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LR-N10-0371

U.S. Nuclear Regulatory Commission
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Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Response to NRC Request for Additional Information, dated October 12, 2010, related to the Buried Piping Inspection Program associated with the Hope Creek Generating Station License Renewal Application

References:

1. Letter from Ms. Bennett Brady (USNRC) to Mr. Thomas Joyce (PSEG Nuclear, LLC) "REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE HOPE CREEK GENERATING STATION LICENSE RENEWAL APPLICATION FOR BURIED PIPING INSPECTION PROGRAM (TAC NO. ME1832)", dated August 6, 2010

2. PSEG Letter LR-N10-0323 to USNRC, "Response to NRC Request for Additional Information, dated August 6, 2010, related to the Buried Piping Inspection Program associated with the Hope Creek Generating Station License Renewal Application," dated September 1, 2010

3. Letter from Ms. Bennett Brady (USNRC) to Mr. Thomas Joyce (PSEG Nuclear, LLC) " REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE HOPE CREEK GENERATING STATION LICENSE RENEWAL APPLICATION FOR BURIED PIPING (TAC NO. ME1832)", dated October 12, 2010

In Reference 1, the NRC staff requested additional information related to the Buried Piping Inspection Program associated with the Hope Creek Generating Station License Renewal Application. In Reference 2, PSEG responded to that request for information.

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After review of that submittal and further discussions between NRC staff and PSEG, the staff requested additional information (Reference 3). Enclosure A contains the responses to that request for additional information. Enclosure B provides updates to affected sections of the main body of the License Renewal Application (LRA).

Enclosure C contains updates to the affected sections of Appendix A and Appendix B of the LRA, including an update to Section A.5, the License Renewal Commitment List. There are no other new or revised regulatory commitments contained in this letter.

If you have any questions, please contact Mr. Ali Fakhar, PSEG Manager - License Renewal, at 856-339-1646.

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

Executed on 10/29/10

Sincerely,

Robert C. Braun
Senior Vice President, Operations
PSEG Nuclear LLC

Enclosures: A. Response to Request for Additional Information

B. Hope Creek Generating Station License Renewal Application Updates

C. LRA Appendix A and Appendix B Updates, including an update to Table A.5, "License Renewal Commitment List"

cc: William M. Dean, Regional Administrator – USNRC Region I
B. Brady, Project Manager, License Renewal – USNRC
R. Ennis, Project Manager – USNRC
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Enclosure A

Response to Request for Additional Information

RAI B.2.1.24-02

RAI B.2.1.24-02

Background:

Given that there have been a number of recent industry events involving leakage from buried or underground piping, the U.S. Nuclear Regulatory Commission (NRC or the staff) required further information to evaluate the impact that these recent industry events might have on the applicant's Buried Piping Inspection and Buried Non-Steel Piping Inspection Programs. By letter dated August 6, 2010, the staff issued request for additional information (RAI) B.2.1.24-01 requesting that the applicant provide information regarding how Hope Creek Generating Station (HCGS) will incorporate the recent industry operating experience into its aging management reviews (AMRs) and programs. The applicant responded on September 1, 2010. In reviewing the response, the staff had further questions.

Issue:

a) The applicant's response stated that "Planned direct visual inspections of excavated piping typically cover the entire circumference and a length of approximately 8 feet for larger pipe (based on a standard shoring box size), when practical." The staff does not have enough information to evaluate the statement, "when practical." While the staff acknowledges that examining buried pipe from the exterior surface may sometimes not be possible due to plant configuration (e.g., the piping is located underneath foundations); nevertheless, it is important to expose a large enough length of the piping in order to establish reasonable assurance of the condition of the piping system. The staff believes that in instances where it is not possible to expose eight feet of piping during each inspection, an alternative examination should be proposed. The staff notes that it is reasonable to substitute an ultrasonic volumetric examination from the interior of the pipe provided the surface is properly prepared.

b) The applicant's response stated that, "Included among the systems that are cathodically protected are some portions of in-scope carbon steel Fire Protection System buried piping, and some portions of in-scope stainless steel Condensate Storage and Transfer System buried piping. Only a small amount of Condensate Storage and Transfer System is buried carbon steel pipe (less than 10 linear feet of 1½ inch piping) and this portion of piping is not within the scope of license renewal." The applicant also stated that "The only other buried piping system within the scope of license renewal (Service Water System) has approximately 12 linear feet of 36 inch nominal carbon steel pipe. The remaining approximately 2,050 feet of Service Water System buried piping within the scope of license renewal is pre-stressed concrete pipe." The staff believes that cathodic protection is an important preventive measure for steel piping where soil resistivity values are below 20,000 ohm cm. The license renewal application (LRA) and supplemental documents lack sufficient detail for the staff to understand which portions of systems that contain steel piping are cathodically protected.

c) The applicant's response did not discuss if annual NACE potential surveys were being conducted at the station. The staff believes that annual NACE potential surveys are important to ensure that the appropriate protection is provided to the buried piping, trending data is obtained on cathodic protection field output, and potential coating holidays are located.

d) The staff does not have enough information to determine if the condensate storage and transfer system contain hazardous material during normal operation (i.e., material which, if released, could be detrimental to the environment such as diesel fuel and radioisotopes that exceed the Environmental Protection Agency drinking water standards). The staff believes that there is a minimum set of excavated and visual inspections of buried piping segments that contain hazardous materials that should be conducted to establish a reasonable basis of assurance that aging effects are not adversely impacting buried pipe and resulting in the release of hazardous materials to the environment.

e) Neither the LRA nor RAI response described the quality of the backfill in the vicinity of buried in-scope piping. The staff understands that the presence of rocks and sharp objects in the backfill around buried pipes is a leading precursor of degradation of buried piping when over time; ground movement causes these materials to come in contact with the buried pipe resulting in damage to the pipe's coating or external surfaces.

