material due to erosion-corrosion has not been identified as an aging effect of concern for primary side Steam Generator sub-components [WCAP-14757, Section 3.3]. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Steam Generators which are exposed to borated water. Loss of material due to galvanic corrosion is an aging effect requiring evaluation for carbon and low steels in a wetted location, where chlorides and/or flourides exceed 150 ppb, when coupled to a material higher on the galvanic series (more cathodic). Loss of material due

System ID	Age Notes ID	Age Notes
		to general corrosion is an aging effect requiring evaluation for carbon and low alloy steels in wetted locations where dissolved oxygen exceeds 100 ppb. A review of the Steam Generator vendor manual and associated drawings verified that the alloy steel sub-components of each Steam Generator, that are in contact with borated water, are clad with either nickel-based alloy or with austenitic stainless steel [1MS-94B-1366]. The presence of this cladding for direct contact with borated water precludes the borated water from directly contacting the alloy steel sub-components. Furthermore, the absense of an electrolyte between alloy steel and stainless steel cladding precludes galvanic corrosion of said alloy steel. As such, loss of material due to galvanic and/or general corrosion is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Steam Generators which are exposed to borated water. Fouling due to particulates is an aging effect for heat exchanger where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). Fouling due to precipitation is an aging effect in systems when the component is subject to alternate wetting and drying that could concentrate contaminants above the bulk fluid levels. However, as clarified in WCAP-14757, fouling is a concern for Steam Generator tube surfaces only [WCAP-14757, Section 3.8], which are nickel-based rather than clad alloy steel. Also, a review of the vendor manual and associated drawings identified no locations on the primary side of the Steam Generators that are alternately wetted and dried [1MS-94B-1366]. Therefore, fouling due to pariculates or to precipitation is not an aging effect requiring management for the stainless steel clad alloy steel sub-components of the Steam Generators which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect for alloy steel and stainless steel cladding in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion. As described above, there are no Steam Generator sub-components subject to alternate wetting and drying, particularly on the primary side. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the alloy steel or stainless steel cladding sub-components of the Steam Generators which are exposed to borated water. Reduction of fracture toughness due to thermal aging (embrittlement) of cast austenitic stainless steel (CASS) normally exposed to temperatures greater than or equal to 482 °F. While primary side Steam Generator temperatures are well above 482°F (650°F) [RC DBD], the stainless steel cladding material is not CASS [1MS-94B-1366]. Therefore, a reduction of fracture toughness due to thermal aging is not an aging effect requiring management for alloy steel or stainless steel cladding sub-components of the Steam Generator which are exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, primary side, of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the alloy steel with stainless steel cladding Steam Generator sub-components that are exposed to borated water.
RC1f	A-RC1f-	The relevant conditions could exist in the borated water environment of the Steam Generators for a loss of material due to crevice and

System ID	Age Notes ID	Age Notes
	e	pitting corrosion, cracking due to primary water stress corrosion cracking (PWSCC) and stress corrosion cracking (SCC), including Intergranular Attack (IA) to occur [TR00160-010, Attachment II, WCAP-14757]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all nickel-based alloy sub-components of the Steam Generators that are exposed to borated water. SCC has been observed in high-purity water (i.e. low sulfates and halogens -- less than 100 ppb and 150 ppb respectively) at temperatures greater than 200°F and dissolved oxygen levels greater than 100 ppb. While nickel-based alloys are generally more resistant to SCC in the presence of impurities and oxygenated water, the threshold values used for austenitic stainless steels were conservatively assumed to apply to nickel-based alloys, i.e., sulfates (>100 ppb), chlorides (>150 ppb) and fluorides (>150 ppb). [TR00160-010, Attachment II] Nickel-based alloys are susceptible to primary water stress corrosion cracking (PWSCC) when exposed to high-purity deaerated water at elevated temperatures. PWSCC in nickel-base alloys is conservatively assumed to be insignificant when exposed to temperatures less than or equal to 500°F and to primary coolant chemical conditions. [TR00160-010, Attachment II] Additionally, nickel-based alloys, particularly weld metal and/or buildup, are susceptible to the growth of fabrication flaws (microscopic damage) due to service loading that leads to cracking at the most highly affected locations [WCAP-14757, Section 3.1]. No material/fabrication flaws have been identified too date in the Delta-75 Steam Generators. However, this does not preclude the possibility of microscopic flaws beneath the resolution of examination equipment at the time of fabrication/inspection. As such, flaw growth is conservatively considered an aging effect requiring management for subject Steam Generator sub-components. While PWSCC has been identified as an aging effect requiring evaluation for nickel-based alloys exposed to borated water, the industry experience indicates that Alloy 600, and due to similar compositions Inconel Alloy 82/182 weld metal, are the susceptible materials. Alloy 690 has not been identified by the industry as a material that is susceptible to PWSCC [BAW-2270, Section 3.2.2]. Standard practice includes the replacement of Alloy 600 material, including weld metal, with Alloy 690 or equivalent that is less susceptible to PWSCC [WCAP-15663]. Furthermore, the only Alloy 600 sub-components or Alloy 82/182 weld metal in each Steam Generator, that are subject to AMR, include the primary side Tubesheet cladding and primary inlet/outlet nozzle-to-safe end welds (with Alloy 152 final layer). All remaining subject nickel-based alloy sub-components are of thermally treated Alloy 690 (Alloy 690 TT) material. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in nickel-based alloy in a borated water environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking due to flaw growth at welds and to primary water stress corrosion cracking, although Alloy 690 has yet to prove susceptible, for applicable sub-components. The "In-Service Inspection (ISI) Plan" manages cracking through a combination of visual, surface and volumetric examinations. The existing "Steam Generator Management Program" will manage cracking of the U-tubes and plugs (due to PWSCC) and will supplement the Chemistry Program for management of the other identified aging effects for pertinent sub-components. Lastly, the "Alloy 600 Aging Management Program", as enhanced, will manage the

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		cracking of the primary side tubesheet cladding (Alloy 600) and primary inlet/outlet nozzle-to-safe end weld material (Alloy 82/182) utilizing the In-Service Inspection (ISI) Plan. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1f	A-RC1f-f	The relevant conditions do not exist in the borated water environment of the Steam Generators for the following aging effects to occur in nickel-based alloys [TR00160-010, Attachment II]: Fouling due to particulates is an aging effect for heat exchanger where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). Degradation of heat transfer performance of the steam generator tube bundle can occur with time as the result of scale formation on the heat transfer tube surfaces. In determining the required heat transfer surface area in the design of the steam generator, an overall tube fouling factor is employed to compensate for the formation of scale on the tube. A typical value used to compensate for steam generator tube fouling is 0.00005°F-hr-ft2/Btu. The degree of fouling that may occur is, in effect, addressed as a specified design margin included into the steam generator. Steam generator fouling, which is compensated for in the design of the steam generator has no significant effect on the intended function of the steam generator. [WCAP-14757, Section 3.8] The design fouling factor of the Delta-75 Steam Generators is 0.00011-hr-sg ft-°F/Btu [Specification 411A78]. The degree of fouling that may occur is, in effect, addressed as a specified design margin included into the Steam Generators. As such, tube fouling is not an aging effect requiring management during the period of extended operation for nickel-based alloys exposed to borated water. Additionally, the existing "Chemistry Program" and "Steam Generator Management Program" provide management for other aging effects, as described in note A-RC1f-e, which would provide further assurance that fouling would not impact Steam Generator intended function during the period of extended operation. Fouling due to precipitation is an aging effect requiring evaluation in systems when the component is subject to alternate wetting and drying that could concentrate contaminants above the bulk fluid levels. A review of the vendor manual and associated drawings identified no locations on the primary side of the Steam Generators that are alternately wetted and dried [1MS-94B-1366]. Therefore, fouling due to precipitation is not an aging effect requiring management for the nickel-based alloy sub-components of the Steam Generators which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect for alloy steel and stainless steel cladding in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion. As described above, there are no Steam Generator sub-components subject to alternate wetting and drying, particularly on the primary side. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the nickel-based alloy sub-components of the Steam Generators which are exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, primary side, of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep

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		range. As such, distortion due to creep is not an aging effect requiring management for the nickel-based alloy cladding Steam Generator sub-components that are exposed to borated water. Loss of material due to mechanical wear caused by foreign/loose objects in the Steam Generator is an aging effect requiring evaluation. Two of the domestic steam generator tube rupture events to date were attributed to loose and foreign objects. Objects such as a metallic ruler, weld rods, and a coiled spring are known to have caused tube penetration. Addressing the presense of loose objects in the primary side of the steam generators, the potential exists that if the object is small enough, it could enter a tube and either pass completely through or the object become lodged in place or, it could damage the tube/tubesheet welds and the tubesheet cladding. [WCAP-14757, Section 3.4] For a loose object in the channel head of a steam generator, although damage would not significantly affect the intended function of the steam generator, significant econonic damage may be incurred in a short period of time [WCAP-14757, Section 3.4.3] As such, and consistent with TR00160-010, Attachment I, loss of material due to mechanical wear is considered an active, fast-acting, degradation mechanism that would be identified and corrected during the current operating term. Therefore, loss of material due to mechanical wear is not an aging effect requiring management for the nickel-based alloy sub-components of the Steam Generators that are exposed to borated water.
RC1f	A-RC1f-g	The relevant conditions could exist in the borated water environment of the Steam Generators for a loss of material due to crevice and pitting corrosion, cracking due to stress corrosion cracking (SCC), including Intergranular Attack (IA), and/or cracking due to flaw growth at welds to occur [TR00160-010, Attachment II, WCAP-14757]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel (and chrome-moly alloy) sub-components of the Steam Generators that are exposed to borated water. SCC has been observed in high-purity water (i.e. low sulfates and halogens -- less than 100 ppb and 150 ppb respectively) at temperatures greater than 200°F and dissolved oxygen levels greater than 100 ppb. Additionally, stainless steel, particularly at welds, is susceptible to the growth of fabrication flaws (microscopic damage) due to service loading that leads to cracking at the most highly affected locations [WCAP-14757, Section 3.1]. No material/fabrication flaws have been identified to date in the Delta-75 Steam Generators However, this does not preclude the possibility and propagation of microscopic flaws beneath the resolution of examination equipment at the time of fabrication/inspection. As such, flaw growth is conservatively considered an aging effect requiring management for subject Steam Generator sub-components. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in stainless steel in a borated water environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking due to flaw growth at welds for applicable sub-components. The ISI Plan manages cracking through a combination of visual, surface and volumetric examinations and will supplement the Chemistry Program

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		for management of stress corrosion cracking for applicable sub-components. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1f	A-RC1f-h	The relevant conditions do not exist in the borated water environment of the Steam Generators for the following aging effects to occur in stainless steel [TR00160-010, Attachment II]: Fouling due to particulates is an aging effect for heat exchanger where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). Fouling due to precipitation is an aging effect in systems when the component is subject to alternate wetting and drying that could concentrate contaminants above the bulk fluid levels. However, as clarified in WCAP-14757, fouling is a concern for Steam Generator tube surfaces only [WCAP-14757, Section 3.8], which are nickel-based rather than stainless steel (see Note A-RC1f-f). Also, a review of the vendor manual and associated drawings identified no locations on the primary side of the Steam Generators that are alternately wetted and dried [1MS-94B-1366]. Therefore, fouling due to pariculates or to precipitation is not an aging effect requiring management for the stainless steel sub-components of the Steam Generators which are exposed to borated water. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect for alloy steel and stainless steel cladding in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion. As described above, there are no Steam Generator sub-components subject to alternate wetting and drying, particularly on the primary side. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the stainless steel sub-components of the Steam Generators which are exposed to borated water. Reduction of fracture toughness due to thermal aging (embrittlement) of cast austenitic stainless steel (CASS) normally exposed to temperatures greater than or equal to 482 °F. While primary side Steam Generator temperatures are well above 482°F (650°F) [RC DBD], the steel material of subject Steam Generator sub-components exposed to borated water is not CASS. The primary nozzle safe ends are SA-336 Cl F316LN and the primary manway cover insert plates are SA-240 Type 304 [1MS-94B-1366]. Therefore, a reduction of fracture toughness due to thermal aging is not an aging effect requiring management for stainless steel sub-components of the Steam Generator which are exposed to borated water. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, primary side, of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the stainless steel Steam Generator sub-components that are exposed to borated water.
RC1f	A-RC1f-ii	The relevant conditions could exist in the treated water (secondary side) environment of the Steam Generators for loss of material due to general, crevice, galvanic and pitting corrosion, and cracking due to fabrication flaw growth at welds from service loadings to occur for carbon and low alloy steel sub-components. If left unmanaged, these aging effects could result in loss of the component intended function

System ID	Age Notes ID	Age Notes
		and, thus, require management during the period of extended operation for the carbon and low alloy steel sub-components of the Steam Generators that are exposed to treated water. The plausibilty of the occurrence of loss of material due to crevice, general, galvanic and pitting corrosion can be directly related to the dissolved oxygen levels and other contaminant levels in the bulk fluid. Control of the fluid environment (e.g. maintaining dissolved oxygen concentrations below 100 ppb, etc.) will manage the loss of material due to crevice, general, galvanic and pitting corrosion by minimizing the presence of contaminants and/or oxidizing agents in the fluid and thus precluding corrosion on the secondary side surfaces of the Steam Generators. The welding of penetration nozzles and other Steam Generator sub-components may have created highly stressed regions in the weld and adjacent base metal areas that are considered to be the most susceptible to cracking due to flaw growth. Likewise, cracking at welded joints that could propagate to the base ferritic metal from the cladding may occur due to the growth of fabrication flaws from service loading (e.g. thermal fatigue). Periodic inspections/examinations will address the propagation of fabrication flaws, including undetected flaws, that could result in cracking at welds due to service loading. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in stainless steel in a borated water environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking due to flaw growth at welds for applicable sub-components. The ISI Plan manages cracking through a combination of visual, surface and volumetric examinations and will supplement the Chemistry Program for management of stress corrosion cracking for applicable sub-components. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1f	A-RC1f-j	The relevant conditions do not exist in the treated water (Secondary side) environment of the Steam Generators for the following aging effects to occur in carbon steel/alloy steel sub-components [TR00160-010, Attachment III]: Loss of material due to erosion/corrosion, also known as flow-accelerated corrosion (FAC), is an aging effect requiring evaluation for carbon and low alloy steels exposed to treated water (water and/or steam) in locations of high fluid velocity, constricted flow, or fluid directional changes [TR00160-010, Attachment III]. The majority of Steam Generator FAC problems involve the feedwater distribution sub-components (feedring and the associated J-tubes). Particularly, thinning of the thinning of the carbon steel J-nozzles located in the feedring of the steam generator has occurred at several plants. The condition is most prevalent near the feedwater inlet, in the vicinity of the feedring tee-section. [WCAP-14757, Section 3.3.1] The feedwater and steam outlet nozzles have been evaluated by the industry regarding their susceptibility to FAC. The steam outlet nozzle of a steam generator was determined to not be susceptible due to the high quality (low moisture content) of the steam exiiting the generator. [EPRI TR-106611, NASDC-202L-R1] Also, the feedwater nozzle includes a nickel-based alloy (Alloy 690

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		TT) thermal sleeve [1MS-94B-1366, Section 1.4], which is resistant to FAC, that precludes alloy steel nozzle degradation. Additionally, the feedring of each Delta-75 Steam Generator is a chromium-molybdenum alloy steel [1MS-94B-1366, Section 1.4], rather than a low alloy steel, and exhibits characteristics similar to stainless steel with regard to corrosion resistance. A number of studies reported that the chromium content in steel has a significant effect on resistance to wall thinning [WCAP-14757, Section 3.3.1]. The J-tubes (nozzles) attached to the feedring of each generator are of nickel-based alloy construction, and therefore are also resistant to wall thinning due to FAC. Loss of material due to the corrosive impacts of alternate wetting and drying are aging effects for carbon steel/alloy steel in locations subject to alternate wetting and drying that may concentrate contaminants above the bulk fluid levels, and result in crevice and/or pitting corrosion. Based upon a review of the vendor manual and associated drawings [1MS-94B-1366], no locations subject to alternate wetting and drying were identified in the treated water (secondary side) environment of the Steam Generators. On the secondary side of each Steam Generator, feedwater enters where it mixes with recirculating water that has previously passed through the tube bundle and is essentially at saturation temperature. The combined circulation flow mixture picks up heat and steam is created [WCAP-14757, Section 2.1], both contain sufficient moisture that exposed surfaces are continuously wetted and no drying occurs. Therefore, loss of material/cracking due to the corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for the carbon steel/alloy steel sub-components of the Steam Generators that are exposed to the treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel/alloy steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in Chemistry Procedure CP-615, a main feature of secondary water chemistry is All Volatile Treatment (methoxypropylamine and carbohydrazide, with ammonia as necessary). Nitrite corrosion inhibitors are not used. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel components of the Steam Generators that are exposed to a treated water environment. Particulate fouling is an aging effect for carbon steel/alloy steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or reservoir. Particulate fouling affects only heat transfer surfaces and only the heat transfer function. The carbon or low alloy steel secondary side Steam Generators sub-components do not meet these conditions [D-302-601, 1MS-94B-1366, RC DBD]. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for the carbon steel/alloy steel sub-components of the Steam Generators that are exposed to treated water/steam. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, primary side, of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the carbon/alloy steel Steam Generator sub-components that are exposed to treated water/steam.
RC1f	A-RC1f-	The relevant conditions could exist in the treated water (Secondary Side) environment of the Steam Generators for a loss of material due to

System ID	Age Notes ID	Age Notes
	k	crevice and pitting corrosion; cracking due to stress corrosion cracking (SCC), including Intergranular Attack (IA), or fabrication flaw growth at welds caused by service loading; and loss of material due to wear (fretting) to occur [TR00160-010, Attachment II, WCAP-14757]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject nickel-based alloy sub-components of the Steam Generators that are exposed to treated water/steam. SCC has been observed in high-purity water (i.e. low sulfates and halogens -- less than 100 ppb and 150 ppb respectively) at temperatures greater than 200°F and dissolved oxygen levels greater than 100 ppb. While nickel-based alloys are generally more resistant to SCC in the presence of impurities and oxygenated water, the threshold values used for austenitic stainless steels were conservatively assumed to apply to nickel-based alloys, i.e., sulfates (>100 ppb), chlorides (>150 ppb) and fluorides (>150 ppb). [TR00160-010, Attachment II] Additionally, nickel-based alloys, particularly weld metal and/or buildup, are susceptible to the growth of fabrication flaws (microscopic damage) due to service loading that leads to cracking at the most highly affected locations [WCAP-14757, Section 3.1]. No material/fabrication flaws have been identified to date in the Delta-75 Steam Generators. However, this does not preclude the possibility of microscopic (undetected) flaws beneath the resolution of examination equipment at the time of fabrication/inspection . As such, flaw growth is conservatively considered an aging effect requiring management for subject Steam Generator sub-components. Loss of tube material due to wear (fretting) resulting from the fluidelastic vibration is an aging effect requiring evaluation for applicable Steam Generator sub-components. Fluidelastic vibration at the sub-component interfaces whose relative motion is not completely restrained, such as Tubes and Anti-Vibrational Bars (AVB)s. Tubes in the U-bend region of steam generator tube bundles showed some at the inersections with the AVBs. [WCAP-14757, Section 3.4.2.1]. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in nickel-based alloy in a treated water/steam environment. The existing "In-Service Inspection (ISI) Plan" will manage cracking due to flaw growth at welds for applicable sub-components. The ISI Plan manages cracking through a combination of visual, surface and volumetric examinations. The existing "Steam Generator Management Program" will manage wear (fretting) of the U-tubes and will supplement the Chemistry Program for management of the other identified aging effects for pertinent sub-components. Eddy current examinations of the steam generator tubes are the foundation of this aging management program. These programs, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1f	A-RC1f-I	The relevant conditions do not exist in the treated water/steam environment (secondary side) of the Steam Generators for the following aging effects to occur in nickel-based alloys [TR00160-010, Attachment III]: Fouling due to particulates is an aging effect for heat exchanger where the supply originates at the bottom of a tank. Fouling is an aging