Request:

a) Define what is meant by "when practical" in relation to the length of piping being excavated for inspection. Additionally, where it is not practical to excavate and inspect eight feet of piping for each inspection, state what alternative means will be utilized to determine the condition of the piping material, or justify why inspecting less than eight feet of piping in the context of all planned inspections for each discrete material type provides a reasonable assurance of the condition of the buried pipe and coatings where applicable.

b) For buried in-scope steel piping respond to the following:

   i. What portions of the Fire Protection System, discriminated by material type, are provided with cathodic protection?

   ii. LRA Table 3.4.2-1, Condensate Storage and Transfer System, lists an AMR line item, Piping and Fittings (Pipe Sleeves), constructed of carbon steel exposed to soil and being managed for loss of material by the Buried Piping Inspection Program. Reconcile this line item with the above statement that there is no in-scope buried carbon steel piping in the Condensate Storage and Transfer System.

   iii. Is the approximate 12 linear feet of 36" service water carbon steel piping provided with cathodic protection?

   iv. If there are in-scope buried carbon steel piping segments that are not cathodically protected, justify why it is acceptable to inspect only one carbon steel piping segment in each ten year period starting ten years prior to the period of extended operation.

c) Clarify the periodicity of conducting NACE potential surveys, and if not annual, justify the proposed periodicity in light of ensuring appropriate protection is provided to the buried piping, trending data is obtained on cathodic protection field output, and potential coating holidays are located.

d) For buried in-scope piping respond to the following:

i. Does the condensate storage and transfer system contain hazardous material during normal operation?

ii. If the condensate storage and transfer system contains hazardous material during normal operation, state what percent of total linear feet of buried in-scope condensate storage and transfer system piping will be inspected by excavation and direct inspection during each ten year period starting ten years prior to the period of extended operation. If there are no planned inspections for this piping, justify why it is acceptable to not inspect in-scope buried pipe containing hazardous materials.

e) For buried in-scope piping respond to the following:

i. Provide details on the quality of the backfill in the vicinity of in-scope buried pipes.

If there is no information on the condition of the quality of backfill beyond initial installation specifications (ie., no documented observations of the quality of the backfill), justify why the planned inspections are adequate to detect potential degradation as a result of coating damage or holidays, or damage to the exterior surface of non-coated piping.

PSEG Response

a) The Hope Creek Buried Pipe Program plans to excavate, expose, and examine a minimum of eight feet of pipe for each committed inspection of buried pipe documented in Hope Creek LRA Table A.5, "License Renewal Commitment List" items 24 and 43. In PSEG's response to RAI B.2.1.24, the phrases "for larger pipe" and "when practical" were intended to capture the rare situations where unexpected physical limitations discovered during the excavation process (to expose large pipe) will prevent a minimum eight foot long section of pipe from being exposed for inspection. The use of the term, "when practical" was not intended to allow for the performance of "bell-hole" or "key-hole" excavations shorter than eight continuous feet for license renewal credited inspections.

However, in reviewing possible inspection candidates which will meet the commitments, Hope Creek has determined that the phrases "for larger pipe" and "when practical" were not necessary for committed buried pipe inspections in the previous RAI response. Therefore, Hope Creek retracts these phrases ("for larger pipe" and "when practical") from the first paragraph of page 5, Enclosure "A" in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Changes are highlighted with strikethroughs for deleted text.

> "Planned direct visual inspections of excavated piping typically cover the entire circumference and a length of approximately eight (8) feet ~~for larger pipe~~ (based on a standard shoring box size)~~, when practical~~."

b) i. Fire Protection System buried piping within the scope of license renewal that is provided with cathodic protection consists of approximately 1,500 linear feet of externally coated carbon steel piping. Other buried portions of the Fire Protection System piping within the scope of license renewal that are not provided with cathodic protection include approximately 10 linear feet of externally coated carbon steel pipe, approximately 428 linear feet of externally coated carbon steel pipe that is internally cement mortar lined, and approximately 19,000 linear feet of externally coated ductile iron pipe that is internally cement mortar lined.

During review of information in response to this RAI, it has been determined that for component type "Piping and Fittings" in the Fire Protection System, the license renewal application (LRA) Table 3.3.2-10 inadvertently identifies a "Soil (External)" environment for galvanized steel material. The Fire Protection System galvanized steel piping and fittings in the scope of license renewal at Hope Creek are located indoor or outdoor above grade, and are not exposed to a "Soil (External)" environment.

As a result, the commitment to inspect buried galvanized steel is revised to inspect a second buried carbon steel pipe segment in the Fire Protection System in each ten year period in lieu of buried galvanized steel.

LRA Table 3.3.2-10 (page 3.3-185) is revised to delete the line item for galvanized steel piping and fittings exposed to an external soil environment. This is the only galvanized steel component that was associated with LRA Table 3.3.1, Item Number 3.3.1-19 and included in the Buried Piping Inspection program. Therefore, LRA Table 3.3.1, Item Number 3.3.1-19 (page 3.3-63) and LRA Section 3.3.2.2.8 (page 3.3-45)

are revised to delete galvanized steel from the Buried Piping Inspection program discussion. This is also the only galvanized steel component that was included in the Buried Piping Inspection program. Therefore, LRA Appendix A, Section A.2.1.24 (page A-22) and Section A.5, License Renewal Commitment List Number 24 (page A-61) are revised to delete galvanized steel from the Buried Piping Inspection program enhancement description and to add a second inspection of carbon steel. LRA Appendix B, Section B.2.1.24 (page B-116) is revised to delete galvanized steel and to add a second inspection of carbon steel in the Buried Piping Inspection program description and program enhancement description (page B-117). The changes described above are included in Enclosures B and C of this letter.

ii. Although LRA Table 3.4.2-1, "Condensate Storage and Transfer System", does list an AMR line item for "Piping and Fittings (Pipe Sleeves)" constructed of carbon steel and exposed to soil, this component is not considered actual piping. These components are listed as pipe sleeves, providing a "Shelter, Protection" intended function, and are not pressure boundary retaining pipe. Therefore, the carbon steel pipe sleeves, listed in LRA Table 3.4.2-1 with a "Shelter, Protection" intended function, were not considered applicable within the context of the discussion contained in the response to RAI B.2.1.24.

During review of information in support of the response to this RAI, it has been determined that the carbon steel pipe sleeves for the Condensate Storage and Transfer (CST) System piping were inadvertently evaluated as fully encapsulating pipe sleeves of the buried stainless steel pipe. Further review has determined that these components were not intended to fully protect the buried stainless steel lines, but rather were used as construction forming devices to allow placement of the CST lines during original construction. These forms do not completely enclose the 2"-HCC-012, 10"-HCC-004, and 20"-HCC-002 stainless steel pipe lines, shown, and discussed in Note 8 on license renewal drawing LR-M-08-0 SH.1 zones F-5 and F-6. As such, the stainless steel pipes are in direct contact with soil. As a result, the pipe sleeves captured in Table 3.4.2-1 are no longer considered to have a license renewal intended function.

Therefore, LRA Table 2.3.4-1, "Condensate Storage and Transfer System, Components Subject to Aging Management Review" on page 2.3-267, LRA Table 3.4-1, "Summary of Aging Management Evaluations for the Steam and Power Conversion System" items 3.4.1-11 and 3.4.1-30 on pages 3.4-18 and 3.4-28, LRA Table 3.4.2-1, "Condensate Storage and Transfer System" on page 3.4-36, and LRA Section 3.4.2.2.5 "Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion" item 1 on page 3.4-8 are revised to delete these line items as shown in Enclosure B of this letter. In addition, license renewal drawing LR-M-08-0 SH.1 is revised to remove Note 8 referencing the carbon steel pipe sleeves.

iii. The configuration of the approximately 12 linear feet of 36 inch diameter carbon steel Service Water System piping is externally coated but not provided with cathodic protection. As described in the PSEG response to RAI B.2.1.24, Hope Creek plans to inspect two of the four buried pipe segments which make up the 12 linear feet during the next refueling outage in the fall of 2010.

iv. Hope Creek contains only two systems (Service Water and Fire Protection) within the scope of license renewal that contain buried carbon steel piping that are not

cathodically protected. The total length of this carbon steel buried pipe is approximately 450 linear feet, with approximately 12 linear feet in the Service Water System and approximately 438 linear feet in the Fire Protection System.

Service Water System

The Service Water System contains four separate pipe segments of coated buried carbon steel pipe, where 36 inch diameter lines penetrate the Service Water Intake Structure and the Reactor Building. The nominal pipe wall thickness of these segments is ½ inch. The total combined length of these segments is approximately 12 feet. These pipe segments are classified as safety-related and ASME Class 3. These segments were backfilled consistent with NACE SP0169-2007 section 5.2.3 and ASTM D 448-8. As documented above, Hope Creek plans to inspect two of these four carbon steel Service Water System pipe segments during the next refueling outage, which will be before entering the ten year period prior to the period of extended operation. The Service Water System does not contain any other buried steel pipe materials such as ductile iron.

To fulfill the commitment to excavate and inspect a carbon steel pipe segment in each of the three ten year periods, one of these four segments will be selected each ten year period. The inspection of one of these segments results in the inspection of approximately 25% of the entire length of buried carbon steel pipe in the Service Water System each ten year period. Hope Creek intends is to inspect a different segment in each ten year period.

The inspections described above, both related to license renewal and those planned before the ten year period prior to the period of extended operation, will provide a representative sample for buried coated carbon steel pipe in the Service Water System and will provide reasonable assurance that loss of material aging effects will be adequately managed so that the intended function of buried Service Water System pipe will be maintained consistent with the current licensing basis during the period of extended operation.

Fire Protection System

Buried portions of the Fire Protection System within the scope of license renewal do not contain hazmat fluids and are not ASME code pipe, are coated, and are backfilled consistent with NACE SP0169-2007 section 5.2.3 and ASTM D 448-8.

Buried Fire Protection System Carbon Steel Pipe

Portions of the Fire Protection System within the scope of license renewal contain approximately 438 feet of buried carbon steel pipe that is not cathodically protected. Approximately 390 feet of these 438 feet are included in 9 buried lines which run from the Turbine Building to the Main Transformers and Station Service Transformers. These lines are normally isolated from the Turbine Building fire suppression header by remote operating deluge valves, which open in the event of a transformer fire.

The remaining approximate 48 feet of the 438 feet is included in 6 additional buried lines that are each approximately 8 feet long. Each of these lines run

through an Auxiliary Building, Turbine Building, or Reactor Building exterior wall penetration below grade and end at a flanged connection to the buried ductile iron fire main piping which supplies water to the suppression systems inside these buildings. A post indicating valve provides isolation capability between the fire main and the branch connections to these carbon steel spool pieces provided at the wall penetrations.

Since the carbon steel pipe sections described above are not cathodically protected, carbon steel pipe wall exposed to soil through potential coating holidays may not be mitigated from corrosion. Therefore these segments represent a leading indicator for the most susceptible locations for coating degradation and pipe degradation on buried carbon steel pipe within the scope of license renewal. Portions of this pipe will be selected to fulfill the commitment to excavate and inspect a second carbon steel pipe section each ten year period. Inspection of 8 feet of this pipe will result in the direct inspection of approximately 2% of the buried Fire Protection System carbon steel pipe not cathodically protected within the scope of license renewal each ten year period.

The inspections described above will provide a representative sample of the most susceptible locations for buried coated carbon steel pipe in the Fire Protection System and therefore provide reasonable assurance that loss of material aging effects will be adequately managed so that the intended function of buried Fire Protection pipe will be maintained consistent with the current licensing basis during the period of extended operation.

Buried Fire Protection System Ductile Iron and Gray Cast Iron

At Hope Creek 14 and 12 inch buried fire mains that supply fire water from the fire pumps to the Auxiliary, Turbine, and Reactor Buildings are externally coated and cement mortar lined ductile iron pipe with gray cast iron fittings. None of this pipe is carbon steel. The Fire Protection System is the only system within the scope of license renewal that contains buried ductile iron and gray cast iron piping and components. Therefore ductile iron and gray cast iron buried piping and components in this system will be selected to fulfill the commitments to excavate and inspect these materials in each ten year period. Direct inspections of the buried Fire Protection System ductile iron pipe performed in 2009 and 2010 indicated that the external coating was in good condition.

Summary

Based on the discussion above, the committed inspections for carbon steel in the Service Water System and a second carbon steel inspection in the Fire Protection System in each ten year period provides reasonable assurance that loss of carbon steel material aging effects will be adequately managed so that the intended function of carbon steel portions of these two systems will be maintained consistent with the current licensing basis during the period of extended operation.

Also, the additional committed inspections of buried ductile iron and gray cast iron, for a total of four steel inspections in each ten year period provides reasonable assurance that loss of material aging effects of buried steel will be adequately managed so that the intended function of these two systems will be maintained consistent with the

current licensing basis during the period of extended operation. These inspections meet the recommended guidance of Table 4a "Inspection of Buried Pipe" in AMP XI.M41, NUREG-1801, Draft Revision 2, Generic Aging Lessons Learned Report (September 23, 2010 Version for Advisory Committee on Reactor Safeguards).

c) Hope Creek performs annual cathodic protection system effectiveness testing, consistent with NACE SP0169-2007 section 10.3, on those portions of the Cathodic Protection System that protect buried piping within the scope of license renewal. The testing results are documented and trended by the Cathodic Protection System Manager. Adverse trends will be entered into the corrective action program. Hope Creek will maintain the annual testing frequency.

d) i. Portions of the Condensate Storage and Transfer System that are within the scope of license renewal contain tritium levels greater than EPA drinking water limits during normal operation.

ii. All buried piping in the Condensate Storage and Transfer System within the scope of license renewal is stainless steel and cathodically protected. The total length of these lines is approximately 250 linear feet. An 8 foot segment of one of these lines will be selected to fulfill the commitment to excavate and inspect a stainless steel pipe segment in each ten year period. This will result in the direct inspection of approximately 3% of Condensate Storage and Transfer buried pipe within the scope of license renewal each ten year period.

The inspections described above will provide a representative sample for buried stainless steel pipe in the Condensate Storage and Transfer System and provide reasonable assurance that loss of material aging effects will be adequately managed so that the intended function of buried Condensate Storage and Transfer System piping will be maintained consistent with the current licensing basis during the period of extended operation.