System ID	Age Notes ID	Age Notes
		effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). Degradation of heat transfer performance of the steam generator tube bundle can occur with time as the result of scale formation on the heat transfer tube surfaces. In determining the required heat transfer surface area in the design of the steam generator, an overall tube fouling factor is employed to compensate for the formation of scale on the tube. A typical value used to compensate for steam generator tube fouling is 0.00005°F-hr-ft2/Btu. The degree of fouling that may occur is, in effect, addressed as a specified design margin included into the steam generator. Steam generator fouling, which is compensated for in the design of the steam generator has no significant effect on the intended function of the steam generator. [WCAP-14757, Section 3.8] The fouling factor of the Delta-75 Steam Generators is 0.00011-hr-sg ft-°F/Btu [Specification 411A78]]. As such, tube fouling is not an aging effect requiring management during the period of extended operation for nickel-based alloys exposed to borated water. Additionally, the existing "Chemistry Program" and "Steam Generator Management Program" provide management for other aging effects, as described in note A-RC1f-k, which would provide further assurance that fouling would not impact Steam Generator intended function during the period of extended operation. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect for alloy steel and stainless steel cladding in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion. As described above, there are no Steam Generator sub-components subject to alternate wetting and drying. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the nickel-based alloy sub-components of the Steam Generators which are exposed to treated water/steam. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, primary side, of 650°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the nickel-based alloy Steam Generator sub-components that are exposed to treated water/steam. Loss of material due to mechanical wear caused by foreign/loose objects in the Steam Generator is an aging effect requiring evaluation. Two of the domestic steam generator tube rupture events to date were attributed to loose and foreign objects. Objects such as a metallic ruler, weld rods, and a coiled spring are known to have caused tube penetration. Addressing the presense of loose objects in the secondary side of the steam generators, an evaluation can be performed of the potential of the object to cause impact/sliding wear. Based on the estimated wear times (to a minimum allowable wall), an engineering judgement can be made concerning the potential for tube degradation due to the loose objects wearing on the tubes for a given operating cycle, [WCAP-14757, Section 3.4] When and if loose/foreign objects are discovered during secondary side inspectiions during the currrent operating term, the objects are either removed, or if removal is not feasible, an evaluation is performed to determine the maximum operating period between eddy current and/or visual inspections. As such, and consistent with TR00160-010, Attachment I, loss of material due to mechanical wear from loose/foreign objects is considered an active, fast-acting, "event driven" degradation mechanism that would be identified and corrected during the current operating term. Therefore, loss of material due to mechanical wear from loose/foreign objects is not an aging effect requiring management for the nickel-based alloy sub-components of the Steam Generators that are exposed to treated water/steam.

System ID	Age Notes ID	Age Notes
RC1f	A-RC1f-m	The relevant conditions could exist in the treated water/steam (secondary side) environment of the Steam Generators for a loss of material due to crevice and pitting corrosion, cracking due to stress corrosion cracking (SCC), including Intergranular Attack (IA), to occur [TR00160-010, Attachment III, WCAP-14757]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel sub-components of the Steam Generators that are exposed to treated water/steam. SCC has been observed in high-purity water (i.e. low sulfates and halogens -- less than 100 ppb and 150 ppb respectively) at temperatures greater than 200°F and dissolved oxygen levels greater than 100 ppb. As discussed in TR00160-020, the existing "Chemistry Program" will manage the conditions required for loss of material due to crevice corrosion (if oxygen is >100 ppb and chlorides >150 ppb), loss of material due to pitting corrosion (if oxygen is >100 ppb and chlorides and fluorides >150 ppb and/or sulfates >100 ppb), and cracking due to stress corrosion cracking/intergranular attack (if oxygen is >100 ppb at T>200°F or if chlorides and/or fluorides >150 ppb and/or sulfates >100 ppb at T>140°F) to occur in stainless steel in a treated water/steam environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RC1f	A-RC1f-n	The relevant conditions do not exist in the treated water/steam (secondary side) environment of the Steam Generators for the following aging effects to occur in stainless steel [TR00160-010, Attachment III]: Fouling due to particulates is an aging effect for heat exchanger where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). However, as clarified in WCAP-14757, fouling is a concern for Steam Generator tube surfaces only [WCAP-14757, Section 3.8]., which are nickel-based rather than stainless steel. Therefore, fouling due to pariculates is not an aging effect requiring management for the stainless steel sub-components of the Steam Generators which are exposed to treated water/steam. Loss of material/cracking due to corrosive impacts of alternate wetting and drying is an aging effect stainless steel in locations that may concentrate contaminants above bulk fluid levels, resulting in crevice/pitting corrosion or stress corrosion. As described above, there are no Steam Generator sub-components subject to alternate wetting and drying. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management for the stainless steel sub-components of the Steam Generators which are exposed to treated water/steam. Reduction of fracture toughness due to thermal aging (embrittlement) of cast austenitic stainless steel (CASS) normally exposed to temperatures greater than or equal to 482 °F. While primary side Steam Generator temperatures are well above 482°F (650°F) [RC DBD], the stainless steel material of subject Steam Generator sub-components exposed to treated water/steam, is not CASS. The tube support plates, including flow distribution baffle and AVBs are SA-240 Type 405 and SA-479 Type 405 respectively [1MS-94B-1366]. Therefore, a reduction of fracture toughness due to thermal aging is not an aging effect requiring management for stainless steel sub-components of the Steam Generator which are exposed to treated water/steam. Creep is the time-dependent plastic deformation (distortion) of a material subjected to a constant stress that is normally below the elastic

System ID	Age Notes ID	Age Notes
		limit. Creep occurs at elevated temperatures where continuous deformation takes place due to a constant load. The creep effects are judged to be insignificant for steam generator materials below 1000°F [WCAP-14757, Section 3.6]. Steam Generator design temperature, secondary side, of 600°F [1MS-94B-036], ensures that components in the same vicinity will not be exposed to temperatures in the creep range. As such, distortion due to creep is not an aging effect requiring management for the stainless steel Steam Generator sub-components that are exposed to treated water/steam.
RD	A-RD-a	The relevant conditions could exist in the borated water environment of the Roof Drains (RD) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the RD System that are exposed to a borated water environment. As discussed in TR00160-020, the Reactor Building Cooling Unit Inspection will assess the condition of cooling unit drain pans and drains in order to detect and characterize, if any, a loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) in stainless steel exposed to a water with accumulated boric acid residue. This activity is a one-time inspection and when performed will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under CLB conditions.
RD	A-RD-b	The relevant conditions do not exist in the borated water environment of the Roof Drains (RD) System for the following aging effects to occur [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, none of the stainless steel components within the license renewal evaluation boundaries of the RD System, that are exposed to a borated water environment, are subject to temperatures continuously above 482°F [Dwg. D-302-824 and HVAC DBD, Section 3.1.1]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the RD System that are exposed to a borated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the RD System that are exposed to a borated water environment [Dwg. D-302-824 and TR00160-002, Attachment XI]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the RD System that are exposed to a borated water environment. Heat exchanger fouling due to precipitation is an aging effect attributed to the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the RD System that are exposed to a borated water environment [Dwg. D-302-824,and TR00160-002, Attachment XI]. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel

System ID	Age Notes ID	Age Notes
		components/component types of the RD System that are exposed to a borated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. The Reactor Building Cooling System has four reactor building cooling units (RBCUs), XAA-0001A-AH, -0001B, -0002A and -0002B, each capable of providing 33-1/3% of normal system cooling capacity [FSAR, Section 9.4.8.2.1]. During normal plant operation, three out of four RBCUs are operating [HVAC DBD, Section 3.1.1.4.3 and FSAR, Section 6.2.2.2.2.2.1]. Note 2.1.a of System Operating Procedure, SOP-114, "Reactor Building Ventilation System" [SOP-114], states: "To increase the stay times for teams entering containment, four RBCUs may be placed in service. The normal and preferred lineup is three RBCUs running in fast speed." Other than providing instructions to start three or four RBCUs in fast speed, SOP-114 does not contain any other guidance for placing an RBCU in service, or removing an RBCU from service. Absent specific instructions concerning how the four RBCUs are operated, and in particular, how often the unit in standby is placed in service, there is no basis to support frequent swapping of the RBCUs, and in turn, the RD System drain lines being exposed to alternate wetting and drying. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the RD System that are exposed to a borated water environment.
RH	A-RH-a	The relevant conditions could exist in the borated water environment of the Residual Heat Removal (RH) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject stainless steel components/component types in the Residual Heat Removal System that are exposed to a borated water environment with the following clarifications. During normal plant operation, the RH System is not in service but is aligned and ready for operation as part of the Safety Injection System. The RH System is typically started at shutdown under 350°F, and is normally below 140°F continuously during shutdown operations. During infrequent startup, cooldown and refueling activities, the majority of the RH System exceeds 140°F for short periods of time only, with the RHR heat exchanger inlet tube temperature of 139°F [RH DBD Section 2.15]. SCC is not a concern below 140°F, thus SCC is not a concern for the majority of the RH System during normal plant operation. However, there are Class 2 portions of the RHR System that potentially could be greater than 140°F and thus susceptible to SCC during normal plant operation. These portions include the 3/4" flow restrictor piping between the Class 1 boundary valves and the drain piping to valves RH-4A/B identified on E-302-641. Also, piping and components immediately downstream of Class 1 boundary valves 8702A/B with the Reactor Coolant System may exceed 140°F. The 3/4" piping to valves RH-16A/B are sufficiently far enough from RC system temperature source to be below 140°F. The RH System Class 1 piping and Class 1 boundary valves are addressed in the Class 1 evaluation [TR00160-011]. Even though SCC is not applicable to the majority of the stainless steel components/component types in the RH System due to

System ID	Age Notes ID	Age Notes
		temperatures being consistently below 140°F, no distinction has been made herein for License Renewal purposes and stainless steel components/component types of the RH System are considered to be susceptible to cracking due to SCC. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RH	A-RH-b	The relevant conditions do not exist in the borated water environment of the Residual Heat Removal System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the Screening Report [TR00160-002], there are no alternately wetted and dried borated water environments for the stainless steel components within the license renewal boundaries of the Residual Heat Removal System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a borated water environment. Reduction in fracture toughness is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. The Residual Heat Removal System operates at less than 482°F [RH DBD, Section 2.3]. The majority of Class 2 RH piping and valves discussed herein are expected to be less than 482°F with the RH System isolated from the RC System during normal plant operation. However, Class 1 boundary valves with the Reactor Coolant System, a small portion of Class 1 RH piping connected to the RC System and several smaller portions of Class 2 RH piping may exceed 482°F. These small portions of Class 2 piping shown on E-302-641 include the 3/4" flow restrictor piping between the Class 1 boundary valves and drain piping to valves RH-4A/B. Bills of Material show these small valves are not made of CASS, and thus are not a concern. Pipe Spec. SP-545 lists applicable Class 2 piping (601) as not being cast austenitic stainless steel (CASS) and so this aging mechanism is not a concern. Two Class 2 relief valve bodies (8708A & B) located in Containment downstream of the Class 1 boundary valves are fabricated from CASS material [1MS-25-028]. Based upon a sufficient piping distance (in this case > 40 feet in length as shown on E-304-641, R11) to reduce stagnant water temperatures, these two valves are not expected to exceed 482°F. The Class 1 piping and Class 1 boundary valves are addressed in the Class 1 evaluation [TR00160-011]. As such, reduction in fracture toughness is not an aging effect requiring management during the period of extended operation for non-Class 1 stainless steel components/component types of the Residual Heat Removal System that are exposed to a borated water environment. Precipitation fouling of heat exchangers in a borated water environment is caused by precipitation of borated compounds. As long as the

System ID	Age Notes ID	Age Notes
		component is water-solid, precipitation fouling is not expected to occur. The subject heat exchangers within the license renewal boundaries of the RH System are expected to remain water-solid. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a borated water environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank [E-302-641]. RH System heat exchanger inlet sources are not at the bottom of a tank. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a borated water environment.
RH	A-RH-c	The relevant conditions could exist in the treated water environment of the Residual Heat Removal System for loss of material due to crevice, pitting, general and galvanic corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types in the Residual Heat Removal System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb), pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb), general corrosion (if oxygen is > 100 ppb) and galvanic corrosion (if chlorides and/or fluorides > 150 ppb) to occur in carbon steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RH	A-RH-d	The relevant conditions do not exist in the treated water environment of the Residual Heat Removal System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams noted in the screening report [TR00160-002], there are no alternately wetted and dried treated water environments for the carbon steel components within the license renewal boundaries of the Residual Heat Removal System. As such, loss of material due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. EPRI Report NSAC-202L-R1 states that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F or operated less than 2% of the time. D-302-611 depicts operating temperature of Component Cooling Water at less than 200°F. As such, erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. Cracking due to stress corrosion cracking is a potential aging effect for carbon steel components in treated water environments in systems

System ID	Age Notes ID	Age Notes
		using nitrite based corrosion inhibitors, such as Chilled Water, Switchgear Cooling and Diesel Generator cooling. Component Cooling (CC) Water to the RH System Heat Exchangers does not use nitrite-based corrosion inhibitors [Chemistry Procedure CP-632, Section 3.3]. As such, cracking due to stress corrosion cracking is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. The RH System heat exchangers shell side fluid is treated water from the Component Cooling Water System. The Component Cooling Water system may be subject to particulates from the Component Cooling Surge Tank as shown on D-302-611. Fouling affects only the heat transfer function, and no carbon steel heat exchanger components have a heat transfer function. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment.
RH	A-RH-e	The relevant conditions could exist in the sheltered environment of the Residual Heat Removal System for loss of material due to general and boric acid corrosion (aggrressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types in the Residual Heat Removal System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage the loss of material due to general corrosion and the existing Boric Acid Corrosion Surveillances will manage the loss of material due to boric acid corrosion in carbon steel in a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RH	A-RH-f	The relevant conditions could exist in the treated water environment of the Residual Heat Removal System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject stainless steel components/component types in the Residual Heat Removal System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program, will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and pitting corrosion (if oxygen is > 100 ppb and chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RH	A-RH-g	The relevant conditions do not exist in the treated water environment of the Residual Heat Removal System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-002], there are no alternately wetted and dried treated water environments for the stainless steel components within the license renewal boundaries of the Residual Heat Removal System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and

System ID	Age Notes ID	Age Notes
		drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. Reduction in fracture toughness is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. The Residual Heat Removal System operates at less than 482°F [RH DBD, Section 2.3]. D-302-611 depicts operating temperature of Component Cooling (CC) Water on the shell side of the RH System Heat Exchangers at less than 200°F. As such, reduction in fracture toughness is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for stainless steel components in treated water environments with temperatures in excess of 140°F. The RHR heat exchanger shell side outlet temperature is 116°F [RH DBD Section 2.15]. Also, D-302-611 depicts operating temperatures of Component Cooling Water System delivery to the RH System heat exchangers at 120°F. As such, cracking due to stress corrosion cracking is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. There is the potential for an accumulation of materials in the Component Cooling (CC) Surge Tank that could cause fouling in heat exchangers. Fouling due to particulates will not affect the pressure boundary function of the heat exchanger components. Heat exchanger components perform a heat transfer function at the tube surface and the CC System treated water is on the external surface of the tubes. The CC System's foulants are adequately managed with the Chemistry program, and so fouling due to particulates will not occur on the exterior surface of the tubes and the heat transfer function will not be affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the Residual Heat Removal System that are exposed to a treated water environment.
RH	A-RH-h	The relevant conditions do not exist in the sheltered environment of the Residual Heat Removal (RH) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon and low alloy steels in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Portions of the RH System are in operation during plant normal operation and during accident operation and they operate at temperatures which are greater than the sheltered environment ambient temperature [D-302-641]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the RH System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building

System ID	Age Notes ID	Age Notes
		wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The RH System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [RH DBD and TR00160-002, Attachment XIV]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable carbon steel components/component types of the RH System that are exposed to a sheltered environment.
RH	A-RH-j	The relevant conditions do not exist in the sheltered environment of the Residual Heat Removal (RH) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The RH System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [RH DBD and TR00160-002, Attachment XIV]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable stainless steel components/component types (piping and tubing) of the RH System that are exposed to a sheltered environment.
RM	A-RM-a	The relevant conditions do not exist in the treated water environment of the Radiation Monitoring (RM) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and borated water screening report [TR00160-002, Attachment IX], no alternately wetted and dried treated water environments exist within the license renewal evaluation boundaries of the RM System. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the treated water environment. Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel in treated water where temperatures are greater than 482°F. According to the information provided in the System Data Table on D-302-611, the highest treated water temperature within the license renewal evaluation boundaries of the RM System during normal operation is 120°F. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the treated water environment.