In addition, these inspections meet the recommended guidance of Table 4a "Inspection of Buried Pipe" in AMP XI.M41, NUREG-1801, Draft Revision 2, Generic Aging Lessons Learned Report (September 23, 2010 Version for Advisory Committee on Reactor Safeguards).

e) i. Direct buried portions of the Fire Protection System, Condensate Storage and Transfer System, and carbon steel portions of the Service Water System piping within the scope of license renewal were backfilled during original construction in accordance with construction backfill specifications. Bedding material within at least 6 inches of the pipe was required to be sand, or an approved well graded granular material free from stones over 3/8 inches in largest diameter, or a lean concrete (fillcrete) or "sandcrete". Backfill more than six 6 inches from the pipe contained a coarser material of up to 3 inches in diameter. These requirements are consistent with NACE SP0169-2007 section 5.2.3 and ASTM D 448-8.

The backfill requirements for the Service Water System pre-stressed concrete pipe were different than requirements for coated metallic pipe since coating damage is not a concern. Bedding material for this piping (within 6 inches of the pipe) was required to be lean concrete or crushed stone not greater than 1 inch in diameter. Most of the direct buried portions of the Service Water System within the scope of license renewal

is pre-stressed concrete cylinder pipe (approximately 2,049 of a total of approximately 2,061 linear feet).

Plant procedures require that these specifications are followed during repair, inspection, and replacement activities when buried piping is backfilled.

Existing Buried Pipe Program inspection procedures require documentation of degraded coating and contributing factors (e.g. foreign objects) to the degradation. The procedure has the specific requirement to document observed stones in excavated soil regardless of whether the coating is damaged. Typical excavation equipment and processes make it difficult to ascertain whether observed stones larger than 3/8 inches were located within 6 inches of buried pipe prior to excavation. Typical excavation processes that expose buried pipe at Hope Creek involve backhoes and vacuum trucks. This equipment along with shoring and "soft dig" excavation procedures are intended to protected personnel and reduce coating damage during the excavation process. The equipment and process do not separate soil that is within 6 inches of the pipe from soil that is further than six (6) inch from the pipe. The Program Engineer fulfills the procedural requirement to look for stones by evaluating the excavation site.

Review of the reports for the inspections described in the Hope Creek LRA Appendix B.2.1.24 and PSEG's response to RAI B.2.1.24 show that some stones greater than 3/8 inches in diameter were observed in excavation soil piles. Foreign objects have not been observed in excavated soil. During these inspections the coating was observed to be in an acceptable condition and typically the piping was bedded with fillcrete within 6 inches of the pipe. Based on the above it is concluded that stones greater than 3/8 inches that were observed in the excavated soil piles were not located within 6 inches of the buried pipe prior to excavation.

Therefore, based on the original construction backfill specifications, recent inspection results which indicate no coating damage due to coarse backfill, and the procedure requirements to document contributing factors for coating degradation and the presence of stones, the planned inspections are adequate to detect potential degradation of buried coated and non coated piping.

Enclosure B

Hope Creek Generating Station License Renewal Application Updates

Note: To facilitate understanding, portions of the original LRA have been repeated in this Enclosure, with revisions indicated. Existing LRA text is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and strikethroughs for deleted text.

Table 2.3.4-1, "Condensate Storage and Transfer System, Components Subject to Aging Management Review" on page 2.3-267 is revised as shown below to delete one line item which addresses Carbon Steel Pipe and Fittings (Pipe Sleeve) and the intended function of "Shelter, Protection". Revisions are indicated with strikethroughs for deleted text.

Table 2.3.4-1 Condensate Storage and Transfer System Components Subject to Aging Management Review

Component Type	Intended Function
~~Piping and Fittings (Pipe Sleeve)~~	~~Shelter, Protection~~

LRA Section 3.3.2.2.8 "Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)" on page 3.3-45 is revised as shown below. Revisions are indicated with strikethroughs for deleted text.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (MIC)

Loss of material due to gener*al, pitting, crevice corrosion, and microbiologically-influenced corrosion (MIC) could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material is not occurring.*

Hope Creek will implement the Buried Piping Inspection, B.2.1.24, to manage loss of material due to general, pitting, crevice, and microbiologically influenced corrosion of the external surfaces of steel (including epoxy lined), ~~galvanized steel,~~ gray cast iron, and ductile cast Iron piping and fittings, fire hydrants, and valve bodies exposed to soil in the Fire Protection System and Service Water System. The Buried Piping Inspection aging management program manages buried steel piping and components for loss of material through the use of coatings and wrappings, and periodic inspections. The program relies on preventive measures such as coating and wrapping to mitigate corrosion and periodic inspection of external surfaces to identify coating degradation, if coated, or base metal corrosion, if uncoated. These inspections assure that existing environmental conditions are not causing material degradation that

LRA Table 3.3.1, "Summary of Aging Management Evaluations for the Auxiliary Systems" item 3.3.1-19 on page 3.3-63 is revised as shown below. Revisions are indicated with strikethroughs for deleted text.

Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-19	Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801. The Buried Piping Inspection program, B.2.1.24, will be used to manage loss of material due to general, pitting, crevice, and microbiologically influenced corrosion of the steel (including epoxy lined ~~and galvanized steel~~) piping, piping components, and piping elements exposed to soil. Hope Creek does not have any buried tanks in the scope of license renewal. See subsection 3.3.2.2.8. Components in the Auxiliary Boiler Building, Auxiliary Building Control/Diesel Generator Area, Auxiliary Building Service/Radwaste Area, Fire Protection System, Fire Water Pump House, Reactor Building, Service Water Intake Structures, Shoreline Protection and Dike, Switchyard, Turbine Building and Yard Structures have been aligned to this item number based on material, environment and aging effect. The Aboveground Steel Tanks program, B.2.1.19, RG 1.127 - Inspection of Water-Control Structures Associated with Nuclear

LRA Table 3.3.2-10, "Fire Protection System", on page 3.3-185 is revised as shown below to delete one line item which address Galvanized Steel Piping and Fittings in "Soil (External)" environment. Revisions are indicated with strikethroughs for deleted text.

Table 3.3.2-10 Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol.2 Item	Table 1 Item	Notes
~~Piping and Fittings~~	~~Pressure Boundary~~	~~Galvanized Steel~~	~~Soil (External)~~	~~Loss of Material/General Pitting, Crevice Corrosion, and Microbiologically Influenced Corrosion~~	~~Buried Piping Inspection~~	~~VIII.G-25~~	~~3.3.1-19~~	~~A~~

LRA Table 3.4.1, "Summary of Aging Management Evaluations for the Steam and Power Conversion System" items 3.4.1-11 and 3.4.1-30 on pages 3.4-18 and 3.4-28 are revised as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

Table 3.4.1 Summary of Aging Management Evaluations for the Steam and Power Conversion System

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	~~Consistent with NUREG-1801. The Buried Piping Inspection Program, B.2.1.24, will be used to manage the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion in steel piping, piping components, and piping elements exposed to soil.~~ ***Not Applicable*** See Subsection 3.4.2.2.5.1.
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, B.2.1.26, will be used to manage the loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements, exposed to Air/Gas wetted in the ~~Condensate Storage and Transfer System and the~~ Main Steam System.

LRA Table 3.4.2-1, "Condensate Storage and Transfer System", on page 3.4-36 is revised as shown below to delete two line items which address Carbon Steel Piping and Fittings (Pipe Sleeve) in "Air/Gas – Wetted (Internal)" and "Soil (External)" environments. Revisions are indicated with strikethroughs for deleted text.

Table 3.4.2-1 Condensate Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol.2 Item	Table 1 Item	Notes
~~Piping and Fittings (Pipe Sleeve)~~	~~Shelter, Protection~~	~~Carbon Steel~~	~~Air/Gas – Wetted (Internal)~~	~~Loss of Material/ General Pitting and Crevice Corrosion~~	~~Inspection of Internal Surface in Miscellaneous Components~~	~~VIII.B1-7~~	~~3.4.1-30~~	~~A~~
~~Piping and Fittings (Pipe Sleeve)~~	~~Shelter, Protection~~	~~Carbon Steel~~	~~Soil (External)~~	~~Loss of Material/ General Pitting, Crevice, and Microbiologically Influenced Corrosion~~	~~Buried Pipe Inspection~~	~~VIII.E-1~~	~~3.4.1-11~~	~~A~~

LRA Section 3.4.2.2.5 "Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion" item 1 on page 3.4-8 is revised as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. *Loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general corrosion, pitting and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material is not occurring.*
   ~~Hope Creek will implement the Buried Piping Inspection program, B.2.1.24, to manage Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion in buried steel piping, piping components, and piping elements exposed to soil in the Condensate Storage and Transfer System. The Buried Piping Inspection Program is described in Appendix B.~~

   ~~There are no steel tanks exposed to soil in the Steam and Power Conversion System.~~

Item number 3.4.1-11 is not applicable to Hope Creek. There is no buried steel piping or steel tanks exposed to soil in the Steam and Power Conversion System.

Enclosure C

Hope Creek Generating Station License Renewal Application Updates to Appendix A and Appendix B Program Descriptions and Updates to the Section A.5 License Renewal Commitment List

Note: To facilitate understanding, portions of the original LRA Appendix A and B have been repeated in this Enclosure, with revisions indicated. Existing text is shown in normal font. Changes are highlighted with ***bolded italics*** for inserted text and strikethroughs for deleted text.

LRA Appendix A, Section A.2.1.24, "Buried Piping Inspection" on page A-22 is revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

A.2.1.24 Buried Piping Inspection

The Buried Piping Inspection aging management program is an existing program that manages the external surface aging effects of loss of material for piping and components in a soil (external) environment. The Hope Creek buried component activities consist of preventive and condition-monitoring measures to manage, detect and monitor the loss of material due to external corrosion for piping and components in the scope of license renewal that are in a soil (external) environment.

External inspections of buried components will occur opportunistically when they are excavated during maintenance. The Buried Piping Inspection aging management program will be enhanced to include:

1. At least one (1) opportunistic or focused excavation and inspection will be performed on each of the material groupings, which include carbon steel, ~~galvanized steel,~~ ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. ***A second opportunistic or focused excavation and inspection on a carbon steel piping segment, which is not cathodically protected, will be performed on the Service Water System during each ten year period, beginning ten years prior to entry into the period of extended operation. A different segment will be inspected in each ten year period.***

This enhancement will be implemented prior to the period of extended operation, with the inspections performed in accordance with the schedule described above.

LRA Appendix B, Section B.2.1.24, "Buried Piping Inspection" on pages B-116, B-117 and B-118 are revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

B.2.1.24 Buried Piping Inspection

Program Description

The Buried Piping Inspection aging management program is an existing program that includes preventive measures such as coating and wrapping to mitigate corrosion and periodic inspection of external surfaces for loss of material to detect and monitor the effects of corrosion on the external surface of buried steel piping and components in a soil (external) environment. The program provides for managing loss of material due to general corrosion, pitting, crevice corrosion and microbiologically-influenced corrosion (MIC). Preventive measures are in accordance with standard industry practices for maintaining external coatings and wrappings.

Hope Creek does not have any buried tanks in the scope of license renewal.

External inspections of buried components using visual techniques will occur opportunistically when they are excavated during maintenance. The Buried Piping Inspection aging management program will be enhanced to include at least one (1) opportunistic or focused excavation and inspection on each of the material groupings, which include carbon steel, ~~galvanized steel,~~ ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. ***A second opportunistic or focused excavation and inspection on a carbon steel piping segment, which is not cathodically protected, will be performed on the Service Water System during each ten year period, beginning ten years prior to entry into the period of extended operation. A different segment will be inspected in each ten year period.***

Any coating and wrapping degradation is reported and evaluated according to site corrective action procedures. External component degradation is reported and evaluated whenever buried commodities are uncovered during yard excavation activities, which includes bolting. The Bolting Integrity program addresses the aging management of buried bolting. In addition, evidence of metal surface corrosion and any leakage detected through periodic testing and visual inspections will be evaluated and used to confirm the system and components ability to perform their intended functions. Any leakage identified is evaluated and appropriate corrective actions are implemented.

The program will be enhanced as described below to provide reasonable assurance that buried piping and components of all steel materials that are in scope of the Buried Piping Inspection program, including carbon steel, ~~galvanized steel,~~ ductile cast iron, and gray cast iron at Hope Creek will perform their intended function during the period of extended operation.