System ID	Age Notes ID	Age Notes
		Particulate fouling is an aging effect for stainless steel heat exchanger components in a treated water environment where the water supply originates at the bottom of a tank or reservoir. As described in TR00160-002, Attachment IX, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the RM System. Therefore, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in a treated water environment with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of the System Data Table on flow diagram D-302-611 and the borated water screening report [TR00160-002, Attachment IX], demonstrates that none of the stainless steel components within the license renewal evaluation boundaries of the RM System (i.e., instrumentation, pipe, tanks, tube & tube fitting and valves associated with RML0002A, B) are continuously exposed to the threshold temperature of 140°F for cracking due to stress corrosion cracking (SCC) in treated water. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the treated water environment.
RM	A-RM-b	The relevant conditions could exist in the treated water environment of the Radiation Monitoring (RM) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the RM System that are exposed to the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in the treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RM	A-RM-c	The relevant conditions do not exist in the borated water environment of the Radiation Monitoring (RM) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel in borated water where temperatures are greater than 482°F. According to the information provided in the System Data Tables on D-302-651 and D-302-771, the highest borated water temperature within the license renewal evaluation boundaries of the RM System during normal operation is 150°F. Information provided on D-806-005 indicates that 150°F may be conservatively high. Therefore, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the borated water environment. Particulate fouling is an aging effect for stainless steel heat exchanger components in a borated water environment where the water supply originates at the bottom of a tank or reservoir. As described in TR00160-002, Attachment IX, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the RM System. Therefore, heat exchanger fouling due to particulates is not

System ID	Age Notes ID	Age Notes
		an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the borated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the borated water screening report [TR00160-002, Attachment IX], no alternately wetted and dried borated water environments exist within the license renewal evaluation boundaries of the RM System. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the borated water environment. Precipitation fouling can be an aging effect for heat exchanger components in a borated water environment. As described in TR00160-002, Attachment IX, no stainless steel heat exchanger components are located within the license renewal evaluation boundaries of the RM System. Therefore, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the borated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in a borated water environment with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of the System Data Tables on flow diagrams D-302-651 and -771, the borated water screening report [TR00160-002, Attachment IX] and the SF DBD, demonstrates that except for RML0004, the maximum temperature that RM System components are exposed to is 115°F. RML0004 is exposed to the spent fuel pool (SFP) cooling heat exchangers inlet temperature. The SF DBD indicates the normal (original rating) value to be 135°F and the peak (original rating) value to be 146°F; however, it also states that the SFP water temperature is maintained less than 140°F. This means that more than likely, none of the stainless steel components within the license renewal evaluation boundaries of the RM System, would be continuously exposed to the threshold temperature of 140°F for any meaningful length of time. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components of the RM System that are exposed to the borated water environment.
RM	A-RM-d	The relevant conditions could exist in the borated water environment of the Radiation Monitoring (RM) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the RM System that are exposed to the borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in the borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
RM	A-RM-e	The relevant conditions could exist in the sheltered environment of the Radiation Monitoring (RM) System for loss of material due to

System ID	Age Notes ID	Age Notes
		microbiologically influenced corrosion [MIC] (pipe only) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe only) in the RM System that are exposed to the sheltered environment. Loss of material due to MIC is only a concern for pipe in the RM System and is not an applicable aging effect for the following stainless steel components/component types in the RM System: instrumentation (including tube and tube fittings), tanks and valves. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components in a sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
SA	A-SA-a	The relevant conditions could exist in the air-gas environment of the Station Service Air (SA) System for loss of material due to general corrosion to occur [TR00160-010, Attachment VI]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types (pipe and fittings, and valves) in the SA System that are exposed to an air-gas environment. As discussed in TR00160-020, the Service Air System Inspection will assess the condition of pertinent components to detect and characterize a loss of material due to general corrosion (oxygen and moisture) in carbon steel in an air-gas environment, if any. This activity is a one-time inspection and will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under all CLB conditions.
SA	A-SA-b	The relevant conditions do not exist in the air-gas environment of the Station Service Air (SA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VI]: Loss of material due to galvanic corrosion is an aging effect in materials exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Normal operating temperature of the SA System is 110°F [D-302-241]. For the Service Air system, the carbon steel components are subject to compressed air with some moisture remaining in the compressed air. However, this aging mechanism does not occur when the metals are completely dry (i.e., they must be completely wetted) and SA System wetted locations are not expected to exist. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SA System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the air-gas screening report [TR00160-006], this environment is expected to be an

System ID	Age Notes ID	Age Notes
		environment which will not have cyclic wet and dry conditions and not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SA System that are exposed to an air-gas environment.
SA	A-SA-c	The relevant conditions could exist in the Reactor Building environment of the Station Service Air (SA) System for loss of material due to general corrosion and loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types (pipe and valves) in the SA System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion (oxygen and moisture) and the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water) in carbon steel in the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SA	A-SA-d	The relevant conditions do not exist in the Reactor Building environment of the Station Service Air (SA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon steel in the Reactor Building environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry. The SA System normally operates at a temperature of 110°F [D-302-241], which is not well below the Reactor Building environment ambient temperature. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the SA System that are exposed to a Reactor Building environment.
SA	A-SA-e	The relevant conditions could exist in the sheltered environment of the Station Service Air (SA) System for loss of material due to boric acid corrosion (aggressive chemical attack) and loss of material due to general corrosion to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SA System that are exposed to the sheltered environment. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (leaking borated water), and the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion (oxygen and moisture) for carbon steel in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component function(s) will be maintained under all CLB conditions.
SA	A-SA-f	The relevant conditions do not exist in the sheltered environment of the Station Service Air (SA) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (for insulated components) are aging effects for carbon steel components in systems

System ID	Age Notes ID	Age Notes
		with external surface temperatures significantly below the ambient conditions. The SA System normally operates at a temperature of 110°F [D-302-241], which is not well below the sheltered environment ambient temperature. Therefore, loss of material due to galvanic and pitting corrosion are not aging effects requiring management during the period of extended operation for the carbon steel components/component types of the SA System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for carbon and low alloy steel in the sheltered environment for piping, tubing and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (i.e., underground, embedded) below the 425' elevation. There are no license renewal boundary in-scope components in the SA system matching these requirements [E-304-722, CHAMPS]. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the carbon steel components/component types of the SA System that are exposed to the sheltered environment.
SA	A-SA-g	The relevant conditions do not exist in the air-gas environment of the Station Service Air (SA) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VI]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. When evaluating the aging effects for components exposed to an air or gas environment, it is generally assumed that the atmospheric environments include airborne contaminants, and that these contaminants are present in all but the purest of gases. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the air-gas screening report [TR00160-006], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SA System that are exposed to an air-gas environment. Cracking due to stress corrosion cracking (SCC) can be an aging effect in stainless steel exposed to an air-gas environment. It is conservatively assumed that sufficient stresses exist to initiate SCC, given an environment conducive to the progression of SCC. It is also assumed that the level of contaminants is not sufficient to produce significant corrosion rates, unless the component is subjected to cyclic wet and dry conditions that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-006], this environment is expected to be an environment which will not have cyclic wet and dry conditions and will not have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. Cracking due to intergranular attack (IGA) is a concern in wetted locations where the temperature is greater than 200°F. The SA System normally operates at a temperature of 110°F [D-302-241], which is significantly less than 200°F. As such, cracking due to SCC and IGA are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SA System that are exposed to an air-gas environment.
SA	A-SA-h	The relevant conditions do not exist in the sheltered environment of the Station Service Air (SA) System for the following aging effects to

System ID	Age Notes ID	Age Notes
		occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) has been identified as an aging effect requiring system specific evaluation for stainless steel in the sheltered environment for piping, tubing and ductwork that pass between pertinent buildings through a non-fire seal penetration or enters the building from outside (I.e., underground, embedded) below the 425' elevation. There are no license renewal boundary in-scope components in the SA system matching these requirements [E-304-722, CHAMPS]. Therefore, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for the stainless steel components/component types of the SA System that are exposed to the sheltered environment.
SF	A-SF-a	The relevant conditions could exist in the borated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for the carbon steel/stainless steel components/component types in the SF, FH, and RW Systems that are exposed to a borated water environment. The channel heads of the Spent Fuel Cooling Heat Exchangers are stainless steel with carbon steel flanges [1MS-11-007]. As only the stainless steel portions of the channel heads are in contact with borated water, aging effects applicable to carbon steel in borated water are not discussed as applicable to this component. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel/stainless steel in a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SF	A-SF-b	The relevant conditions do not exist in the borated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Cracking due to stress corrosion cracking is an aging effect in borated water environments with temperatures in excess of 140°F. The SF DBD states that the system is designed to maintain fuel pool water at <146°F when not in accident or failed component conditions. The system is normally operated at temperatures well below 140°F [SF DBD, Section 2]. Below 140°F, stress corrosion cracking is not an aging effect requiring management. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. As discussed above, the SF, FH, and RW Systems are designed to operate at <146°F. Therefore reduction of fracture toughness due to thermal aging is not an aging mechanism requiring management for the stainless steel components/component types of the SF, FH, and RW Systems which are exposed to borated water.

System ID	Age Notes ID	Age Notes
		Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (I.e., heat exchanger tubes). Water circulated in the SF, FH, and RW Systems is typically drawn from the fuel pool, but not from the bottom of the pool. Also, spent fuel pool purifcation includes demineralizers and filters to remove particulates. Therefore, fouling due to particulates is not an aging effect requiring management. Precipitation fouling of heat exchangers in a borated water environment is caused by precipitation of borated compounds. As long as the component is water-solid, precipitation fouling is not expected to occur. The subject heat exchangers within the license renewal boundaries of the subject systems are expected to remain water-solid. As such, fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SF System that are exposed to a borated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to borated water and subject to cycles of wetting and drying. The only stainless steel components within the license renewal evaluation boundaries of the SF, FH, or RW Systems subject to alternate cycles of borated water wetting and drying are the Refueling Water Storage Tanks (RWSTs). For the RWSTs, this aging effect requires management as described in Note A-SF-c. The drain pipe between the refueling cavity and the Reactor Coolant Drain Tank is wetted during a refueling outage and drained off during normal operation. Any borated water which may not be drained off is standing and subject to evaporation if it is not replenished. Long (18 month) cycles do not concentrate contaminants enough to cause loss of material and cracking. Therefore, loss of material/cracking due to corrosive impacts of wetting and drying are not aging effects requiring management except for the internal surfaces of the RWSTs.
SF	A-SF-c	The relevant conditions could exist in the borated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to crevice and pitting corrosion and loss of material/cracking due to corrosive impacts of alternate wetting and drying (Refueling Water Storage Tank only) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the SF, FH, and RW Systems that are exposed to a borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel in a borated water environment. Also, the one-time Above Ground Tank Inspection will assess conditions in order to detect and characterize a loss of material and cracking due to corrosive impacts of wetting and drying in the air-space of the RWST. This program/activity, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SF	A-SF-d	The relevant conditions could exist in the sheltered environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the SF, FH, and RW Systems that are exposed

System ID	Age Notes ID	Age Notes
		to the sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances, will manage the loss of material due to general and boric acid corrosion, respectively, in carbon steel exposed to the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) wil be maintained under CLB conditions.
SF	A-SF-e	The relevant conditions do not exist in the sheltered environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effect to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher on the galvanic series. It can be shown that the subject components' exterior surfaces are not at a temperature significantly less than ambient temperature, which would lead to condensation on the component's exterior surface. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the carbon steel components within the license renewal evaluation boundaries of the SF, FH, and RW Systems which have borated (SF System) water within and are exposed to the sheltered environment are limited to the flanges of the SF heat exchanger channel heads. SF System water is maintained below 140°F [SF DBD]. Thus, the channel head outer surfaces are generally at or above ambient temperatures and are not susceptible to the formation of condensation. Those components which have treated (Component Cooling System) water within and are exposed to the sheltered environment are limited to the SF heat exchanger shells. The Component Cooling System is normally operated between 95 - 105°F [CC DBD, Section 2]. Thus, the shell outer surfaces are generally at or above ambient temperatures and are not susceptible to the formation of condensation. Thus, it has been shown that the subject components' exterior surfaces are at or above ambient temperature and would not be subject to wetted locations. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SF, FH, and RW Systems that are exposed to the sheltered environment. Loss of material due to pitting corrosion is an aging effect for carbon steel external surfaces which are insulated, but otherwise exposed to the sheltered environment when the system internal environment operates at well below ambient temperatures. As described above, the SF, FH, and RW System carbon steel components are generally at temperatures at or above ambient. Therefore, loss of material due to pitting corrosion is not an aging effect requiring management.
SF	A-SF-f	The relevant conditions could exist in the treated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the SF, FH, and RW Systems that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice

System ID	Age Notes ID	Age Notes
		corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and pitting corrosion (if oxygen is > 100 ppb, halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SF	A-SF-g	The relevant conditions do not exist in the treated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion cracking is an aging effect in treated water environments with temperatures in excess of 140°F. The only stainless steel components within the license renewal evaluation boundaries of the SF, FH, and RW Systems which are exposed to treated water are the tubes and tube sheets of the SF heat exchangers. The source of that treated water is the Component Cooling (CC) System. The CC DBD states that the system is designed to operate normally between 95 - 105°F. Below 140°F, stress corrosion cracking is not an aging effect requiring management for the stainless steel components/component types of the SF, FH, and RW Systems which are exposed to treated water. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. As discussed above, the CC System is designed to operate between 95 - 105°F. Therefore reduction of fracture toughness due to thermal aging is not an aging mechanism requiring management. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to treated water and subject to cycles of wetting and drying. As described in TR00160-002, Attachment III and shown on the mechanical system flow diagram [E-302-651], there are no mechanical components/component types within the license renewal evaluation boundaries of the SF, FH, and RW System which are exposed to wet/dry cycles of treated water. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management. Heat exchanger fouling due to particulates is an aging effect where foulants (such as corrosion products) accumulate on the heat transfer surfaces. This typically occurs where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer function (i.e., tubes) of heat exchangers. For the SF System heat exchangers, XHE-7A/B, component cooling water circulates through the shell side; thus, the outside surface of the tubes is exposed to treated water. In the design configuration of the CC System, there is the potential for an accumulation of particles in the component cooling water surge tank, XTK-3. However, due to the continuous, turbulent flow through the heat exchanger shell, heat exchanger fouling due to particulates is not expected to occur on the exterior surface of the tubes and the heat transfer function is not expected to be adversely affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SF System that are exposed to a treated water environment. [SF and CC DBDs, and D-302-611 and -651]
SF	A-SF-h	The relevant conditions could exist in the treated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to crevice, galvanic, general, and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the SF, FH, and RW Systems that are exposed to treated water.

System ID	Age Notes ID	Age Notes
		As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to galvanic corrosion (if chlorides or fluorides > 150 ppb), loss of material due to general corrosion (if oxygen is > 100ppb), and loss of material due to pitting corrosion (if oxygen is > 100 ppb, halogens > 150 ppb or sulfates > 100ppb) to occur in carbon steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SF	A-SF-ii	The relevant conditions do not exist in the treated water environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to erosion-corrosion is an aging effect applicable to carbon steel exposed to treated water. Erosion-corrosion is not an aging effect requiring management in systems which are highly oxygenated, superheated, or single phase below 200°F. The only carbon steel components within the license renewal evaluation boundaries of the SF, FH, and RW Systems which are exposed to treated water are the shells of the SF heat exchangers. The source of that treated water is the Component Cooling (CC) System. The CC DBD states that the system is designed to operate normally between 95 - 105°F. Below 200°F, erosion-corrosion is not an aging effect requiring management during the period of extended operation for the carbon steel components/component types of the SF, FH, and RW Systems which are exposed to treated water. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel in closed recirculating treated water systems in which nitrites are used as corrosion inhibitors. As described in the CC System DBD, corrosion inhibiting chemistry controls within the Component Cooling System include potassium chromates and not nitrites. Therefore, cracking due to SCC is not an aging effect requiring management. Fouling due to particulates is an aging effect which is applicable only to heat exchanger heat transfer surfaces (I.e., tubes). This aging effect is applicable to only the heat transfer component intended function, not the pressure boundary function. As such, fouling due to particulates is not an aging effect requiring management for the SF HX shells. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel components exposed to treated water and subject to cycles of wetting and drying. As described in TR00160-002, Attachment III and shown on the mechanical system flow diagram [E-302-651], there are no mechanical components/component types within the license renewal evaluation boundaries of the SF, FH, and RW Systems which are exposed to wet/dry cycles of treated water. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.
SF	A-SF-j	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VII]: Fouling due to particulates is an aging effect for heat exchanger heat transfer surfaces exposed to the ventilation environment. The only SF,

System ID	Age Notes ID	Age Notes
		FH, and RW components subject to the ventilation* environment are the Fuel Transfer Tube and pipe and valve bodies associated with the syphon breaker, purification, or refueling activities. Since none of these components are part of a heat exchanger, fouling due to particulates is not an aging effect requiring management for stainless steel components exposed to the ventilation* environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a ventilation* environment and subject to cycles of wetting and drying. The only stainless steel components within the license renewal evaluation boundaries of the SF, FH, or RW Systems subject to alternate cycles of wetting and drying are the Refueling Water Storage Tanks (RWSTs). See notes A-SF-b and A-SF-c for a discussion of this aging effect for the RW Storage Tank. Therefore, loss of material/cracking due to corrosive impacts of wetting and drying are not aging effects requiring management except for the internal surfaces of the RWSTs.
SF	A-SF-k	The relevant conditions do not exist in the sheltered environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for vulnerable stainless steel components/component types. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for stainless steel components/component types other than pipe, process tubing or ductwork. Therefore, loss of material due to MIC is not an aging effect requiring management for the stainless steel components (other than pipe) of the SF, FH, and RW Systems exposed to the sheltered environment.
SF	A-SF-l	The relevant conditions could exist in the sheltered environment of the Spent Fuel Cooling (SF), Fuel Handling (FH), and Refueling Water (RW) Systems for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe) in the SF, FH, and RW Systems that are exposed to the sheltered environment. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components in a sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SI	A-SI-a	The relevant conditions could exist in the borated water environment of the Safety Injection (SI) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the SI System that are exposed to a borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb and chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion (SCC) (either oxygen > 100 ppb and temperature > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel exposed to a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component

System ID	Age Notes ID	Age Notes
		intended function(s) will be maintained under CLB conditions.
SI	A-SI-b	The relevant conditions do not exist in the borated water environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, the SI System is not operating and none of the stainless steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a borated water environment, are subject to temperatures continuously above 482°F [SI DBD and Dwgs. E-302-691, -692 and -693]. There is the potential for piping and boundary valves, that interface with the Reactor Coolant System, to be in contact with borated water having a temperature greater than 482°F. However, the SI System Class 1 piping and boundary valves are specifically addressed in the evaluation of Class 1 piping and components [TR00160-011]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a borated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the SI System that are exposed to a borated water environment [Dwgs. E-302-691, -692 and -693 and TR00160-002, Attachment XV]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a borated water environment. Heat exchanger fouling due to precipitation is an aging effect attributed to the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the SI System that are exposed to a borated water environment [Dwgs. E-302-691, -692 and -693 and TR00160-002, Attachment XV]. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a borated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the SI System is not operating and none of the stainless steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a borated water environment, are subject to alternate wetting and drying [Dwgs. E-302-691, -692 and -693 and TR00160-002, Attachment XV]. The most likely source of this aging effect is in an accumulator tank, which has a cover gas of compressed nitrogen maintained over borated water. However, the environment within the accumulator is normally closed and isolated, with no opportunity for alternate wetting and drying to occur. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a borated water environment.