NUREG-1801 Consistency

There are no buried tanks at Hope Creek that are in scope for license renewal. The Buried Piping Inspection aging management program is consistent with the ten elements of aging management program XI.M34, "Buried Piping and Tanks Inspection," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented:

1. The Buried Piping Inspection aging management program will be enhanced to include at least one (1) opportunistic or focused excavation and inspection on each of the material groupings, which include carbon steel, ~~galvanized steel,~~ ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. ***A second opportunistic or focused excavation and inspection on a carbon steel piping segment, which is not cathodically protected, will be performed on the Service Water System during each ten year period, beginning ten years prior to entry into the period of extended operation. A different segment will be inspected in each ten year period.*** **Program Elements Affected: Detection of Aging Effects (Element 4)**

Operating Experience

Operating experience shows that the program described here is effective in managing corrosion of external surfaces of buried steel piping. However, because the inspection frequency is plant-specific and depends on the plant operating experience, the Hope Creek plant-specific operating experience is further evaluated for the extended period of operation. Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that loss of material due to general, pitting, crevice, and microbiologically influenced corrosion are being adequately managed. The following examples of operating experience provide objective evidence that the Buried Piping Inspection program will be effective in assuring that intended function(s) would be maintained consistent with the CLB for the period of extended operation:

1. In 2008, risk ranking of the Hope Creek buried piping revealed that the portions of the carbon steel Service Water piping were determined to be high risk. As a result, a plan was developed to conduct non-intrusive inspection of the coated carbon steel through-wall penetrations of the 36-inch service water underground spools at the Service Water Intake Structure and Reactor Building penetrations. Non-destructive examination of piping is to take place from the inside diameter of this piping to determine the external condition of the pipe and its external coating. This example provides objective evidence that an active risk ranking methodology is in place and that focused inspection of the outer coating of the buried steel piping was planned as part of this aging management program.

2. In May 2005, water was bubbling up from beneath the asphalt, in front of the Fire Pump House. The 12-inch fire main was excavated to the elbow level and inspection found the leakage to be caused by a loose flange joint. Bolting on the flange was tightened and the leakage stopped. There was no need for further excavation since no deficiencies were identified on the excavated coated ductile cast iron piping. This example provides objective evidence that inspections are performed and buried piping is opportunistically inspected, whenever it is exposed, during any excavation for maintenance.

3. In 2003, the fire main appeared to be broken underground between Fire Hydrant FH-07 and FH-15 in front of the Fire Pump House. Excavation was conducted to the elbow level and found the flange joint to be loose. No deficiency was identified on the exposed portion of the coated cast iron piping. Bolting on the flange was tightened and the leakage stopped. This example provides objective evidence that corrective actions are taken prior to loss of intended function.

A review of plant operating experience showed that excavation of buried piping has occurred, and no instances of significant age related deficiencies were documented. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the implementation of the Buried Piping Inspection program will effectively identify degradation prior to failure. The work planning process provides instructions to do exterior surface inspections when excavations occur. Appropriate guidance for re-evaluation, repair, or replacement is provided for locations where degradation is found. Assessments of the Buried Piping Inspection program are planned, to identify the areas that need improvement to maintain the quality performance of the program.

Conclusion

The enhanced Buried Piping Inspection program will provide reasonable assurance that loss of material aging effects will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained consistent with the current licensing basis during the period of extended operation.

LRA Appendix A, Table A.5, "License Renewal Commitment List", commitment 24 on page A-61 is revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

A.5 License Renewal Commitment List

NO.	*PROGRAM OR TOPIC*	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
24	Buried Piping Inspection	Buried Piping Inspection is an existing program that will be enhanced to include: 1. At least one (1) opportunistic or focused excavation and inspection will be performed on each of the material groupings, which include carbon steel, ~~galvanized steel,~~ ductile cast iron, and gray cast iron piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. ***A second opportunistic or focused excavation and inspection on a carbon steel piping segment, which is not cathodically protected, will be performed on the Service Water System during each ten year period, beginning ten years prior to entry into the period of extended operation. A different segment will be inspected in each ten year period.***	A.2.1.24	Program to be enhanced prior to the period of extended operation. Inspection schedule identified in commitment.	Section B.2.1.24 Hope Creek Letter LR-N10-0323 RAI B.2.1.24 ***Hope Creek Letter LR-N10-0371 RAI B.2.1.24-02***

LRA Appendix A, Section A.2.2.4, "Buried Non-Steel Piping Inspection" on pages A-32 and A-33 are revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

A.2.2.4 Buried Non-Steel Piping Inspection

The Buried Non-Steel Piping Inspection aging management program is an existing condition monitoring program that manages the buried reinforced concrete piping and components in the Service Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability and loss of material. These aging effects will be identified through visual inspections of the external surfaces of the piping and components.

The Buried Non-Steel Piping Inspection aging management program also inspects the buried stainless steel piping and components in the Condensate Storage and Transfer System and the Fire Protection System for loss of material. These aging effects will be identified through visual inspections of the external surfaces of the piping and components. The Buried Non-Steel Piping Inspection will be enhanced to include:

1. At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.

2. At least one (1) opportunistic or focused excavation and inspection will be performed on ***Condensate Storage and Transfer System*** buried stainless steel piping and components, ***which contain fluid that exceed EPA drinking water limits,*** during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.

3. Guidance for inspection of concrete aging effects.

These enhancements will be implemented prior to the period of extended operation, with the inspections performed in accordance with the schedule described above.

LRA Appendix B, Section B.2.2.4, **"Buried Non-Steel Piping Inspection"** on pages B-197 through B-205 are revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

B.2.2.4 Buried Non-Steel Piping Inspection

Program Description

The Buried Non-Steel Piping Inspection aging management program is an existing condition monitoring program that manages the buried reinforced concrete piping and components in the Service Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability, and loss of material. The program relies on inspections of the external surfaces of piping and components to identify cracking, loss of bond, increase in porosity and permeability and loss of material.

The Buried Non-Steel Piping Inspection aging management program also manages the aging effects on buried stainless steel piping and components in the Condensate Storage and Transfer System and the Fire Protection System that are exposed to an external soil environment. The program relies on visual inspections of the external surfaces of the piping and components to identify loss of material. Inspection of buried components identifies coating degradation, if coated, or base metal corrosion, if uncoated.

Opportunistic and focused inspections are performed to manage the effects of exterior surface and coating degradation on the pressure-retaining capacity of buried piping and components. Buried piping and components are inspected when they are excavated for maintenance or any other reason.

At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.

Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface and coating degradation problems are identified and prioritized. Probabilistic arguments were not used in the development of the Buried Non-Steel Piping Inspection aging management program. Aging effects are managed by a condition monitoring program.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the Standard Review Plan of License Renewal Applications for Nuclear Power Plants, NUREG-1800, are provided below.

Scope of Program – Element 1

The Buried Non-Steel Piping Inspection aging management program is an existing program that manages cracking, loss of bond, loss of material and increase in porosity and permeability, through the use of opportunistic and focused inspections. The program relies on condition monitoring inspections of the external surfaces of piping and components to identify external surface

degradation and detect the aging effects listed above. Opportunistic or focused inspections are performed when the components are excavated for maintenance or for any other reason. The program directs engineering to perform inspections of piping and components exposed during excavation. Inspection of buried components identifies coating degradation, if coated, or base metal corrosion, if uncoated.