System ID	Age Notes ID	Age Notes
SI	A-SI-c	Not Used
SI	A-SI-d	The relevant conditions do not exist in the treated water environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking are aging effects for stainless steel exposed to treated water when oxygen is present. The only stainless steel components within the license renewal evaluation boundaries of the SI System which are exposed to treated water are the instrumentation tubing, fittings and root valves associated with the Reactor Building pressure bellows for pressure measurement. This instrumentation is filled with demineralized, de-aerated water and depicted on D-302-861; there is no means of air (oxygen) intrusion to the treated water. Therefore, loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking are not aging effects requiring management for the stainless steel components of the SI System exposed to treated water. Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, the SI System is not operating and none of the stainless steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a treated water environment, are subject to temperatures continuously above 482°F [SI DBD and Dwgs. E-302-691, -692 and -693 and D-302-861]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the SI System that are exposed to a treated water environment [Dwgs. E-302-691, -692 and -693 and D-302-861, and TR00160-002, Attachment XV]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the SI System is not operating and none of the stainless steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwgs. E-302-691, -692 and -693 and D-302-861, and TR00160-002, Attachment XV]. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to a treated water environment.
SI	A-SI-e	The relevant conditions could exist in the Reactor Building environment of the Safety Injection (SI) System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon

System ID	Age Notes ID	Age Notes
		steel components/component types in the SI System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SI	A-SI-f	The relevant conditions do not exist in the Reactor Building environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment IX]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher on the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the SI System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SI DBD and Dwgs. E-302-691, -692 and -693]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to a Reactor Building environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the SI System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a Reactor Building environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SI DBD and Dwgs. E-302-691, -692 and -693]. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to a Reactor Building environment.
SI	A-SI-g	The relevant conditions do not exist in the air-gas environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to general corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment. The only carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to an air-gas environment, are piping and valves located in the nitrogen supply header to the three accumulator tanks [Dwgs. E-302-691, -692 and -693, and TR00160-002, Attachment XV]. These components are in contact with compressed nitrogen gas that is considered dry and clean. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist

System ID	Age Notes ID	Age Notes
		air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The only carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to an air-gas environment, are piping and valves located in the nitrogen supply header to the three accumulator tanks [Dwgs. E-302-691, -692 and -693, and TR00160-002, Attachment XV]. These components and valves are in contact with compressed nitrogen gas that is considered dry and clean. Also, the nitrogen supply header is a closed system and not subject to alternate wetting and drying. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The only carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to an air-gas environment, are piping and valves located in the nitrogen supply header to the three accumulator tanks [Dwgs. E-302-691, -692 and -693, and TR00160-002, Attachment XV]. These components are in contact with compressed nitrogen gas that is considered dry and clean. Also, these components are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to an air-gas environment.
SI	A-SI-h	The relevant conditions do not exist in the air-gas environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. Except for the three accumulator tanks, all of the stainless steel components within the license renewal evaluation boundaries of the SI System that are exposed to an air-gas environment are in contact with compressed nitrogen gas that is considered dry and clean [Dwgs. E-302-691, -692 and -693, and TR00160-002, Attachment XV]. The nitrogen gas inside the accumulator tanks absorbs moisture from the liquid contents and is considered a moist gas. However, during normal plant operation, the SI System is not operating and is in a standby condition, with the accumulator tanks isolated from the rest of the SI System. Hence, the air-gas environment within the accumulator tank is not subject to alternate wetting and drying that may concentrate contaminates. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to an air-gas environment. Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. Except for the three accumulator tanks, all of the stainless steel components within the license renewal evaluation boundaries of the SI System that are exposed to an air-gas environment are in contact with compressed nitrogen gas that is considered dry and clean [Dwgs. E-302-691, -692 and -693, and TR00160-002, Attachment XV]. The nitrogen gas inside the accumulator tanks absorbs moisture from the liquid contents and is considered a moist gas.

System ID	Age Notes ID	Age Notes
		During normal plant operation, the SI System is not operating and is in a standby condition, with the tanks isolated from the rest of the SI System, and the maximum expected temperature inside the accumulator tanks being 120°F [Dwg. E-302-692]. As such, cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SI System that are exposed to an air-gas environment.
SI	A-SI-ii	The relevant conditions do not exist in the sheltered environment of the Safety Injection (SI) System for the following aging effect to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The SI System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [SI DBD and TR00160-002, Attachment XV]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable stainless steel components/component types (piping and tubing) of the SI System that are exposed to a sheltered environment.
SI	A-SI-j	The relevant conditions could exist in the sheltered environment of the Safety Injection (SI) System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SI System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SI	A-SI-k	The relevant conditions do not exist in the sheltered environment of the Safety Injection (SI) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher on the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the SI System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SI DBD and Dwgs. E-302-691, -692 and -693]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI

System ID	Age Notes ID	Age Notes
		System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the SI System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SI System, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SI DBD and Dwgs. E-302-691, -692 and -693]. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SI System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The SI System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [SI DBD and TR00160-002, Attachment XV]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable carbon steel components/component types of the SI System that are exposed to a sheltered environment.
SP	A-SP-a	The relevant conditions could exist in the borated water environment of the Reactor Building Spray (SP) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the SP System that are exposed to a borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb) and stress corrosion cracking (either oxygen > 100 ppb and temperature > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel exposed to a borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SP	A-SP-b	The relevant conditions do not exist in the borated water environment of the Reactor Building Spray (SP) System for the following aging effects to occur [TR00160-010, Attachment II]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, the SP System is in a standby condition and none of the stainless steel components within the license renewal evaluation boundaries of the SP System, that are exposed to a borated water environment, are

System ID	Age Notes ID	Age Notes
		subject to temperatures continuously above 482°F [SP DBD and Dwg. D-302-661]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a borated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the SP System that are exposed to a borated water environment [Dwg. D-302-661 and TR00160-002, Attachment X]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a borated water environment. Heat exchanger fouling due to precipitation is an aging effect attributed to the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers. However, there are no heat exchangers within the license renewal evaluation boundaries of the SP System that are exposed to a borated water environment [Dwg. D-302-661 and TR00160-002, Attachment X]. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a borated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminants. During normal plant operation, the SP System is in a standby condition and is aligned to receive water from the Refueling Water Storage Tank (RWST). The Reactor Building spray header outside containment isolation valves (CIVs), 3003A/B, are located in the auxiliary building between the spray pumps and the spray ring header inside containment. These valves are normally closed and are designed to automatically open following receipt of an engineered safety feature actuation signal (ESFAS). To verify their operability and performance in accordance with Technical Specification Surveillance Requirement 4.0.5, these CIVs are subject to periodic, in situ stroke time testing, which is described in Surveillance Test Procedure, STP-112.003, "Reactor Building Spray System Valve Operability Test" [STP-112.003]. Located downstream of these outside CIVs and inside the reactor building are spray check valves, 3009A/B, which serve as inside CIVs. The internal surface of the SP System piping and components downstream of these check valves is normally open to the reactor building ambient air (considered to be a ventilation environment). By design, this portion of the SP System is charged with borated water only while the system is operating under accident conditions. Depending on how the outside CIVs are specifically stroke time tested, will determine whether or not any piping and components located downstream of the spray header CIVs is exposed to borated water. It is reasonable to expect that the level of borated water downstream of these valves would tend to seek the RWST level during stroke time testing of the CIVs. The maximum possible height of water in the RWST would approximate an elevation of 467 ft. [TR00160-002, Attachment X]. The SP

System ID	Age Notes ID	Age Notes
		System piping supplying the spray header enters the reactor building through containment penetrations Nos. 401 and 303 [Dwg. D-302-661]. The elevation for both of these penetrations is 477 ft. [TR00160-002, Attachment X]. Since both containment penetrations are located above the maximum possible height of water in the RWST, the portion of the SP System inside containment will not be exposed to any borated water while testing the CIVs. Since the elevation of both reactor building spray header CIVs is 464 ft.-6 in. [Dwg. D-304-666], there is the possibility that the SP System piping between the CIVs and the containment penetrations could be exposed to borated water during valve testing. A review of STP-112.003 indicates that the SP System piping of interest is not drained following stroke time testing of these CIVs, and therefore, it can be conservatively assumed that a portion of the piping inside the auxiliary building is exposed to borated water. However, with the spray check valves present, the borated water is essentially trapped in a closed volume between the inside and outside CIVs with no opportunity for alternate wetting and drying to occur. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a borated water environment.
SP	A-SP-c	The relevant conditions could exist in the treated water environment of the Reactor Building Spray (SP) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the SP System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) and stress corrosion cracking (either oxygen > 100 ppb and temperature > 200°F; or chlorides/fluorides > 150 ppb and/or sulfates > 100 ppb and temperature > 140°F) to occur in stainless steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SP	A-SP-d	The relevant conditions do not exist in the treated water environment of the Reactor Building Spray (SP) System for the following aging effects to occur [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. During normal plant operation, the SP System is in a standby condition and none of the stainless steel components within the license renewal evaluation boundaries of the SP System, that are exposed to a treated water environment, are subject to temperatures continuously above 482°F [SP DBD and Dwg. D-302-661]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the SP System that are

System ID	Age Notes ID	Age Notes
		exposed to a treated water environment [Dwg. D-302-661]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, none of the stainless steel components within the license renewal evaluation boundaries of the SP System that are exposed to a treated water environment, are subject to alternate wetting and drying [TR00160-002, Attachment X and Dwg. D-302-661]. As such, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SP System that are exposed to a treated water environment.
SP	A-SP-e	The relevant conditions could exist in the sheltered environment of the Reactor Building Spray (SP) System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SP System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components and Boric Acid Corrosion Surveillances will manage loss of material due to general corrosion and boric acid corrosion (aggressive chemical attack), respectively, in carbon steel exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SP	A-SP-f	The relevant conditions do not exist in the sheltered environment of the Reactor Building Spray (SP) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher on the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the SP System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SP System that are exposed to a sheltered environment are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SP DBD and Dwg. D-302-661]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. During normal plant operation, the SP System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SP System that are exposed to a sheltered environment are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SP DBD and Dwg. D-302-661]. As such, loss of material due to pitting corrosion is not an aging effect requiring

System ID	Age Notes ID	Age Notes
		management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The SP System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [SP DBD and TR00160-002, Attachment X]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable carbon steel components/component types (piping) of the SP System that are exposed to a sheltered environment.
SP	A-SP-g	The relevant conditions could exist in the treated water environment of the Reactor Building Spray (SP) System for loss of material due to general, galvanic, crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SP System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), crevice corrosion (chlorides > 150 ppb) and pitting corrosion (halogens > 150 ppb and/or sulfates > 100 ppb) to occur in carbon steel exposed to a treated water environment. Also, since oxygen is not controlled in the system which supplies the Sodium Hydroxide Storage Tank (components: pipe and valve bodies), a one-time "Above Ground Tank Inspection" will detect and characterize, if any, a loss of material due to general corrosion for those components associated with the Sodium Hydroxide Storage Tank. This program when continued during the period of extended operation,supplemented by the one-time inspection, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
SP	A-SP-h	The relevant conditions do not exist in the treated water environment of the Reactor Building Spray (SP) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. During normal plant operation, the SP System is not operating and is in a standby condition. Prior to taking a Technical Specification sample from the NaOH storage tank, the contents of the tank are mixed by operating the recirculation loop. Except for the infrequent start-up of the recirculation loop, all of the carbon steel components within the license renewal evaluation boundaries of the SP System, that are exposed to a treated water environment, are subject to stagnant flow conditions [SP DBD and Dwg. D-302-661]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
		Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the SP System that are exposed to a treated water environment [Dwg. D-302-661]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a treated water environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminates. During normal plant operation, the SP System is not operating and none of the carbon steel components within the license renewal evaluation boundaries of the SP System, that are exposed to a treated water environment, are subject to alternate wetting and drying [TR00160-002, Attachment X]. The most likely source of this aging effect is the Sodium Hydroxide Storage Tank. The environment within this tank is normally closed and isolated with no opportunity for wetting and drying to occur. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel components exposed to a nitrate-based corrosion inhibitor. The SP System does not utilize a nitrate-based corrosion inhibitor [CP-632]. As such, cracking due to nitrate-induced SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a treated water environment.
SP	A-SP-ii	The relevant condition could exist in the yard environment of the Reactor Building Spray (SP) System for loss of material due to general corrosion to occur [TR00160-010, Attachment XII]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SP System that are exposed to a yard environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a yard environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended functions will be maintained under CLB design conditions.
SP	A-SP-j	The relevant conditions do not exist in the yard environment of the Reactor Building Spray (SP) System for the following aging effect to occur [TR00160-010, Attachment XII]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, the SP System is not operating and is in a standby condition. All of the carbon steel components within the license renewal evaluation boundaries of the SP System that are exposed

System ID	Age Notes ID	Age Notes
		to a yard environment are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [SP DBD and Dwg. D-302-661]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to a yard environment.
SP	A-SP-k	The relevant conditions do not exist in the air-gas environment of the Reactor Building Spray (SP) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to general corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment. The only carbon steel component within the license renewal evaluation boundaries of the SP System, that is exposed to an air-gas environment, is the sodium hydroxide storage tank [Dwg. D-302-661]. A cover gas of compressed nitrogen is maintained over the sodium hydroxide solution [SP DBD]. All compressed gases are considered dry and clean, with no significant levels of contaminants such as chlorides, sulfates or oxygen. In this case, the nitrogen gas inside the tank absorbs moisture from the liquid contents and becomes a moist gas. During normal plant operation, the sodium hydroxide suction line isolation valves are closed to isolate the sodium hydroxide storage tank from the rest of the SP system. Both oxygen and moisture must be present to cause general corrosion because oxygen alone or water free of dissolved oxygen does not corrode iron to any practical extent. As such, since the gas enters the tank dry and clean and the tank's oxygen content is minimal, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The only carbon steel component within the license renewal evaluation boundaries of the SP System, that is exposed to an air-gas environment, is the sodium hydroxide storage tank [Dwg. D-302-661]. A cover gas of compressed nitrogen is maintained over the sodium hydroxide solution. The nitrogen gas inside the tank absorbs moisture from the liquid contents and is considered a moist gas. During normal plant operation, the SP System is not operating and is in a standby condition, with the sodium hydroxide suction line isolation valves normally closed to isolate the sodium hydroxide storage tank from the rest of the SP system. Therefore, the air-gas environment within the storage tank is not subject to alternate wetting and drying that may concentrate contaminates. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The only carbon steel component within the license renewal evaluation boundaries of the SP System, that is exposed to an air-gas environment, is the sodium hydroxide storage tank [Dwg. D-302-661]. All of the piping connections with the sodium storage tank, that could possibly be involved as a galvanic couple, are also made of carbon steel [Dwg. D-302-661 and SP-545]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SP System that are exposed to an air-gas environment.

System ID	Age Notes ID	Age Notes
SP	A-SP-l	The relevant conditions do not exist in the sheltered environment of the Reactor Building Spray (SP) System for the following aging effect to occur in stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The SP System does not contain any system piping, process tubing or ductwork exposed to a sheltered environment that passes between buildings or enters a building, and is located below the 425' elevation [SP DBD and TR00160-002, Attachment X]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for vulnerable stainless steel components/component types (piping and tubing) of the SP System that are exposed to a sheltered environment.
SS	A-SS-a	The relevant conditions could exist in the borated water environment of the Nuclear Sampling (SS) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the SS System that are exposed to the borated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in the borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-b	The relevant conditions do not exist in the borated water environment of the Nuclear Sampling (SS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the borated water screening report [TR00160-002, Attachment VIII], there are no alternately wetted and dried borated water environments for the stainless steel components within the license renewal evaluation boundaries of the SS System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a borated water environment. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel (CASS) components in environments with temperatures continuously greater than or equal to 482°F. Stainless steel components within the SS System license renewal evaluation boundaries include piping and valve bodies in the sample lines, shown on D-302-771, from the Reactor Coolant System (pressurizer and hot legs). Pipe Specification SP-545 shows that the subject pipe is forged, not CASS. A review of valve drawings and Bill of

System ID	Age Notes ID	Age Notes
		Materials reveals that none of the subject valve bodies is fabricated from CASS. As such, reduction in fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a borated water environment. Fouling due to precipitation is an aging effect specific to Chemical and Volume Control System (CVCS) heat exchangers (e.g., regenerative, letdown, seal water and excess letdown). There are no CVCS heat exchangers within the license renewal evaluation boundaries of the SS System. As such, fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a borated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. The SS System heat exchangers cooling borated water have no sources which are from the bottom of a tank. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a borated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in a borated water environment with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of the System Data Table on flow diagram D-302-772 and the borated water screening report [TR00160-002, Attachment VIII], demonstrates that none of the stainless steel components within the license renewal evaluation boundaries of the SS System are continuously exposed to the threshold temperature of 140°F for cracking due to stress corrosion cracking (SCC) in borated water. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components of the SS System that are exposed to the borated water environment.
SS	A-SS-c	The relevant conditions could exist in the treated water environment of the Nuclear Sampling (SS) System for loss of material due to crevice, pitting, general and galvanic corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the SS System that are exposed to the treated water environment with the following clarifications. Concerning galvanic corrosion, carbon steel piping is in contact with stainless steel tubing in the Steam Generator blowdown and drum sample lines. Also, carbon steel material is in contact with stainless steel material in the SS System heat exchangers. Pumps (XPP-162A/B) may have carbon steel material in contact with stainless steel. There is a combination of stainless and carbon steels for the pumps (XPP-162A/B) in the treated water environment. The referenced loss of material is for carbon steel and stainless steel. The referenced cracking is for stainless steel only. In this instance, loss of material due to general and galvanic corrosion affect carbon steel only. In this instance, SCC affects stainless steel only. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice

System ID	Age Notes ID	Age Notes
		corrosion (oxygen > 100 ppb, chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), loss of material due to general corrosion (oxygen > 100 ppb) and loss of material due to galvanic corrosion (chlorides and/or fluorides > 150 ppb) to occur in carbon steel in the treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-d	The relevant conditions do not exist in the treated water environment of the Nuclear Sampling (SS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams noted in the screening report [TR00160-002], there are no alternately wetted and dried treated water environments for the carbon steel components within the license renewal evaluation boundaries of the SS System. As such, loss of material due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for carbon steel components in treated water environments in systems using nitrite based corrosion inhibitors, such as Chilled Water, Switchgear Cooling and Diesel Generator Cooling Systems. Component cooling water to the SS System heat exchangers and feedwater from the Steam Generator blowdown and drum do not use nitrite-based corrosion inhibitors [Chemistry Procedure CP-632, Rev. 3, Section 3.3]. As such, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to a treated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. The SS System heat exchangers depicted on flow diagram D-302-771 have shell material of carbon steel and the fluid is treated water from the Component Cooling (CC) System. The CC System may be subject to particulates from the CC System surge tank as shown on D-302-611. Fouling affects only the heat transfer function, and no carbon steel heat exchanger components have a heat transfer function. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to a treated water environment. Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. Flow rates less than six (6) fps will not cause erosion-corrosion of carbon and low alloy steels. An EPRI report [NSAC-202L-R1] states that erosion-corrosion is not a concern in systems that are either highly oxygenated, superheated, single-phase flow below 200°F, or operated less than 2% of the plant operating time. Conservatvely, there is the potential for erosion-corrosion at three different locations in the SS System. The first location is where the CC