The Buried Non-Steel Piping Inspection aging management program consists of system components within the scope of license renewal that are buried and included in the Service Water System, the Condensate Storage and Transfer System and the Fire Protection System. This includes the buried reinforced concrete piping in the Service Water System that extends from the carbon steel spool piece at the Service Water Intake Structure to the interface of the Reactor Building and the buried stainless steel piping in the Fire Protection System that extends from the Reactor Building into the ground in several locations. Additionally, the Buried Non-Steel Piping Inspection aging management program consists of buried stainless steel piping in the Condensate Storage and Transfer System that extends from the Condensate Storage Tank piping to a buried seismic anchor block credited for structural support. Opportunistic and focused inspections are performed when the piping and components are excavated for maintenance or for any other reason.

The Buried Non-Steel Piping Inspection aging management program will be enhanced to include at least one opportunistic or focused excavation and inspection of buried reinforced concrete piping and components and at least one opportunistic or focused excavation and inspection of ***Condensate Storage and Transfer System*** stainless steel buried piping and components, ***which contain fluid that exceed EPA drinking water limits,*** during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.

Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface and coating degradation problems are identified and prioritized. Probabilistic arguments were not used in the development of the Buried Non-Steel Piping Inspection aging management program. Aging effects are managed by a condition monitoring program.

Preventive Actions – Element 2

The Buried Non-Steel Piping Inspection aging management program is not a preventive or mitigation program. The Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that relies on opportunistic or focused inspections of the buried reinforced concrete piping and components in the Service Water System and the buried stainless steel piping and components in the Condensate Storage and Transfer System and the Fire Protection System that is exposed to an external soil or groundwater environment. The buried reinforced concrete piping and components are inspected for cracking, loss of bond, increase in porosity and permeability, and loss of material. The buried stainless steel piping and components are

inspected for loss of material.

Parameters Monitored/Inspected – Element 3

The Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that relies on opportunistic or focused inspections of the buried reinforced concrete piping and components in the Service Water System that are exposed to an external soil or groundwater environment to inspect for cracking, loss of bond, increase in porosity and permeability, and loss of material. The Buried Non-Steel Piping Inspection aging management program also relies on opportunistic or focused inspections of the buried stainless steel piping and components in the Condensate Storage and Transfer System and the Fire Protection System that are exposed to an external soil environment to inspect for loss of material.

These aging effects will be identified through visual inspections of the external surfaces of the piping and components. Opportunistic or focused inspections are performed when the piping is excavated for maintenance or for any other reason. External surfaces are inspected by visual techniques whenever buried piping and components are uncovered during excavation activities. Inspection of buried components identifies coating degradation, if coated, or base material degradation, if uncoated. At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.

The Buried Non-Steel Piping Inspection aging management program is not a performance monitoring program nor is it a preventive or mitigation program.

Detection of Aging Effects – Element 4

The Buried Non-Steel Piping Inspection aging management program is a condition monitoring program that performs opportunistic or focused inspections on the buried piping and components in the scope of this program to detect and inspect the buried reinforced concrete piping and components in the Service Water System that are exposed to an external soil or groundwater environment for cracking, loss of bond, increase in porosity and permeability, and loss of material and will detect degradation of the component prior to loss of its intended function. Opportunistic or focused inspections to detect cracking, loss of bond, increase in porosity and permeability, and loss of material will be specified by engineering through specific procedures and will be based on accepted industry practices. Examination methods include visual inspections of the external surface of buried piping and components. The methods used to inspect for degradation are implemented in accordance with accepted industry standards.

The Buried Non-Steel Piping Inspection aging management program will inspect the buried stainless steel piping and components in the Condensate Storage and Transfer System and the Fire Protection System that are exposed to an external soil environment for loss of material and will detect degradation

of the component prior to loss of its intended function. Examination methods include visual inspections of the external surface of buried piping and components. The methods used to inspect for degradation are implemented in accordance with accepted industry standards.

These inspections are an effective method to ensure that degradation of external surfaces has not occurred and the intended function is maintained. External inspections of buried components will occur opportunistically when they are excavated during maintenance, in addition to focused inspections. The inspections will be performed on all of the areas made accessible to support the maintenance activity.

At least one opportunistic or focused excavation and inspection of buried piping and components within the scope of this program will be performed during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. Areas with high susceptibility of exterior surface degradation, consequence of failure and areas with a history of exterior surface and coating degradation problems are identified and prioritized. If necessary, engineering will determine expanded inspection scope based on technical evaluations if the initial inspection results are unacceptable.

Operating experience supports this frequency of inspection. A review of plant operating experience at Hope Creek shows that there have been no underground leaks that developed as a result of failure of the external surface of buried stainless steel or reinforced concrete piping. Although failure of buried piping has occurred, it has been determined that the buried piping leaks were caused by degradation of the inside of the buried piping. In 2004, it was determined that the service water loop underground headers joint epoxy coating was blistering internally. The cause of this blistering was due to exposure of the bell and spigot joints and other piping joints to river water on the internal surface of the pipe and not due to external age related degradation. There have been no inspections of buried stainless steel piping at Hope Creek to date. Additionally there have been no failures of buried stainless steel piping at Hope Creek to date.

Focused visual inspections will be performed on a representative sample of components, material and environment combinations. Visual inspections will be performed on external piping and component surfaces that are made accessible during opportunistic or focused excavations and inspections. Visual inspections will be performed on a representative sample of piping and component external surfaces in the scope of this program.

Significant degradation identified during inspection activities are entered into the corrective action program. The degraded condition is evaluated, and corrective actions are established if necessary to preclude recurrence.

Monitoring and Trending – Element 5

Opportunistic or focused inspections are appropriate for detecting cracking, loss of bond, increase in porosity and permeability, and loss of material aging

effects prior to loss of intended function, based on plant specific and industry operating experience. External piping and component degradation is repaired and evaluated whenever buried commodities are uncovered during excavation and inspection activities. These inspection activities provide an effective technique to identify the extent of degradation on piping and component surfaces prior to loss of component intended function. The inspections will be performed on a representative sample of component, material and environment combinations. Results of the inspection activities will be monitored and indications of significant degradation will be entered into the corrective action process for evaluation. The evaluation will determine the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize system and component intended functions. In addition, the engineering evaluation will either demonstrate acceptability or specify the appropriate repair or replacement.

The data collected will be evaluated and quantified by engineering, and appropriate corrective actions will be taken for any adverse findings. Engineering evaluation requires an assessment of the rate of degradation, such that timing of the next scheduled inspection will occur before a loss of intended function. Significant degradation identified by visual inspections will be entered into the corrective action process. The corrective action process will include a notification and evaluation of the degraded condition against the acceptance criteria. Notifications are trended within the corrective action program. Significant loss of material identified by the external surface inspection will be quantified in terms of remaining wall thickness, and compared to minimum wall thickness design requirements. Subsequent inspection results will be compared to previous results for trending and confirmation of adequate inspection frequency. Follow up examinations will be required if necessary to determine the extent of the degraded condition, thus expanding the sample size and locations of inspections or adjusting the inspection frequency as appropriate.

Acceptance Criteria – Element 6

Acceptance criteria are specified in the implementing procedure or work order in accordance with the applicable regulatory or industry requirements. Inspection data is evaluated to determine wear rate, remaining life and the time to the next inspection or repair/replacement. External component degradation is reported and evaluated whenever buried commodities are uncovered during yard excavation activities. In addition, evidence of surface degradation and any leakage detected through periodic testing and visual inspections will be evaluated and used to confirm the system and components ability to perform their intended functions. Any leakage identified is evaluated and appropriate corrective actions are implemented. Guidance for acceptance criteria relating to localized wall thinning and is contained in engineering documents and is used in the evaluation methodology.

Acceptance criteria are specified to ensure that the structure and component intended function(s) will be maintained under all CLB design conditions. Guidance for local wall thinning evaluations is in accordance with applicable

regulatory or industry codes.

Any acceptance criteria not currently defined in the UFSAR will be defined by engineering and accepted based on procedures, regulatory requirements and accepted industry practices to maintain intended functions under CLB loads.

All qualitative inspections will be performed to the same predetermined criteria as quantitative inspections in accordance with approved site procedures. Acceptance criteria for loss of material are quantitative, in that the requirement is to maintain a predetermined wall thickness. Visual inspections are qualitative in that they are relied upon to determine if any wall loss is occurring based on the visually observable surface conditions. Indications of significant degradation will require additional evaluation to quantify the material loss and compare it to the applicable design requirements. Inspections are performed by qualified personnel in accordance with approved station procedures.

Corrective Actions – Element 7

Evaluations will be performed for inspection results that do not meet the acceptance criteria and a Notification is initiated to document the concern in accordance with the requirements of 10 CFR Part 50, Appendix B and in accordance with plant administrative procedures. The corrective action program ensures that the conditions adverse to quality are promptly corrected, including root cause determination and prevention of recurrence.

If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition. Engineering analysis of identified degradation will confirm that the structure or component intended function will be maintained consistent with the CLB, or the structure or component will be repaired or replaced.

Confirmation Process – Element 8

The confirmation process is implemented by site quality assurance (QA) procedures, review and approval processes, and administrative controls which are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The completion and effectiveness of the preventive and corrective actions are monitored by the site's quality assurance (QA) procedures.

The Buried Non-Steel Piping Inspection program relies on condition monitoring activities and strategies to ensure long-term operability of buried piping and components. The Buried Non-Steel Piping Inspection program is a condition monitoring program, not a prevention and mitigation program.

Administrative Controls – Element 9

The procedures used to implement the Buried Non-Steel Piping Inspection program are included in the quality assurance program that provides for formal reviews and approvals. Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

The Buried Non-Steel Piping Inspection program consists of administratively controlled procedures, which are controlled as stated in the item above. This aging management program is included in the Hope Creek license renewal UFSAR supplement.

Operating Experience – Element 10

Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that aging effects/mechanisms are being adequately managed. The following examples of operating experience provide objective evidence that the Buried Non-Steel Piping Inspection program will be effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1. A review of plant operating experience at Hope Creek shows that there have been no underground leaks that developed as a result of failure of the external surface of buried stainless steel or reinforced concrete piping. Although failure of buried piping has occurred, it has been determined that the buried piping leaks were caused by degradation of the inside of the buried piping. Degradation of inside surfaces of piping is managed through other aging management programs.

2. In 2004, it was determined that the service water loop underground headers joint epoxy coating was blistering internally. The cause of this blistering was due to exposure of the bell and spigot joints and other piping joints to river water on the internal surface of the pipe and not due to external age related degradation. This blistering was grit blasted, cleaned, NDE examined, prepared and recoated using new coating ENECON coating. All joints were rescanned and were found to have adequate metal thickness. No immediate need for installation of WEKO seals was warranted. The exterior surface of the buried reinforced concrete piping of the Service Water system has a tar and fiber material, which protects the joints from outside, and no problems have been identified or suspected with the coating. The service water headers joints are inspected once every three years internally, one loop every 18 months. This provides objective evidence that susceptible buried piping is internally inspected on a routine basis, and any indication of degradation would be evaluated. Additionally, this operating example provides objective evidence that excavation and inspection of piping and components have been occurring opportunistically when underground pipe is exposed for other maintenance.

A review of plant operating experience showed that excavation of buried non-steel piping has occurred, and no instances of significant age related deficiencies were documented. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the implementation of the Buried Non-Steel Piping Inspection program will effectively identify degradation prior to failure. The work planning process provides instructions to do exterior surface inspections when excavations occur. Appropriate guidance for re-evaluation, repair, or replacement is

provided for locations where degradation is found. Assessments of the Buried Non-Steel Piping Inspection program are performed to identify the areas that need improvement to maintain the quality performance of the program.

Exceptions to NUREG-1800

None.

Enhancements

1. At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. **Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**

2. At least one (1) opportunistic or focused excavation and inspection will be performed on ***Condensate Storage and Transfer System*** buried stainless steel piping and components, ***which contain fluid that exceed EPA drinking water limits,*** during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. **Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**

3. Guidance for inspection of concrete aging effects. Instructions will include inspection for cracking, loss of bond, loss of material and increase in porosity and permeability. **Program Elements Affected: Scope of Program (Element 1), Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)**

Conclusion

The enhanced Buried Non-Steel Piping Inspection aging management program will provide reasonable assurance that cracking, loss of bond, increase in porosity and permeability, and loss of material will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained consistent with the current licensing basis during the period of extended operation.

LRA Appendix A, Table A.5, "License Renewal Commitment List", commitment 43 on page A-70 is revised as shown below. These revisions supersede the revisions in PSEG's response to Hope Creek RAI B.2.1.24, contained in PSEG letter LR-N10-0323 dated September 01, 2010, as shown below. Revisions are indicated with strikethroughs for deleted text and ***bolded italics*** for inserted text.

A.5 License Renewal Commitment List

43	Buried Non-Steel Piping Inspection	Buried Non-Steel Piping Inspection is an existing program that will be enhanced to include: 1. At least one (1) opportunistic or focused excavation and inspection will be performed on buried reinforced concrete piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. 2. At least one (1) opportunistic or focused excavation and inspection will be performed on ***Condensate Storage and Transfer System*** buried stainless steel piping and components***, which contain fluid that exceed EPA drinking water limits,*** during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. 3. Guidance for inspection of concrete aging effects.	A.2.2.4	Program to be enhanced prior to the period of extended operation. Inspection schedule identified in commitment.	Section B.2.2.4 Hope Creek Letter LR-N10-0323 RAI B.2.1.24 ***Hope Creek Letter*** ***LR-N10-0371*** ***RAI B.2.1.24-02***