System ID	Age Notes ID	Age Notes
		System piping interfaces with the SS System heat exchanger shells, and the second location is the SS System piping from the the Steam Generator blowdown and drum. For the first item, flow diagram D-302-611 depicts the operating temperature of CC System water at less than 200°F. For the second item, there is carbon steel piping connected to the Steam Generator Blowdown Line Sample Coolers [D-302-771] and the assocuiated SG drum sampling valves (9380A,B,C and 9398A,B,C) are normally open to have continuous indication of the chemistry in the Steam Generators, since any changes are the quickest indication of tube leakage. This is also consistent with the note in Section 6.6 of Chemistry Procedure CP-903. However, a quick evaluation determined that the flow in this piping is not sufficient to cause erosion-corrosion. Also, pumps (XPP-162A/B) are not susceptible to erosion-corrosion as their internal fluid temperature is < 200°F. Therefore, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to a treated water environment.
SS	A-SS-e	The relevant conditions could exist in the sheltered environment of the Nuclear Sampling (SS) System for loss of material due to general and boric acid corrosion (aggressvie chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the SS System that are exposed to the sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components, will manage loss of material due to general corrosion and the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion in carbon steel in the sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-f	The relevant conditions could exist in the treated water environment of the Nuclear Sampling (SS) System for loss of material due to crevice and pitting corrosion, and loss of material/cracking due to corrosive impacts of alternate wetting and drying to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the SS System that are exposed to the treated water environment with the following clarifications. Since the SS Flush Tank has a water and air interface, the location subject to alternate wetting and drying is the upper portion of the Flush Tank. For pumps (XPP-162A/B), there is a combination of stainless and carbon steels in the treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb) to occur in stainless steel in the treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying will be detected and characterizzed, if any, by the one-time Above Ground Tank Inspection. This program/activity, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-g	The relevant conditions do not exist in the treated water environment of the Nuclear Sampling (SS) System for the following aging effects to

System ID	Age Notes ID	Age Notes
		occur in stainless steel components/component types [TR00160-010, Attachment III]: Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel (CASS) components in environments with temperatures continuously greater than or equal to 482°F. Stainless steel components within the SS System license renewal evaluation boundaries with temperatures continuously greater than or equal to 482°F include tubing and valve bodies in the sample lines [shown on D-302-771] from the Steam Generators (blowdown and drum). Pipe Specification SP-545 shows that the subject tubing is forged, not CASS. A review of valve drawings and Bill of Materials reveals that none of the subject valve bodies is fabricated from CASS. As such, reduction in fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a treated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. The treated water environment for these heat exchangers is from a dedicated closed loop chiller package. For license renewal purposes, fouling affects only the heat transfer function, and the Auxiliary Sample heat exchanger heat transfer function is not required. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in a treated water environment with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of the System Data Tables on flow diagrams D-302-771 and -772, and the borated water screening report [TR00160-002, Attachment VIII], demonstrates that none of the stainless steel components within the license renewal evaluation boundaries of the SS System are continuously exposed to the threshold temperature of 140°F for cracking due to stress corrosion cracking (SCC) in treated water. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components of the SS System that are exposed to the treated water environment.
SS	A-SS-h	The relevant conditions could exist in the Reactor Building environment of the Nuclear Sampling (SS) System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all carbon steel components/component types in the SS System that are exposed to the Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion, and the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion in carbon steel in the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-j	The relevant conditions could exist in the borated water environment of the Nuclear Sampling (SS) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment II]. Nickel-based portions of the SS System include tubing in heat exchangers (XCE-1, 2, 4 & 5). If left unmanaged, these aging effects could result in loss of

System ID	Age Notes ID	Age Notes
		component intended function(s), and thus, require management during the period of extended operation for all nickel-based components/component types in the SS System that are exposed to the borated water environment with the following clarifications. Portions of the SS System are in operation during normal plant operation and during accident conditions. Nickel-based portions of the system operate at a temperature which is greater than 140°F. Thus, cracking due to stress corrosion cracking (SCC) could be a concern for portions of the system during normal plant operation, and therefore, nickel-based tubing of the SS System heat exchangers (XCE-1, 2, 4 & 5) is considered susceptible to cracking due to SCC. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to stress corrosion cracking [SCC] (oxygen > 100 ppb with temperature > 200°F or with chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with temperature > 140°F) to occur in nickel-based components in the borated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-k	The relevant conditions do not exist in the borated water environment of the Nuclear Sampling (SS) System for the following aging effects to occur in nickel-based components/component types [TR00160-010, Attachment II]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Nickel-based portions of the system include tubing in heat exchangers (XCE-1, 2, 4 & 5). Based upon a review of the system flow diagrams and the screening report [TR00160-002], there are no alternately wetted and dried borated water environments for the nickel-based components within the license renewal evaluation boundaries of the SS System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to a borated water environment. Primary water stress corrosion cracking (PWSCC) is an aging effect in borated water under the following conditions. Nickel-based alloys are susceptible to PWSCC when exposed to high-purity deaerated water at elevated temperatures. PWSCC in nickel-based alloys is conservatively assumed to be insignificant when exposed to temperatures less than or equal to 500°F and to primary coolant chemical conditions. Nickel-based portions of the system include tubing in heat exchangers (XCE-1, 2, 4 & 5). Based upon Technical Work Record JL05381 for the Sample System, dated 08/07/2001 [see Supplementary Information], it has been demonstrated that the time to degradation for the subject inconel is well past the date of the proposed extended life of the plant and that PWSCC is not an aging effect requiring management for the inconel material in the sample coolers. As such, primary water stress corrosion cracking is not an aging effect requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to the borated water environment.

System ID	Age Notes ID	Age Notes
		Precipitation fouling of heat exchangers in the borated water environment is caused by precipitation of borated compounds. As long as the component is water-solid, precipitation fouling is not expected to occur. The subject heat exchangers within the license renewal evaluation boundaries of the SS System are expected to remain water-solid. As such, fouling due to precipitation is not an aging effect requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to the borated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. The four SS System heat exchangers (XCE-1, 2, 4 & 5) shown on D-302-771, with sources directly from the RC and RHR Systems, are not from the bottom of a tank. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to the borated water environment.
SS	A-SS-l	The relevant conditions could exist in the treated water environment of the Nuclear Sampling (SS) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all nickel-based components/component types in the SS System that are exposed to the treated water environment with the following clarifications. Portions of the SS System are in operation during normal plant operation and during accident conditions. Nickel-based tubing in three HXs from the SG System shown on D-302-771 operate at a temperature which is greater than 140°F. Thus, SCC could be a concern for portions of the system during normal plant operation. The exterior surface of tubing in HXs (XCE-1, 2, 4 & 5) contains relatively cool treated water from the Component Cooling Water System. The interior surface of tubing in HXs (XCE-3A, 3B & 3C) contains hot treated water from the steam generators. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb, chlorides > 150 ppb) and pitting corrosion (oxygen > 100 ppb with either halogens > 150 ppb or sulfates > 100 ppb), and cracking due to stress corrosion cracking [SCC] (oxygen > 100 ppb with temperature > 200°F or with chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb with temperature > 140°F) to occur in nickel-based components in the treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-m	The relevant conditions do not exist in the treated water environment of the Nuclear Sampling (SS) System for the following aging effects to occur in nickel-based components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-002],

System ID	Age Notes ID	Age Notes
		components are normally water-solid and there are no alternately wetted and dried treated water environments for the nickel-based components within the license renewal evaluation boundaries of the SS System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect where foulants (such as corrosion products) accumulate on the heat transfer surfaces. This typically occurs where the water supply originates at the bottom of a tank or reservoir. Fouling only affects the heat transfer function (i.e., tubes) of heat exchangers. For SS System heat exchangers, XCE-1, -2, -3A, -3B, -3C, -4 and -5, component cooling water flows through the shell side; thus, the outside surface of the tubes is exposed to treated water. In the design configuration of the CC System, there is the potential for an accumulation of particles in the component cooling water surge tank, XTK-3. However, due to the turbulent flow through the shells of these heat exchangers, heat exchanger fouling due to particulates is not expected to occur on the exterior surfaces of the tubes and the heat transfer function is not expected to be adversely affected. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for nickel-based components/component types of the SS System that are exposed to a treated water environment. [SS and CC DBDs, and D-302-771 and -772]
SS	A-SS-n	The relevant conditions do not exist in the sheltered environment of the Nuclear Sampling (SS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment X]: In some cases, corrosion of vulnerable carbon steel components/component types (pipe) that are in contact with microbes can cause microbiologically influenced corrosion (MIC). Loss of material due to MIC is not an applicable aging effect in the sheltered environment for carbon steel components/component types (such as heat exchangers, pumps, valves and tanks) in the SS System. Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon and low alloy steels in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Portions of the SS System are in operation during plant normal operation and during accident operation and they operate at temperatures which are greater than the sheltered environment ambient temperature [D-302-771]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to the sheltered environment.
SS	A-SS-o	The relevant conditions do not exist in the Reactor Building environment of the Nuclear Sampling (SS) System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon and low alloy steels in the Reactor Building environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry since there is no electrolyte to electrically couple the two materials. Portions of the SS System are in operation during plant normal operation and during accident operation and they operate

System ID	Age Notes ID	Age Notes
		at temperatures which are greater than the Reactor Building environment ambient temperature [D-302-771]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the SS System that are exposed to a Reactor Building environment.
SS	A-SS-p	The relevant conditions could exist in the sheltered environment of the Nuclear Sampling (SS) System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe) in the SS System that are exposed to the sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following stainless steel components/component types in the SS System: heat exchangers, pumps, valves and tanks. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components in a sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SS	A-SS-q	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the Nuclear Sampling (SS) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VII]: Some component surfaces such as the area around cooling coils are subject to alternate wetting and drying and are thus susceptible to pitting and crevice corrosion and stress corrosion cracking (SCC). This mechanism is not expected to a significant degree in the ventilation* environments. The subject piping and valves are not in a wetted location and are considered to be dry during normal operation. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel tanks exposed to borated water and subject to cycles of wetting and drying, and discussed in Note A-SS-f for the applicable tank. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for subject stainless steel components/component types of the SS System that are exposed to a ventilation* environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. There are no heat transfer functions related to the relevant stainless steel and ventilation* component/component types in the SS System. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the SS System that are exposed to a ventilation* environment.
SW	A-SW-a	The relevant conditions could exist in the raw water environment of the Service Water (SW) System for loss of material due to crevice, galvanic (carbon steel only), general (carbon steel only), microbiologically influenced, and pitting corrosion, loss of material due to erosion, and fouling due to biological materials and particulates [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all carbon steel and stainless steel components/component types in the SW System that are exposed to raw water.

System ID	Age Notes ID	Age Notes
		Loss of material due to erosion is only an aging effect for those carbon steel and stainless steel components/component types which are exposed to high fluid velocites, constricted flows, or rapidly changing flow directions. Loss of material due to erosion is not an aging effect for components where flow is stagnant or of low velocity (e.g., tubing and tube fittings). As discussed in TR00160-020, the Service Water System Reliability and In-Service Testing Program will manage loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion, loss of material due to erosion, and fouling due to biological material and particulates in carbon steel and stainless steel exposed to raw water. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SW	A-SW-b	The relevant conditions do not exist in the raw water environment of the Service Water (SW) System for the following aging effects to occur in carbon steel and stainless steel components/component types [TR00160-010, Attachment IV]: Fouling due to precipitation is an aging effect for carbon steel components exposed to raw water and alternate wetting and drying. A review of TR00160-004, Attachment II and applicable flow diagrams revealed that there are no components within the license renewal evaluation boundaries of the SW System which are subject to alternate wetting and drying. Therefore, fouling due to precipitation is not an aging effect requiring management for the carbon steel components of the SW System exposed to raw water. Stress corrosion cracking (SCC) is a type of corrosive attack that occurs through the combined actions of stress (both applied and residual tensile stresses), a corrosive environment and a susceptible material. Elimination or reduction in any of these three factors will decrease the likelihood of SCC occurring. When evaluating the aging effects for stainless steel components exposed to a raw water environment, it is conservatively assumed that all austenitic stainless steels and nickel-base alloys contain the necessary stresses to initiate SCC and IGA, if subjected to a corrosive environment. Perry's Chemical Engineers' Handbook cites a threshold temperature of 120°F, even in the presence of concentrated chlorides. Therefore, cracking due to SCC or IGA is an aging effect requiring system specific evaluation for stainless steels exposed to raw water at temperatures greater than 120°F. The SW System operating temperature is stated at 95°F [D-302-221] and therefore is less than the threshold temperature of 120°F stated above for SCC to occur. Therefore, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management for the stainless steel components of the SW System exposed to the raw water environment.
SW	A-SW-c	The relevant conditions could exist in the raw water environment of the Service Water (SW) System for loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to erosion and fouling due to particulates and biological materials [TR00160-010, Attachment IV] to occur. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all copper components/component types in the SW System that are exposed to raw water. As discussed in TR00160-020, the Service Water System Reliability and In-Service Testing Program will manage loss of material due to crevice, galvanic, microbiologically influenced, and pitting corrosion, loss of material due to erosion and fouling due to particulates and biological materials in copper exposed to raw water. This program, when continued into the period of extended operation, will provide

System ID	Age Notes ID	Age Notes
		reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SW	A-SW-d	The relevant conditions do not exist in the raw water environment of the Service Water (SW) System for the following aging effects to occur in copper components/component types [TR00160-010, Attachment IV]: Heat exchanger fouling (heat exchanger tubes only) due to precipitates is an aging effect of foulants in raw water applications and that are alternately wetted and dried for any reason. The subject SW System heat exchangers are not expected to be alternately wetted and dried as Service Water is normally flowing. As such, heat exchanger fouling due to precipitates is not an aging effect requiring management during the period of extended operation for copper components/component types of the SW System that are exposed to a raw water environment. Cracking due to stress corrosion (SCC) is an aging effect for copper alloys exposed to raw water and in the presence of ammonia and ammonium compounds. Ammonia and ammonium compounds are often used to control pH or as a cleaning solvent for raw water systems. The SW System is treated only with a biocide which does not contain ammonia or ammonium compounds [CP 913]. Therefore, cracking due to stress corrosion is not an aging effect requiring management. Loss of material due to selective leaching is an aging effect for copper alloys exposed to raw water. The only copper component within the license renewal evaluation boundaries of the SW System is the Service Water Pump Motor Integral Bearing Coolers [TR00160-004, Attachment II and flow diagrams]. This component is constructed of copper without the alloying materials necessary for selective leaching to occur. Therefore, loss of material due to selective leaching is not an aging effect requiring management.
SW	A-SW-e	The relevant conditions could exist in the sheltered environment of the Service Water (SW) System for loss of material due to boric acid, galvanic, general, microbiologically influenced and pitting corrosion to occur [TR00160-010, Attachment X] . If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SW System that are exposed to the sheltered environment. Loss of material due to boric acid corrosion is only an aging effect requiring management for the carbon steel components/component types of the SW System which are exposed to the sheltered environment of the Auxiliary, Fuel Handling and Intermediate Buildings. Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Loss of material due to MIC is only an aging effect requiring management for the carbon steel pipe of the SW System which passes between buildings below the 425' elevation. Loss of material due to pitting corrosion is only an aging effect requiring management for the carbon steel components/component types of

System ID	Age Notes ID	Age Notes
		the SW System which are insulated and exposed to internal raw water. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to the sheltered environment of the Auxiliary, Fuel Handling and Intermediate Buildings, while the activities for Inspections for Mechanical Components will manage loss of material due to galvanic, general and pitting corrosion. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SW	A-SW-f	The relevant conditions could exist in the sheltered environment of the Service Water (SW) System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X] . If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for stainless steel components/component types in the SW System that are exposed to the sheltered environment. Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Loss of material due to microbiologically influenced corrosion is only an aging effect requiring management for the stainless steel process tubing which passes between buildings below the 425' elevation. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
SW	A-SW-g	The relevant conditions could exist in the Reactor Building environment of the Service Water (SW) System for loss of material due to boric acid, galvanic, general and pitting corrosion to occur [TR00160-010, Attachment IX] . If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the SW System that are exposed to the Reactor Building environment. Loss of material due to pitting corrosion is only an aging effect requiring management for the carbon steel components of the SW System which are insulated and exposed to internal raw water. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion, and the activities for Inspections for Mechanical Components will manage loss of material due to galvanic, general, and pitting corrosion in carbon steel exposed to the Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.

System ID	Age Notes ID	Age Notes
SW	A-SW-h	Not used.
SW	A-SW-ii	The relevant conditions do not exist in the oil/fuel oil environment of the Service Water (SW) System for the following aging effects to occur in copper components/component types [TR00160-010, Attachment V]: Loss of material due to crevice, pitting and galvanic corrosion, microbiologically influenced corrosion (MIC), and selective leaching; cracking due to stress corrosion (SCC); and heat exchanger fouling due to particulates are aging effects for copper exposed to oil/fuel oil under stagnant conditions in locations conducive to water pooling and contaminants. The copper components exposed to an oil environment, within the license renewal evaluation boundaries of the SW System, are limited to the copper tubing which is part of the SW Pump Motor Integral Bearing Coolers [TR00160-004, Attachment II]. The oil environment is strictly lubrication oil, and not fuel oil. Water and contaminants tend to collect in low spots, such as tanks. The subject components are not conducive to water pooling. Heat exchanger fouling due to particulates is the accumulation of foulants onto the heat transfer surfaces of a heat exchanger (i.e., tubes). Factors affecting fouling include concentration, fluid velocities and operating practices, and generally, fouling occurs when the supply originates at the bottom of a tank or reservoir. The subject components are not conducive to fouling. Due to the above considerations, loss of material due to crevice, pitting and galvanic corrosion, microbiologically influenced corrosion (MIC), and selective leaching; cracking due to stress corrosion (SCC); and heat exchanger fouling due to particulates are not aging effects requiring management during the period of extended operation for copper components/component types of the SW System that are exposed to an oil/fuel oil environment.
SW	A-SW-j	The relevant conditions could exist in the underground environment of the Service Water (SW) System for loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion to occur [TR00160-010, Attachment XI]. The underground environment is one in which equipment is in contact with soil and groundwater, but these components are usually coated and wrapped to prevent contact with soil or groundwater. For the purposes of license renewal, the coating and/or wrapping are assumed to have failed such that those aging effects associated with carbon steel in contact with soil or groundwater are plausible. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for carbon steel components/component types in the SW System that are exposed to the underground environment. As discussed in TR00160-020, the activities for the Buried Piping and Tanks Inspection will manage loss of material due to crevice, galvanic, general, microbiologically influenced, and pitting corrosion in carbon steel exposed to the underground environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
TR	A-TR-a	The relevant conditions could exist in the borated water environment of the Thermal Regeneration (TR) System for loss of material due to crevice and pitting corrosion, and cracking due to stress corrosion cracking to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all stainless steel components/component types in the TR System that are exposed to a borated water environment. The TR System is no longer used for boration and dilution as originally designed [TR00160-002, Attachment XVI]. It has occasionally been

System ID	Age Notes ID	Age Notes
		used to provide additional letdown cooling in order to provide cooler seal injection water to temperature sensitive seals during times when there has been increased reactor coolant pump seal leakage. The license renewal function of this system is as a pressure boundary for the CS System. System temperatures are assumed to be less than design temperatures, but no distinction has been made herein for license renewal purposes and stainless steel components/component types of the TR System are considered to be susceptible to cracking due to SCC because temperatures might not be below 140°F. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb) and stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides, fluorides, copper > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a borated water environment. This existing program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
TR	A-TR-b	The relevant conditions do not exist in the borated water environment of the Thermal Regeneration (TR) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Reduction in fracture toughness is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. The TR System is designed to less than or equal to 382°F per the System Flow Diagram [E-302-676]. Therefore reduction of fracture toughness is not an aging mechanism requiring management for the stainless steel components/component types of the TR System exposed to borated water. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). TR System heat exchangers serve only pressure boundary functions as described above. With no heat transfer component intended function, fouling due to particulates is not an aging effect requiring management.
TR	A-TR-c	The relevant conditions could exist in the treated water environment of the Thermal Regeneration (TR) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all stainless steel components/component types in the TR System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (if oxygen is > 100 ppb and chlorides and fluorides > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
TR	A-TR-d	The relevant conditions do not exist in the treated water environment of the Thermal Regeneration (TR) System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]:

System ID	Age Notes ID	Age Notes
		Cracking due to stress corrosion cracking (SCC) is a potential aging effect for stainless steel components in treated water environments with temperatures in excess of 140°F. The tube side of the Letdown Chiller Heat Exchanger is designed to normal temperatures of 140°F per the System Flow Diagram [E-302-676]. As such, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the TR System that are exposed to a treated water environment. Reduction in fracture toughness is an aging effect for cast austenitic stainless steel components in environments with temperatures continuously in excess of 482°F. The TR System is designed to less than or equal to 382°F per the System Flow Diagram [E-302-676]. Therefore reduction of fracture toughness is not an aging mechanism requiring management. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Fouling is an aging effect applicable only to heat transfer surfaces (i.e., heat exchanger tubes). TR System heat exchangers serve only pressure boundary functions as described above. With no heat transfer component intended function, fouling due to particulates is not an aging effect requiring management. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. The only stainless steel components within the license renewal evaluation boundaries of the TR System, that are exposed to a treated water environment, are the tubes and tube sheets of the Letdown Chiller HX. The treated water side of this HX is water solid and is not subject to alternate wetting and drying [TR00160-002]. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management.
TR	A-TR-e	The relevant conditions could exist in the sheltered environment of the Thermal Regeneration (TR) System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe) in the TR System that are exposed to the sheltered environment. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components in a sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
VL	A-VL-a	The relevant conditions could exist in the sheltered environment of the Local Ventilation & Cooling (VL) System for loss of material due to boric acid corrosion (carbon steel and galvanized steel), galvanic corrosion (carbon steel and galvanized steel), general corrosion (carbon steel), and microbiologically induced corrosion [MIC] to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel, galvanized steel and stainless steel components/component types in the VL System that are exposed to the sheltered environment. Loss of material due to MIC is an aging effect for vulnerable carbon, galvanized, and stainless steel components/component types (pipe,

System ID	Age Notes ID	Age Notes
		process tubing, and ductwork) that are in contact with microbes between building walls (and from outside the building) below the 425' elevation, due to groundwater inleakage. Loss of material due to MIC is an applicable aging effect (aging effect requiring evaluation) in the sheltered environment for carbon, galvanized, and stainless steel pipe, process tubing, or ductwork components/component types only. As discussed in TR00160-020, the Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (carbon steel and galvanized steel) for components/component types exposed to the sheltered environment, while the Inspections for Mechanical Components will manage loss of material due to galvanic corrosion (carbon steel and galvanized steel) and general corrosion (carbon steel) in that environment. As discussed in Tr00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC (carbon steel, galvanized steel and stainless steel) for components/component types in the VL System that are exposed to the sheltered environment. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
VL	A-VL-b	The relevant conditions could exist in the ventilation environment of the Local Ventilation & Cooling (VL) System for loss of material due to galvanic corrosion and fouling due to particulates (copper cooling coils) to occur [TR00160-010, Attachment VII]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for galvanized steel and copper components/component types in the VL System that are exposed to the ventilation environment. As discussed in TR00160-020, the Preventive Maintenance Activities - Ventilation Systems Inspections will manage loss of material due to galvanic corrosion and fouling due to particulates for galvanized steel and copper components/component types exposed to the ventilation environment. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
VL	A-VL-c	The relevant conditions do not exist in the ventilation environment of the Local Ventilation & Cooling (VL) System for the following aging effects to occur in copper, galvanized steel and stainless steel components/component types [TR00160-010, Attachment VII]: Loss of material due to boric acid corrosion is an aging effect for copper and galvanized steel components/component types exposed to the ventilation environment with air from the Reactor Building. None of the copper or galvanized steel components within the license renewal evaluation boundaries of the VL System are exposed to air from the Reactor Building [TR00160-007, Attachment II]. Therefore, loss of material due to boric acid corrosion is not an aging effect requiring management during the period of extended operation for copper and galvanized steel components/component types of the VL System exposed to the ventilation environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper, galvanized steel and stainless steel exposed to a ventilation environment. A review of the relevant flow diagrams demonstrates that none of the copper, galvanized steel or stainless steel components, within the license renewal evaluation boundaries of the VL System, that are exposed to a ventilation environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper, galvanized steel and stainless steel components/component types of the VL System that are exposed to a ventilation environment.

System ID	Age Notes ID	Age Notes
		Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers (i.e., tubes), and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. However, there are no galvanized steel or stainless steel heat exchanger tubes within the license renewal evaluation boundaries of the VL System that are exposed to a ventilation environment [TR00160-007, Attachment I]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for galvanized steel and stainless steel components/component types of the VL System that are exposed to the ventilation environment (there are copper heat exchanger tubes subject to this aging effect, as discussed in Note A-VL-b). Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloys. A review of the relevant flow diagrams demonstrates that none of the components, within the license renewal evaluation boundaries that are exposed to a ventilation environment, are made of brass or copper alloy [TR00160-007, Attachment I]. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper components/component types of the VL System that are exposed to the ventilation environment.
VL	A-VL-d	The relevant conditions could exist in the treated water environment of the Local Ventilation & Cooling (VL) System for loss of material due to crevice, pitting, galvanic and general (carbon steel) corrosion; loss of material due to erosion-corrosion (copper) and cracking due to stress corrosion (SCC) [carbon steel]; and fouling due to particulates to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for the carbon steel and copper components/component types in the AH System that are exposed to treated water. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions necessary for aloss of material due to crevice, pitting, galvanic and general corrosion, cracking due to stress corrosion (SCC) to occur for carbon steel components/component types exposed to a treated water environment. For copper heat exchanger sub-components, in addition to the Chemistry Program, the new Heat Exchanger Inspections will detect and characterize a loss of material due to erosion-corrosion, and heat exchanger fouling due to particulates, if any. The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
VL	A-VL-e	The relevant conditions do not exist in the treated water environment of the Local Ventilation & Cooling (VL) System for the following aging effects to occur in carbon steel and copper components/component types [TR00160-010, Attachment III]: Cracking due to stress corrosion (SCC) is an aging effect for copper alloys exposed to a treated water environment in the presence of ammonia and ammonium compounds. The AHU cooling coils are the only copper components exposed to treated water within the license renewal evaluation boundaries of the VL System. However, the cooling coils material is not a copper alloy, but is copper, and copper is not susceptible to SCC without zinc or aluminum as an alloy. Therefore, cracking due to stress corrosion (SCC) is not an aging effect requiring management during the period of extended operation for the copper components/component types of the VL System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
		Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for carbon steel and copper exposed to a treated water environment. A review of the relevant flow diagrams demonstrates that none of the carbon steel and copper components, within the license renewal evaluation boundaries that are exposed to a treated water environment, are exposed to alternate wetting and drying conditions [TR00160-007, Attachment I]. Therefore, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel and copper components of the VL System exposed to a treated water environment. Loss of material due to selective leaching is an aging effect in materials occurring when one element is preferentially removed from a solid alloy by corrosion processes. This loss of material is of concern for brass and copper alloys. A review of the relevant flow diagrams demonstrates that none of the components, within the license renewal evaluation boundaries that are exposed to a treated water environment, are made of brass or copper alloy [TR00160-007, Attachment I]. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper components/component types of the VL System that are exposed to a treated water environment.
VL	A-VL-f	The relevant conditions do not exist in the sheltered environment of the Local Ventilation & Cooling (VL) System for the following aging effect to occur in carbon steel, galvanized steel and stainless steel components/component types [TR00160-010, Attachment X]: Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions, and exposed to a sheltered environment. The VL System components containing cooling water are heat exchanger components, which are not insulated. The internal environment of the VL System is ventilation air and is at temperatures that approximate ambient conditions. Therefore, all of the carbon steel components within the license renewal evaluation boundaries, that are exposed to a sheltered environment, are generally at the same temperature as ambient conditions, and are not susceptible to the formation of condensation on their external surfaces. As such, loss of material due to pitting corrosion is not an aging effect requiring management duing the period of extended operation for carbon steel components of the VL System that are exposed to a sheltered environment.
VU	A-VU-a	The relevant conditions could exist in the sheltered environment of the Chilled Water (VU) System for loss of material due to general corrosion, galvanic corrosion, pitting corrosion (insulated components), boric acid corrosion (aggressive chemical attack) and microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the VU System that are exposed to a sheltered environment. Loss of material due to microbiologically induced corrosion (MIC) is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings

System ID	Age Notes ID	Age Notes
		included in the sheltered environment below the 425' elevation. Loss of material due to MIC is an applicable aging effect for carbon steel piping in the sheltered environment of the VU System. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general, galvanic and pitting corrosion (insulated components), while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-b	The relevant conditions could exist in the treated water environment of the Chilled Water (VU) System for loss of material due to general, galvanic, crevice and pitting corrosion, corrosive impacts of alternate wetting and drying and cracking due to stress corrosion (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the VU System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) and cracking due to stress corrosion (SCC) (presence of nitrite based corrosion inhibitor) to occur in carbon steel exposed to a treated water environment. The one-time Above Ground Tank Inspection will assess conditions in oder to detect and characterize, if any, a loss of material due to corrosive impacts of alternate wetting and drying in carbon steel tanks at the treated water-air interface. This program/activity, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-c	The relevant conditions do not exist in the treated water environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment III]: Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. The VU System contains three HVAC mechanical water chillers that reject the total heat load from the refrigeration system to the Service Water (SW) System. Each water chiller unit contains a chilled water heat exchanger (evaporator) and refrigerant condenser that could be susceptible to fouling [Dwgs. D-302-841, -842 and -843, and 1MS-54-064]. The chilled water heat exchanger (evaporator) is of the horizontal shell-and-tube type [SP-541-044461-000] and contains refrigerant on the shell side and treated water on the tube side. Fouling only affects the heat transfer component intended function. The only carbon steel components in the chilled water heat exchanger in contact with treated water are the tubesheets and waterboxes, neither of which have a heat transfer function [TR00160-003, Attachment III]. As such, heat exchanger fouling due to particulates is not an aging effect requiring

System ID	Age Notes ID	Age Notes
		management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a treated water environment. Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. An EPRI report [NSAC-202L-R1] states that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F, or operated less than 2% of the plant operating time. During normal plant operation, the VU System operates under single-phase flow conditions, with maximum-expected system temperatures well below 200°F [Dwgs. D-302-841, -842 and -843]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a treated water environment.
VU	A-VU-d	The relevant conditions could exist in the treated water environment of the Chilled Water (VU) System for loss of material due to crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the VU System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-e	The relevant conditions do not exist in the treated water environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. None of the stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are subject to temperatures continuously above 482°F [Dwgs. D-302-841, -842 and -843, and TR00160-003, Attachment III]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. The VU System contains three HVAC mechanical water chillers that reject the total heat load from the refrigeration system to the Service Water (SW) System. Each water chiller unit contains a chilled water heat exchanger (evaporator) and refrigerant condenser that could be susceptible to fouling [Dwgs. D-302-841, -842 and -843, and 1MS-54-064].

System ID	Age Notes ID	Age Notes
		The chilled water heat exchanger (evaporator) is of the horizontal shell-and-tube type [SP-541-0444461] and contains refrigerant on the shell side and treated water on the tube side. Fouling only affects the heat transfer component intended function. There are no stainless steel components in the chilled water heat exchanger in contact with treated water [TR00160-003, Attachment III]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. None of the stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwgs. D-302-841, -842 and -843, and 1MS-54-064, and TR00160-003, Attachment III]. As such, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for stainless steel in treated water with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F, or with chlorides and/or fluorides in excess of 150 ppb and/or sulfates in excess of 100 ppb and temperatures greater than 140°F. A review of System and Design Data Tables [D-302-841, -842 and -843] and TR00160-003, Attachment III, demonstrates that except for the chilled water expansion tanks (constructed of carbon steel and located in a yard environment), none of the components within the license renewal evaluation boundaries are exposed to treated water temperatures greater than 54°F. Therefore, cracking due to SCC is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to a treated water environment.
VU	A-VU-f	The relevant conditions do not exist in the sheltered environment of the Chilled Water (VU) System for the following aging effect to occur [TR00160-010, Attachment VI]: Loss of material due to microbiologically influenced corrosion (MIC) is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. A review of applicable flow diagrams [Dwgs. D-302-841, -842 and -843] demonstrates that all piping, penetrating buildings within the license renewal evaluation boundaries of the VU System and exposed to a sheltered environment, is made of carbon steel [TR00160-003, Attachment III]. As such, loss of material due to MIC is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to a sheltered environment.
VU	A-VU-g	The relevant conditions do not exist in the air-gas environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment VI]:

System ID	Age Notes ID	Age Notes
		Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. The stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: piping, valve, filter and purge unit in purge subsystem; and tube and tube fitting, and eductor (jet pump) in cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. A review of the maximum expected temperatures in the water chiller units during operation, demonstrates that none of the components approach a temperature of 200°F [SP-541-044461-000]. As such, cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: piping, valve, filter and purge unit in purge subsystem; and tube and tube fitting, and eductor (jet pump) in cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. None of the stainless steel components within the license renewal evaluation boundaries, that are exposed to an air-gas environment, are subject to alternate wetting and drying that may concentrate contaminants [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to an air-gas environment.
VU	A-VU-h	The relevant conditions do not exist in the air-gas environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to general corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment. The carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: shell and tubesheet in evaporator; shell and tubesheet in condenser; flow control chamber; piping, valve and purge unit in purge subsystem; and eductor (jet pump) in cleanup subsystem [Dwg. 1MS-54-064 and TR00160-

System ID	Age Notes ID	Age Notes
		003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: shell and tubesheet in evaporator; shell and tubesheet in condenser; flow control chamber; piping, valve and purge unit in purge subsystem; and eductor (jet pump) in cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: shell and tubesheet in evaporator; shell and tubesheet in condenser; flow control chamber; piping, and eductor (jet pump) in cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. None of the carbon steel components within the license renewal evaluation boundaries, that are exposed to an air-gas environment, are subject to alternate wetting and drying that may concentrate contaminants [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an air-gas environment.

System ID	Age Notes ID	Age Notes
VU	A-VU-ii	The relevant conditions do not exist in the air-gas environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to galvanic corrosion is an aging effect for copper and copper alloy components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The copper and copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: fins and tubes in evaporator; and fins and tubes in condenser [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect for copper alloys that do not contain any inhibiting elements, and are exposed to a moist air or gas environment in wetted locations. In particular, copper-zinc alloys containing greater than 15% zinc are susceptible to selective leaching under these conditions. The copper components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: fins and tubes in evaporator; and fins and tubes in condenser [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The material of construction for these components is ASTM B359 [BOM SM-11 and SP-541], which has a chemical composition of less than 15% zinc [Metals & Alloys in the Unified Numbering System]. These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. In summary, the likelihood of wetted locations appearing in the water chiller units is very remote. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for copper alloy components/component types of the VU System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper and copper alloy components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The copper components within the license renewal evaluation boundaries of the VU System, that are exposed to an air-gas environment, consist of the following within each water chiller unit: fins and tubes in evaporator; and fins and tubes in condenser [Dwg. 1MS-54-064 and TR00160-003, Attachment III].

System ID	Age Notes ID	Age Notes
		These components are in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. None of the copper components within the license renewal evaluation boundaries, that are exposed to an air-gas environment, are subject to alternate wetting and drying that may concentrate contaminants [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to an air-gas environment.
VU	A-VU-j	The relevant conditions could exist in the sheltered environment of the Chilled Water (VU) System for loss of material due to general corrosion, galvanic corrosion, pitting corrosion (insulated components) and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for cast iron components/component types in the VU System that are exposed to a sheltered environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion, galvanic corrosion and pitting corrosion in cast iron exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in cast iron exposed to a sheltered environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-k	The relevant conditions do not exist in the air-gas environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment VI]: Loss of material due to general corrosion is an aging effect for cast iron components exposed to a moist air or gas environment. The only cast iron component within the license renewal evaluation boundaries of the VU System, that is exposed to an air-gas environment, is the compressor housing within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. This component is in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect for cast iron components exposed to a moist air or gas environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. The only cast iron component within the license renewal evaluation boundaries of the VU System, that is exposed to an air-gas environment, is the compressor housing within each water chiller unit

System ID	Age Notes ID	Age Notes
		[Dwg. 1MS-54-064 and TR00160-003, Attachment III]. This component is in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to selective leaching is an aging effect for gray cast iron exposed to a moist air or gas environment in wetted locations. The only cast iron component within the license renewal evaluation boundaries of the VU System, that is exposed to an air-gas environment, is the compressor housing within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The material of construction for this component is ASTM A278 [BOM SM-11], which generally has a chemical composition indicative of gray cast iron [Metals & Alloys in the Unified Numbering System]. This component is in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. In summary, the likelihood of wetted locations appearing in the water chiller units is very remote. As such, loss of material due to selective leaching is not an aging effect requiring management during the period of extended operation for gray cast iron components/component types of the VU System that are exposed to an air-gas environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for cast iron components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminates. The only cast iron component within the license renewal evaluation boundaries of the VU System, that is exposed to an air-gas environment, is the compressor housing within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. This component is in contact with Refrigerant-11 (R-11) [BOM SM-11], a fluorocarbon known as a low pressure refrigerant, and considered a dry and clean gas. The water chiller units are of the hermetic, centrifugal type, thus minimizing the likelihood of contaminants being introduced into the refrigeration system. Also, the water chiller units have a purge subsystem, whose function is to ensure that the refrigerant is free of air and water [SP-541-044461-000]. It operates continuously when the chiller is in operation. In addition, during normal plant operation, the compressor housing is not subject to alternate wetting and drying that may concentrate contaminants [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an air-gas environment.
VU	A-VU-I	The relevant condition could exist in the yard environment of the Chilled Water (VU) System for loss of material due to general corrosion to

System ID	Age Notes ID	Age Notes
		occur [TR00160-010, Attachment XII]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the VU System that are exposed to a yard environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a yard environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended functions will be maintained under CLB design conditions.
VU	A-VU-m	The relevant condition does not exist in the yard environment of the Chilled Water (VU) System for the following aging effect to occur [TR00160-010, Attachment XII]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The only carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to a yard environment, are the chilled water expansion tanks [Dwgs. D-302-842 and -843, and TR00160-003, Attachment III]. All of the piping connections with the chilled water expansion tanks, that could possibly be involved as a galvanic couple, are also made of carbon steel [Dwgs. D-302-842 and -843, and SP-337 and -545]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a yard environment.
VU	A-VU-n	The relevant conditions could exist in the treated water environment of the Chilled Water (VU) System for loss of material due to crevice, erosion and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for copper and copper alloy components/component types in the VU System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides or fluorides > 150 ppb) and pitting corrosion (oxygen > 100 ppb and chlorides or fluorides > 150 ppb) to occur in copper and copper alloys exposed to a treated water environment. The new Heat Exchanger Inspections, in addition to the Chemistry Program, will detect and characterize a loss of material due to erosion-corrosion, if any . The Chemistry Program and Heat Exchanger Inspections, when continued/implemented in the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
VU	A-VU-o	The relevant conditions do not exist in the treated water environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment III]: Loss of material due to galvanic corrosion is an aging effect for copper and copper alloy components exposed to a treated water environment and electrolytically coupled to a material higher in the galvanic series. The only copper and copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are the evaporator tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. Within the treated water environment, the evaporator tubes

System ID	Age Notes ID	Age Notes
		are only coupled with the tubesheets and waterboxes, which are each made of carbon steel, a material less cathodic than copper or copper alloy. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to a treated water environment. Loss of material due to selective leaching and cracking due to stress corrosion (SCC) are aging effects for copper alloys that do not contain any inhibiting elements and are exposed to a treated water environment. In particular, copper-zinc alloys containing greater than 15% zinc are susceptible to both selective leaching and SCC under these conditions. The only copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are the evaporator tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The material of construction for these components is ASTM B359 [BOM SM-11 and SP-541], which has a chemical composition of less than 15% zinc [Metals & Alloys in the Unified Numbering System]. As such, loss of material due to selective leaching and cracking due to SCC are not aging effects requiring management during the period of extended operation for copper alloy components/component types of the VU System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for copper and copper alloy components subject to alternate wetting and drying that may concentrate contaminates. The only copper and copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are the evaporator tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The VU System is a closed system with redundant supply and return mains. During normal plant operation, one of the three chillers and chilled water pumps are in continuous operation [FSAR, Section 9.4.7.2.4]. None of the copper alloy components within the license renewal evaluation boundaries, that are exposed to a treated water environment, are subject to alternate wetting and drying [Dwgs. D-302-841, -842 and -843]. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. The VU System contains three HVAC mechanical water chillers that reject the total heat load from the refrigeration system to the Service Water (SW) System. Each water chiller unit contains a chilled water heat exchanger (evaporator) and refrigerant condenser that could be susceptible to fouling [Dwgs. D-302-841, -842 and -843, and 1MS-54-064]. The chilled water heat exchanger (evaporator) is of the horizontal shell-and-tube type [SP-541-044461-000] and contains refrigerant on the shell side and treated water on the tube side. The only copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a treated water environment, are the evaporator tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The VU System is a closed system with redundant supply and return mains, and does not employ any tanks or reservoirs as sources of treated water. During normal plant operation, one of the three chillers and chilled water pumps are in continuous operation [FSAR, Section 9.4.7.2.4]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
VU	A-VU-p	The relevant conditions do not exist in the oil/fuel oil environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment V]: Loss of material due to general, crevice and pitting corrosion are aging effects for carbon steel components exposed to an oil/fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. Water and contaminants tend to collect in low spots, e.g., at the bottom of tanks. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. The carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil environment, consist of the following within the lubrication subsystem: eductors, pumps, piping and valves [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These type of components are not conducive to pooling of water and contaminants. As such, loss of material due to general, crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an oil/fuel oil environment. Loss of material due to galvanic corrosion and microbiologically influenced corrosion (MIC) are aging effects for carbon steel components exposed to a fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. These aging effects are not a concern in a lubrication oil environment. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. All carbon steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil/fuel oil environment, are only in contact with lubrication oil [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material due to galvanic corrosion and MIC are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an oil/fuel oil environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the VU System that are exposed to an oil/fuel oil environment [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to an oil/fuel oil environment.
VU	A-VU-q	The relevant conditions do not exist in the oil/fuel oil environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment V]: Loss of material due to crevice and pitting corrosion are aging effects for stainless steel components exposed to an oil/fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. Water and contaminants tend to collect in low spots, e.g., at the bottom of tanks. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. The stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil environment, consist of the following within the lubrication subsystem: eductors,

System ID	Age Notes ID	Age Notes
		filters, piping, tube and tube fittings and valves [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. These type of components are not conducive to pooling of water and contaminants. As such, loss of material due to crevice and pitting corrosion are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to an oil/fuel oil environment. Loss of material due to microbiologically influenced corrosion (MIC) and cracking due to stress corrosion (SCC) are aging effects for stainless steel components exposed to a fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. These aging effects are not a concern in a lubrication oil environment. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. All stainless steel components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil/fuel oil environment, are only in contact with lubrication oil [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material due to MIC and cracking due to SCC are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to an oil/fuel oil environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the VU System that are exposed to an oil/fuel oil environment [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the VU System that are exposed to an oil/fuel oil environment.
VU	A-VU-r	The relevant conditions do not exist in the oil/fuel oil environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment V]: Loss of material due to general, crevice and pitting corrosion, and loss of material due to selective leaching are aging effects for cast iron components exposed to an oil/fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. Water and contaminants tend to collect in low spots, e.g., at the bottom of tanks. Selective leaching is only a concern for gray cast iron. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. The only cast iron components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil environment, are the lubrication subsystem pump casings [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. This type of component is not conducive to pooling of water and contaminants. As such, loss of material due to general, crevice and pitting corrosion, and loss of material due to selective leaching are not aging effects requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an oil/fuel oil environment. Loss of material due to galvanic corrosion and microbiologically influenced corrosion (MIC) are aging effects for cast iron components exposed to a fuel oil environment under stagnant conditions in locations conducive to pooling water and contaminants. These aging effects are not a concern in a lubrication oil environment. Each water chiller unit has a forced-feed, lubrication subsystem with an oil pump

System ID	Age Notes ID	Age Notes
		supplying oil under pressure to all compressor and hermetic motor journal and thrust bearings. All cast iron components within the license renewal evaluation boundaries of the VU System, that are exposed to an oil/fuel oil environment, are only in contact with lubrication oil [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, loss of material due to galvanic corrosion and MIC are not aging effects requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an oil/fuel oil environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the supply originates at the bottom of a tank or reservoir. However, there are no heat exchangers within the license renewal evaluation boundaries of the VU System that are exposed to an oil/fuel oil environment [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for cast iron components/component types of the VU System that are exposed to an oil/fuel oil environment.
VU	A-VU-s	The relevant conditions could exist in the raw water environment of the Chilled Water (VU) System for loss of material due to general, galvanic, crevice and pitting corrosion, microbiologically influenced corrosion (MIC), erosion and fouling due to particulates and biological materials to occur [TR00160-010, Attachment IV]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the VU System that are exposed to a raw water environment. As discussed in TR00160-020, the existing Service Water System Reliability and In Service Testing Program will manage loss of material due to general, galvanic, crevice and pitting corrosion, MIC, erosion and fouling due to particulates and biological materials in carbon steel exposed to a raw water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-t	The relevant conditions do not exist in the raw water environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment IV]: Heat exchanger fouling due to precipitation is an aging effect caused by the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers that are subject to alternate wetting and drying. The VU System contains three HVAC mechanical water chillers that reject the total heat load from the refrigeration system to the Service Water (SW) System. Each water chiller unit contains a refrigerant condenser [Dwgs. D-302-841, -842 and -843, and 1MS-54-064]. The refrigerant condenser is of the horizontal shell-and-tube type [SP-541-044461-000] and contains refrigerant on the shell side and raw water on the tube side (SW System). The only carbon steel components in the chilled water refrigerant condenser in contact with raw water are the tubesheets and waterboxes [TR00160-003, Attachment III]. These heat exchangers are not expected to be subject to an alternate wetted and dried condition. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a raw water environment.

System ID	Age Notes ID	Age Notes
VU	A-VU-u	The relevant conditions could exist in the raw water environment of the Chilled Water (VU) System for loss of material due to crevice and pitting corrosion, microbiologically influenced corrosion (MIC) and erosion, and fouling due to particulates and biological materials to occur [TR00160-010, Attachment IV]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for copper and copper alloy components/component types in the VU System that are exposed to a raw water environment. As discussed in TR00160-020, the existing Service Water System Reliability and In Service Testing Program will manage loss of material due to crevice and pitting corrosion, MIC and erosion, and fouling due to particulates and biological materials in copper and copper alloys exposed to a raw water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-v	The relevant conditions do not exist in the raw water environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment IV]: Loss of material due to galvanic corrosion is an aging effect for copper and copper alloy components exposed to a raw water environment and electrolytically coupled to a material higher in the galvanic series. The only copper and copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a raw water environment, are the condenser tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. Within the raw water environment, the condenser tubes are only coupled with the tubesheets and waterboxes, which are each made of carbon steel, a material less cathodic than copper or copper alloy. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to a raw water environment. Loss of material due to selective leaching and cracking due to stress corrosion (SCC) are aging effects for copper alloys that do not contain any inhibiting elements and are exposed to a raw water environment. In particular, copper-zinc alloys containing greater than 15% zinc are susceptible to both selective leaching and SCC under these conditions. The only copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a raw water environment, are the condenser tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. The material of construction for these components is ASTM B359 [BOM SM-11 and SP-541], which has a chemical composition of less than 15% zinc [Metals & Alloys in the Unified Numbering System]. As such, loss of material due to selective leaching and cracking due to SCC are not aging effects requiring management during the period of extended operation for copper alloy components/component types of the VU System that are exposed to a raw water environment. Heat exchanger fouling due to precipitation is an aging effect caused by the crystallization of dissolved ions from solution onto the heat transfer surfaces of heat exchangers that are subject to alternate wetting and drying. The VU System contains three HVAC mechanical water chillers that reject the total heat load from the refrigeration system to the Service Water (SW) System. The only copper and copper alloy components within the license renewal evaluation boundaries of the VU System, that are exposed to a raw water environment, are the condenser tubes within each water chiller unit [Dwg. 1MS-54-064 and TR00160-003, Attachment III].

System ID	Age Notes ID	Age Notes
		During normal plant operation, one of the three chillers and chilled water pumps are in continuous operation [FSAR, Section 9.4.7.2.4]. Cooling water from the SW System to the chiller units is controlled by inlet isolation valves. These valves automatically open when the associated chiller is started, and close when the chiller is secured [SW DBD, Section 2.1.3]. None of the copper and copper alloy components within the license renewal evaluation boundaries, that are exposed to a raw water environment, are subject to alternate wetting and drying [Dwgs. D-302-841, D-302-221 and -222]. As such, heat exchanger fouling due to precipitation is not an aging effect requiring management during the period of extended operation for copper and copper alloy components/component types of the VU System that are exposed to a raw water environment.
VU	A-VU-w	The relevant conditions do not exist in the air-gas environment of the Chilled Water (VU) System for any aging effects to occur in glass components/component types [TR00160-010, Attachment VI]. The only glass component within the license renewal evaluation boundaries of the VU System, that is exposed to an air-gas environment, is the sight glass in the cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. A search of applicable industry and plant operating experience was conducted that identified no instances of glass failure attributed to aging in air or gas environments. As such, there are no aging effects requiring management during the period of extended operation for glass components/component types of the VU System that are exposed to an air-gas environment.
VU	A-VU-x	The relevant conditions do not exist in the sheltered environment of the Chilled Water (VU) System for any aging effects to occur in glass components/component types [TR00160-010, Attachment X]. The only glass component within the license renewal evaluation boundaries of the VU System, that is exposed to a sheltered environment, is the sight glass in the cleanup subsystem [Dwg. 1MS-54-064 and TR00160-003, Attachment III]. A search of applicable industry and plant operating experience was conducted that identified no instances of glass failure attributed to the sheltered environment. As such, there are no aging effects requiring management during the period of extended operation for glass components/component types of the VU System that are exposed to a sheltered environment.
VU	A-VU-y	The relevant condition could exist in the ventilation* (same aging effects as the ventilation environment) environment of the Chilled Water (VU) System for loss of material due to general corrosion to occur [TR00160-010, Attachment VII]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the VU System that are exposed to the ventilation* environment. Loss of material due to general corrosion is an applicable aging effect for carbon steel chilled water expansion tanks exposed to the ventilation * (moist air) environment in the VU System. As discussed in TR00160-020, the one-time Above Ground Tank Inspection will assess conditions in order to detect and characterize, if any, a loss of material due to general corrosion in carbon steel exposed to the moist air inside a tank. This activity, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
VU	A-VU-z	The relevant conditions do not exist in the ventilation* environment of the Chilled Water (VU) System for the following aging effects to occur [TR00160-010, Attachment VII]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components exposed to a ventilation* environment in wetted locations, and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are

System ID	Age Notes ID	Age Notes
		completely dry since there is no fluid to electrolytically couple the two materials. During normal plant operation, both of the chilled water expansion tanks are vented to the atmosphere [Dwgs. D-302-842 and -843]. All of the piping connections with the chilled water expansion tanks within the license renewal evaluation boundaries of the VU System, that could possibly be involved as a galvanic couple, are also made of carbon steel [Dwgs. D-302-842 and -843, and SP-337 and -545 and TR00160-003, Attachment III]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a ventilation* environment. Fouling due to particulates is an aging effect for carbon steel heat exchanger sub-components. Fouling effects only the heat transfer surfaces of heat exchangers (i.e., tubes). A review of TR00160-003 revealed that there are no carbon steel heat exchanger tubes within the license renewal evaluation boundaries of the VU System. Therefore, fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the VU System that are exposed to a ventilation * environment. Loss of material due to boric acid corrosion is only an aging effect requiring management for those carbon steel components with a Reactor Building external environment. A review of TR00160-003 revealed that there are no carbon steel components with a ventilation* environment in the Reactor Building within the license renewal evaluation boundaries of the VU System. Therefore, loss of material due to boric acid corrosion is not an aging effect requiring management for the carbon steel components of the VU System exposed to the ventilation* environment during the period of extended operation. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminants. The expansion tanks are subject to this aging effect, and discussed in the treated water environment (See Note A-VU-b).
WG	A-WG-a	The relevant conditions could exist in the treated water environment of the Gaseous Waste Processing (WG) System for loss of material due to general, galvanic, crevice and pitting corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the WG System that are exposed to a treated water environment. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to general corrosion (oxygen > 100 ppb), loss of material due to galvanic corrosion (chlorides > 150 ppb and/or fluorides > 150 ppb), loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb and either halogens > 150 ppb or sulfates > 100 ppb) to occur in carbon steel exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
WG	A-WG-b	The relevant conditions do not exist in the treated water environment of the Gaseous Waste Processing (WG) System for the following aging effects to occur [TR00160-010, Attachment III]:

System ID	Age Notes ID	Age Notes
		Loss of material due to erosion-corrosion is an aging effect for carbon steel components subject to high fluid velocities, constricted flows or rapidly changing flow directions. An EPRI report [NSAC-202L-R1] indicates that erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase flow below 200°F, or operated less than 2% of the time. The carbon steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a treated water environment, are in contact with water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. During normal plant operation, the CC System transfers heat from the waste gas compressor packages (XGC-0001A/B) and catalytic hydrogen recombiner packages (XHR-0003A/B), and operates under single-phase flow conditions with maximum fluid temperatures less than 200°F [Dwg. D-302-613 and CC DBD]. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. Within the license renewal evaluation boundaries of the WG System, there are two waste gas compressor heat exchangers (XGC-0001A/B-HE1) and two catalytic hydrogen recombiner cooler condensers (XHR-0003A/B-HE1), each of which is susceptible to fouling [Dwgs. E-302-742, -744 and -745]. The only carbon steel components that are exposed to a treated water environment are the shells and channel heads in the heat exchangers, and the shells in the cooler condensers, neither of which have a heat transfer function [TR00160-006, Attachment VII]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a treated water environment. Loss of material due to corrosive impacts of alternate wetting and drying is an aging effect for carbon steel components subject to alternate wetting and drying that may concentrate contaminants. The carbon steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a treated water environment, are in contact with water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. The CC System serves as an intermediate, closed-loop cooling system, and during normal plant operation, transfers heat from nonessential plant equipment. Based upon the current design and operation of the CC System, none of these carbon steel components are subject to alternate wetting and drying [TR00160-006, Attachment VII]. As such, loss of material due to corrosive impacts of alternate wetting and drying is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is an aging effect for carbon steel components exposed to a nitrite-based corrosion inhibitor. The WG System and the CC System do not utilize a nitrite-based corrosion inhibitor [Chemistry Procedure (CP) - 632, Section 3.3]. As such, cracking due to SCC is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a treated water environment.
WG	A-WG-c	The relevant conditions could exist in the sheltered environment of the Gaseous Waste Processing (WG) System for loss of material due to

System ID	Age Notes ID	Age Notes
		general corrosion, boric acid corrosion (aggressive chemical attack) and microbiologically induced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for carbon steel components/component types in the WG System that are exposed to a sheltered environment. Loss of material due to MIC is an aging effect for carbon steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. Therefore, loss of material due to MIC is an applicable aging effect for carbon steel piping in the sheltered environment of the WG System. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion in carbon steel exposed to a sheltered environment, while the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion (aggressive chemical attack) in carbon steel exposed to a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions.
WG	A-WG-d	The relevant conditions do not exist in the sheltered environment of the Gaseous Waste Processing (WG) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to galvanic corrosion is an aging effect for carbon steel components normally exposed to wetted locations and electrolytically coupled to a material higher in the galvanic series. Galvanic corrosion does not occur when the metals are completely dry since there is no fluid to electrolytically couple the two materials. The carbon steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a sheltered environment, are in contact with an internal environment of water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. During normal plant operation, the CC System transfers heat from the waste gas compressor packages (XGC-0001A/B) and catalytic hydrogen recombiner packages (XHR-0003A/B). All of these carbon steel components are generally at the same, or higher temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [Dwg. D-302-613 and CC DBD]. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a sheltered environment. Loss of material due to pitting corrosion is an aging effect for insulated carbon steel components in systems with normal operating temperatures well below ambient conditions. The carbon steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a sheltered environment, are in contact with an internal environment of water from the Component Cooling

System ID	Age Notes ID	Age Notes
		Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. During normal plant operation, the CC System transfers heat from the waste gas compressor packages (XGC-0001A/B) and catalytic hydrogen recombiner packages (XHR-0003A/B). All of these carbon steel components are generally at the same, or higher temperature as ambient conditions, and are not susceptible to the formation of condensation on the external surfaces [Dwg. D-302-613 and CC DBD]. As such, loss of material due to pitting corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WG System that are exposed to a sheltered environment.
WG	A-WG-e	The relevant conditions could exist in the treated water environment of the Gaseous Waste Processing (WG) System for loss of material due to crevice and pitting corrosion and cracking due to stress corrosion for pipe and valves (SCC) to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for stainless steel components/component types in the WG System that are exposed to a treated water environment. Drawing 1MS-09-012 depicts that the Waste Gas Compressor heat exchanger cooling water outlet temperature is 115°F. Drawing D-302-613 depicts that the Catalytic Hydrogen Recombiner heat exchanger cooling water outlet temperature is 135°F. SCC is considered to be an aging effect/mechanism requiring system specific evaluation for stainless steel exposed to a treated water environment with either dissolved oxygen levels greater than 100 ppb and temperatures greater than 200°F or with chlorides and/or fluorides in excess of 150 ppb, and/or sulfates in excess of 100 ppb, and temperatures greater than 140°F. Based on the fact that the subject treated water system component temperatures are less than 140°F, cracking due to stress corrosion (SCC) is not an applicable aging effect for the subject stainless steel heat exchanger components. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (oxygen > 100 ppb and chlorides > 150 ppb) and loss of material due to pitting corrosion (oxygen > 100 ppb and halogens > 150 ppb and/or sulfates > 100 ppb) to occur in stainless steel heat exchanger components exposed to a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under CLB conditions. As discussed in TR00160-020, the Waste Gas System Inspection will detect and characterize a loss of material due to crevice and pitting corrosion and cracking due to stress corrosion (SCC), if any, for stainless steel pipe and valves exposed to a treated water environment. This activity is a one-time inspection and when performed will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under CLB conditions.
WG	A-WG-f	The relevant conditions do not exist in the treated water environment of the Gaseous Waste Processing (WG) System for the following aging effects to occur [TR00160-010, Attachment III]: Reduction of fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel components normally exposed to temperatures greater than 482°F. The stainless steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a treated water environment, are in contact with water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -

System ID	Age Notes ID	Age Notes
		744 and -745, and TR00160-006, Attachment VII]. The CC System serves as an intermediate, closed-loop cooling system, and during normal plant operation, transfers heat from nonessential plant equipment. None of these stainless steel components are subject to temperatures continuously above 482°F [Dwg. D-302-613 and CC DBD]. As such, reduction of fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WG System that are exposed to a treated water environment. Heat exchanger fouling due to particulates is an aging effect attributed to the accumulation of foulants (such as corrosion products) on the heat transfer surfaces of heat exchangers, and could be a significant aging mechanism where the water supply originates at the bottom of a tank or reservoir. The stainless steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a treated water environment, are in contact with water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. There are two waste gas compressor heat exchangers (XGC-0001A/B-HE1) and two catalytic hydrogen recombiner cooler condensers (XHR-0003A/B-HE1) [Dwgs. E-302-742, -744 and -745]. The stainless steel components that are exposed to a treated water environment are the spiral baffles, tube coils and tube manifolds in the cooler condensers, and the tubes and tubesheets in the heat exchangers. Fouling is only an aging effect when there is a heat transfer function and the subject heat exchangers do not have a license renewal heat transfer function. [TR00160-006, Attachment VII]. As such, heat exchanger fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WG System that are exposed to a treated water environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components subject to alternate wetting and drying that may concentrate contaminates. The stainless steel components within the license renewal evaluation boundaries of the WG System, that are exposed to a treated water environment, are in contact with water from the Component Cooling Water (CC) System [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. The CC System serves as an intermediate, closed-loop cooling system, and during normal plant operation, transfers heat from nonessential plant equipment. None of these stainless steel components are subject to alternate wetting and drying [TR00160-006, Attachment VII]. As such, loss of material and cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the WG System that are exposed to a treated water environment.
WG	A-WG-g	The relevant conditions do not exist in the sheltered environment of the Gaseous Waste Processing (WG) System for the following aging effects to occur [TR00160-010, Attachment X]: Loss of material due to MIC is an aging effect for stainless steel components, and is a potential problem in sheltered environments where contamination from untreated water or soil may have introduced bacteria. VCSNS operating experience has identified the accumulation of microbiological organisms on the external surfaces of some piping components at building wall penetrations as a result of groundwater intrusion effects. The VCSNS AMR has conservatively considered all piping, process tubing and ductwork component types to be susceptible to external MIC if they either enter a building from the outside or pass between buildings included in the sheltered environment below the 425' elevation. The applicable piping is at elevation 463' in the Auxiliary Building. As such, MIC is not an aging effect requiring management during the period of extended operation for stainless steel pipe of the WG System that are exposed to a sheltered

System ID	Age Notes ID	Age Notes
		environment.
WG	A-WG-h	The relevant conditions do not exist in the air-gas environment of the Gaseous Waste Processing (WG) System for the following aging effects to occur [TR00160-010, Attachment VI]: Cracking due to stress corrosion (SCC), specifically intergranular attack (IGA), is an aging effect for stainless steel components exposed to a moist air or gas environment in wetted locations where the temperature exceeds 200°F. The pipe and valve stainless steel components within the license renewal evaluation boundaries of the WG System, that are exposed to an air-gas environment are at temperatures (design) less than 200°F as noted on the E-302-741. As such, cracking due to SCC, specifically IGA, is not an aging effect requiring management during the period of extended operation for stainless steel pipe and valves of the WG System that are exposed to an air-gas environment. Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects for stainless steel components exposed to a moist air or gas environment, and subject to alternate wetting and drying that may concentrate contaminants. The stainless steel components within the license renewal evaluation boundaries of the WG System, that are exposed to an air-gas environment, consist of the following: tube coils and tube manifolds in the catalytic hydrogen recombiner cooler condensers, and also, piping and valves [Dwgs. E-302-742, -744 and -745, and TR00160-006, Attachment VII]. The WG System is a closed-loop system, and during normal plant operation, with one of the two catalytic hydrogen recombiner packages always operating, the WG System collects and retains gaseous effluents from radioactive systems. These effluents are predominantly impurities from bottled hydrogen and oxygen, fission noble gases, helium and nitrogen. The catalytic hydrogen recombiner package disposes of hydrogen brought into the waste gas stream by the volume control tank purge by adding a controlled amount of oxygen in the recombiner to react with the hydrogen as the gas flows through the catalyst bed. Water vapor formed by the reaction is then condensed and removed from the system [WG DBD]. Irrespective of whether or not the gas environment is dry or moist, none of the above-noted stainless steel components that are in contact with the various gaseous effluents are subject to alternate wetting and drying that may concentrate contaminants. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the WG System that are exposed to an air-gas environment.
WG	A-WG-j	The relevant conditions could exist in the air-gas environment of the Gaseous Waste Processing (WG) System for cracking due to stress corrosion (SCC), to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for the stainless steel heat exchanger components/component types in the WG System that are exposed to an air-gas environment. The susceptible heat exchanger components consist of the tube coils and tube manifolds in the catalytic hydrogen recombiner cooler condensers that could operate at a temperature greater than 200°F. As discussed in TR00160-020, the Waste Gas System Inspection will detect and characterize cracking due to stress corrosion (SCC), if any, in stainless steel heat exchanger components/component types that could operate at a temperature greater than 200°F exposed to an

System ID	Age Notes ID	Age Notes
		air-gas environment. This activity is a one-time inspection and when performed will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under CLB conditions.
WL	A-WL-a	The relevant conditions could exist in the borated water environment of the Liquid Waste Processing (WL) System for loss of material due to crevice corrosion, loss of material due to pitting corrosion and cracking due to stress corrosion cracking to occur [TR00160-010, Attachment II]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject stainless steel components/component types in the WL System that are exposed to a borated water environment with the following clarifications. For AMR purposes, the Liquid Waste Processing System is also noted herein as the WL System. Portions of the WL System operate at a temperature which is greater than 140°F. Thus, SCC could be a concern for portions of the system during normal plant operation. Even though SCC is not applicable to all of the stainless steel components/component types in the WL System, no distinction has been made herein for License Renewal purposes and stainless steel components/component types of the WL System were considered to be susceptible to cracking due to SCC. As discussed in TR00160-020, the Liquid Waste System Inspection will assess the condition of pertinent components in order to detect and characterize, if any, loss of material due to crevice corrosion or pitting corrosion and cracking due to stress corrosion cracking in stainless steel in a water environment gthat xcould contain borated water or other contaminants. This activity is a one-time inspection and when performed will provide reasonable assurance during the period of extended operation that the component intended function(s) will be maintained under CLB conditions.
WL	A-WL-b	The relevant conditions do not exist in the borated water environment of the WL System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment II]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-002], there are no alternately wetted and dried borated water environments for the stainless steel components within the license renewal boundaries of the WL System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a borated water environment. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel (CASS) components in environments with temperatures continuously greater than or equal to 482°F. A review of the screening report [TR00160-002] and associated references determined that no CASS components/components types exist and no operating temperatures continuously greater than or equal to 482°F exist within the treated water environment of the WL System license renewal evaluation boundaries. As such, reduction in fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a borated water environment.

System ID	Age Notes ID	Age Notes
		Precipitation fouling of heat exchangers in a borated water environment is caused by precipitation of borated compounds. As long as the component is water-solid, precipitation fouling is not expected to occur. The subject heat exchangers within the license renewal boundaries of the WL System are expected to remain water-solid. As such, fouling due to precipitation is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a borated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat exchanger heat transfer function, and no stainless steel heat exchanger components have a heat transfer function. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a borated water environment.
WL	A-WL-c	The relevant conditions could exist in the treated water environment of the WL System for loss of material due to crevice corrosion, loss of material due to pitting corrosion, loss of material due to general corrosion and loss of material due to galvanic corrosion to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject carbon steel components/component types in the WL System that are exposed to a treated water environment. There is a combination of stainless and carbon steels for the condensers channel head (XEV0029-CN1 & CN2) in the treated water environment. The referenced loss of material is for carbon steel and stainless steel. The referenced cracking is for stainless steel only. For this item, general and galvanic corrosion affect carbon steel only. For this item, stress corrosion cracking affects stainless steel only. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb), loss of material due to general corrosion (if oxygen is > 100 ppb) and loss of material due to galvanic corrosion (if chlorides and/or fluorides > 150 ppb) to occur in carbon steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
WL	A-WL-d	The relevant conditions do not exist in the treated water environment of the WL System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams noted in the screening report [TR00160-002], there are no alternately wetted and dried treated water environments for the carbon steel components within the license renewal boundaries of the WL System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
		EPRI Report NSAC-202L-R1 states that loss of material due to erosion-corrosion is not an aging effect requiring evaluation in systems that are either highly oxygenated, superheated, single-phase below 200°F or operated less than 2% of the time. There are no WL System piping components subject to these conditions. D-302-613 depicts operating temperature of treated water (Component Cooling Water) at less than 200°F. As such, loss of material due to erosion-corrosion is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a treated water environment. Cracking due to stress corrosion cracking (SCC) is a potential aging effect for carbon steel components in treated water environments in systems using nitrite-based corrosion inhibitors, such as Chilled Water, Switchgear Cooling and Diesel Generator Cooling. Component Cooling (CC) Water to the WL System heat exchangers do not use nitrite-based corrosion inhibitors [Chemistry Procedure CP-632, Section 3.3]. As such, cracking due to stress corrosion cracking (SCC) is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a treated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. Fouling affects only the heat transfer function, and no carbon steel heat exchanger components within the license renewal boundaries of the WL System have a heat transfer function. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a treated water environment.
WL	A-WL-e	The relevant conditions could exist in the sheltered environment of the WL System for loss of material due to general corrosion, loss of material due to MIC (pipe only) and loss of material due to boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment X]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for subject carbon steel components/component types in the WL System that are exposed to a sheltered environment. There is a combination of stainless and carbon steels for the condensers channel head (XEV0029-CN1 & CN2) and the heat exchanger (XEV0029-HE2) shell in the sheltered environment. The referenced loss of material is for carbon steel only. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following carbon steel components/component types in the WL System: condenser channel heads, heat exchanger shells and valves. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion, and the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion in carbon steel in a sheltered environment. Also, the Maintenance Rule Structures Program, as discussed in TR00170-003, will manage the loss of material due to external MIC in susceptible locations. These activities/program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
WL	A-WL-f	The relevant conditions could exist in the treated water environment of the WL System for loss of material due to crevice corrosion, loss of

System ID	Age Notes ID	Age Notes
		material due to pitting corrosion and cracking due to stress corrosion cracking to occur [TR00160-010, Attachment III]. If left unmanaged, these aging effects could result in loss of component intended function and thus, require management during the period of extended operation for all subject stainless steel components/component types in the WL System that are exposed to a treated water environment. There is a combination of stainless and carbon steels for the condensers channel head (XEV0029-CN1 & CN2) in the treated water environment. The referenced loss of material is for carbon steel and stainless steel. The referenced cracking is for stainless steel only. General and galvanic corrosion affect carbon steel only. Stress corrosion cracking affects stainless steel only. As discussed in TR00160-020, the existing Chemistry Program will manage the conditions required for loss of material due to crevice corrosion (if oxygen is > 100 ppb and chlorides > 150 ppb), loss of material due to pitting corrosion (if oxygen is > 100 ppb and halogens > 150 ppb or sulfates > 100 ppb) and cracking due to stress corrosion cracking (first possibility - oxygen is > 100 ppb at > 200°F, or second possibility - if chlorides and/or fluorides > 150 ppb and/or sulfates > 100 ppb at > 140°F) to occur in stainless steel in a treated water environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
WL	A-WL-g	The relevant conditions do not exist in the treated water environment of the WL System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment III]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in locations subject to alternate wetting and drying that may concentrate contaminants. Based upon a review of the system flow diagrams and the screening report [TR00160-002], components are normally water-solid and there are no alternately wetted and dried treated water environments for the stainless steel components within the license renewal boundaries of the WL System. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a treated water environment. Reduction in fracture toughness due to thermal aging is an aging effect for cast austenitic stainless steel (CASS) components in treated water environments with temperatures continuously greater than or equal to 482°F. A review of the screening report [TR00160-002] and associated references determined that no CASS components/components types exist and no operating temperatures continuously greater than or equal to 482°F exist within the treated water environment of the WL System license renewal evaluation boundaries. As such, reduction in fracture toughness due to thermal aging is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a treated water environment. Fouling due to particulates is an aging effect of foulants such as corrosion products building up in heat exchangers, where the supply originates at the bottom of a tank. For license renewal purposes, fouling affects only the heat transfer function, and the WL System heat exchangers heat transfer function is not required per TR00160-002 and its associated documents. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a treated water environment.

System ID	Age Notes ID	Age Notes
WL	A-WL-h	The relevant conditions could exist in the Reactor Building environment of the WL System for loss of material due to general and boric acid corrosion (aggressive chemical attack) to occur [TR00160-010, Attachment IX]. If left unmanaged, these aging effects could result in loss of component intended function(s), and thus, require management during the period of extended operation for all subject carbon steel components/component types in the WL System that are exposed to a Reactor Building environment. As discussed in TR00160-020, the activities for Inspections for Mechanical Components will manage loss of material due to general corrosion and the existing Boric Acid Corrosion Surveillances will manage loss of material due to boric acid corrosion in carbon steel in a Reactor Building environment. These activities, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
WL	A-WL-j	For the WL System, the air-gas environment is compressed hydrogen [E-302-735] with trace concentrations of fission product gases, which have been moistened by the contents of the Reactor Coolant Drain Tank. The relevant conditions do not exist in the air-gas environment of the WL System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment VI]: Loss of material/cracking due to corrosive impacts of alternate wetting and drying are aging effects in moist air or gas with airborne contaminants and locations subject to alternate wetting and drying that may concentrate contaminants. Within the license renewal evaluation boundaries of the WL System, the air-gas environment is compressed hydrogen, with trace concentrations of other gases. Based upon a review of the system flow diagrams and the screening report [TR00160-002], this environment is not expected to be an environment which will have the potential for contaminants to be concentrated as a result of cyclic wet and dry conditions. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for carbon steel piping and valves of the WL System that are exposed to an air-gas environment. Loss of material due to general corrosion is an aging effect in moist air or gas. Both oxygen and moisture must be present because oxygen alone or water free of dissolved oxygen does not corrode iron to any practical extent. Within the license renewal evaluation boundaries of the WL System, the air-gas environment is not air, but rather compressed hydrogen, with trace concentrations of other gases. As such, loss of material due to general corrosion is not an aging effect requiring management during the period of extended operation for carbon steel piping and valves of the WL System that are exposed to an air-gas environment. Loss of material due to galvanic corrosion is an aging effect in materials with different electrochemical potentials that are in contact in the presence of a corrosive or conductive environment. Within the license renewal evaluation boundaries of the subject piping and valves, there are no different materials in contact with the carbon steel. As such, loss of material due to galvanic corrosion is not an aging effect requiring management during the period of extended operation for carbon steel piping and valves of the WL System that are exposed to an air-gas environment.
WL	A-WL-k	The relevant conditions do not exist in the ventilation* (same aging effects as ventilation) environment of the WL System for the following aging effects to occur in stainless steel components/component types [TR00160-010, Attachment VII]: The WL System flow diagram [E-302-735] shows piping from the refueling canal to the outlet header from the Reactor Coolant Drain Tank.

System ID	Age Notes ID	Age Notes
		The subject WL System stainless steel component (valve WL-7129) is closed during refueling operations and during normal plant operation. The subject pipe internal surface is only wetted during draining of the refueling canal and herein is called the ventilation* environment. Some component surfaces such as the area around cooling coils are subject to alternate wetting and drying and are thus susceptible to pitting and crevice corrosion and stress corrosion cracking. This mechanism is not expected to a significant degree in the ventilation air environments. The subject valve is not in a wetted location for the majority of the time and is considered to be dry during normal operation. As such, loss of material/cracking due to corrosive impacts of alternate wetting and drying are not aging effects requiring management during the period of extended operation for subject carbon steel components/component types of the WL System that are exposed to an air-gas environment. Fouling due to particulates is an aging effect of foulants such as dirt, dust and debris building up in heat exchangers. For license renewal purposes, fouling affects only the heat transfer function, and the WL System heat exchangers heat transfer function is not required per TR00160-002 and its associated documents. As such, fouling due to particulates is not an aging effect requiring management during the period of extended operation for stainless steel components/component types of the WL System that are exposed to a ventilation* environment.
WL	A-WL-l	The relevant conditions do not exist in the Reactor Building environment of the WL System for the following aging effects to occur in carbon steel components/component types [TR00160-010, Attachment IX]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon steel in the Reactor Building environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry. The WL System operates at temperatures which are not well below the Reactor Building environment ambient temperature [D-302-735]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a Reactor Building environment.
WL	A-WL-m	The relevant conditions could exist in the sheltered environment of the WL System for loss of material due to microbiologically influenced corrosion (MIC) to occur [TR00160-010, Attachment X]. If left unmanaged, this aging effect could result in loss of component intended function(s), and thus, requires management during the period of extended operation for vulnerable stainless steel components/component types (pipe) in the WL System that are exposed to the sheltered environment. Loss of material due to MIC is not an applicable aging effect in the sheltered environment for the following stainless steel components/component types in the WL System: condenser channel heads, heat exchanger shells and valves. As discussed in TR00170-003, the Maintenance Rule Structures Program will manage loss of material due to MIC in vulnerable stainless steel components/component types (pipe) in the sheltered environment. This program, when continued into the period of extended operation, will provide reasonable assurance that the component intended function(s) will be maintained under all CLB conditions.
WL	A-WL-n	The relevant conditions do not exist in the sheltered environment of the WL System for the following aging effects to occur in carbon steel

System ID	Age Notes ID	Age Notes
		components/component types [TR00160-010, Attachment X]: Loss of material due to galvanic and pitting corrosion (insulated components) are aging effects requiring system specific evaluation for carbon steel in the sheltered environment in systems with normal operating temperatures well below ambient conditions. Galvanic and pitting corrosion do not occur when the metals are completely dry. The WL System operates at temperatures which are not well below the sheltered environment ambient temperature [D-302-735]. As such, loss of material due to galvanic and pitting corrosion (insulated components) are not aging effects requiring management during the period of extended operation for carbon steel components/component types of the WL System that are exposed to a sheltered environment.