PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, NJ 08038

PSEG
Nuclear LLC

SEP 01 2010

10 CFR 50
10 CFR 51
10 CFR 54

LR-N10-0323

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

Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: 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

Reference: 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

In the referenced letter, the NRC requested additional information related to the Buried Piping Inspection Program associated with the Hope Creek Generating Station License Renewal Application. Enclosure A to this letter provides the response to this request for additional information.

Enclosure B provides updates to the Hope Creek LRA associated with this RAI response. Included within this submittal are updates to license renewal commitments 24 (Buried Piping Inspection) and 43 (Buried Non-Steel Piping Inspection) on pages 4 and 14 of Enclosure B, respectively. There are no other new or revised regulatory commitments associated with this submittal.

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

A142
NRR

SEP 01 2010

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

Executed on 9/1/10

Sincerely,

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

Enclosure: Response to Request for Additional Information

cc: Regional Administrator – USNRC Region I
B. Brady, Project Manager, License Renewal – USNRC
R. Ennis, Project Manager - USNRC
NRC Senior Resident Inspector – Hope Creek
P. Mulligan, Manager IV, NJBNE
L. Marabella, Corporate Commitment Tracking Coordinator
T. Devik, Hope Creek Commitment Tracking Coordinator

Enclosure A

Response to Request for Additional Information related to the Buried Piping Inspection Program associated with the Hope Creek Generating Station License Renewal Application

RAI B.2.1.24

Note: For clarity, portions of the original LRA text are repeated in this Enclosure. Added text is shown in ***Bold Italics***, and deletions are shown with strikethrough text.

RAI B.2.1.24

Background:

The license renewal application (LRA) states that aging management program (AMP) B.2.1.24, Buried Piping Inspection Program, is an existing program with one enhancement and is consistent with the program elements in GALL AMP XI.M34. This AMP addresses buried piping, (i.e., piping in direct contact with soil). The LRA also states that AMP B.2.1.25, External Surfaces Monitoring Program, is a new program and is consistent with the program elements in GALL AMP XI.M36. This AMP addresses aging management of the external surfaces of piping exposed to air, which would normally include underground inaccessible piping (i.e., piping not in direct contact with soil, but located below grade in a vault, pipe chase, or other structure where it is exposed to air and where access is limited).

There have been a number of recent industry events involving leakage from buried and underground piping and tanks.

Issue:

In light of this recent industry operating experience (OE), the staff is concerned about the continued susceptibility to failure of buried and/or underground piping that are within the scope of 10 CFR 54.4 and subject to aging management for license renewal. In reviewing the AMPs cited above along with the applicable aging management review (AMR) items associated with them, the staff is not clear whether: (1) the components addressed by these AMPs clearly include both buried and underground piping (piping which is below grade and contained in a vault or other structure where it is exposed to air and where access is limited); and (2) whether such programs are being updated to incorporate lessons learned from these recent events as well as any OE from the applicant's own history.

Request:

1. Provide a list and a brief summary of any leaks or adverse conditions discovered during inspections (e.g., coating damage that directly exposes the piping or tank to the environment, presence of any coarse material in backfill within six inches of the pipe or tank, unexpected corrosion or damage to piping walls or component pressure boundaries) which have occurred in buried or underground piping or tanks at the station in the past five years that were entered in your corrective action program but are not included in your LRA. Describe how your current AMPs or proposed changes to the AMPs address these issues.

2. Provide a discussion of how the AMPs used in managing the aging of buried and underground piping and tanks within the scope of license renewal will address recent industry OE as well as any OE from the applicant's own history.

PSEG Response:

Background Information

The Hope Creek Buried Piping Inspection aging management program (Hope Creek LRA Appendix B, Section B.2.1.24) and the Hope Creek Buried Non-Steel Piping aging management program (Hope Creek LRA Appendix B, Section B.2.2.4) are existing programs that are consistent with NUREG-1801, Revision 1, Section XI.M34, "Buried Piping and Tanks Inspection" and NUREG-1800, Revision 1 Appendix A, Position A.1.2.3. These two (2) aging management programs are implemented under one site program which is referred to as the Hope Creek Buried Pipe Program (BPP). There are no buried tanks at Hope Creek which are within scope of license renewal.

1. Hope Creek Specific Operating Experience

Summarized below by the associated Hope Creek system are events that have occurred within the past five (5) years and were not previously described in the Hope Creek LRA.

Fire Protection System:

In April 2009, a potential leak was identified by the presence of standing water in a roadway. This condition was entered into the Corrective Action Program. The area was excavated and a leak was found to be due to a loose mechanical joint in buried Fire Protection piping. The joint was tightened to eliminate the leakage. During the efforts to isolate the leakage and repair the joint, approximately 20-25 ft of the ductile iron pipe was excavated and visually inspected for overall condition. The as found condition of the coating was acceptable. The external surfaces were found protected by a low strength concrete, known as fillcrete. This portion of the Fire Protection System is within the scope of license renewal. Additionally, a portion of the Fresh Water System was exposed during this excavation with the coating found to be in excellent condition. There is no buried Fresh Water System piping within the scope of license renewal.

In January 2010, a leak in buried Fire Protection System piping was identified beneath Warehouse 13. This condition was entered into the Corrective Action Program. In May 2010, the associated piping under Warehouse 13 was excavated and the leak was found to be due to a loose mechanical joint and a broken valve bonnet vent. The apparent cause was settling of the soil under the warehouse slab. The leaking valve and mechanically damaged joint were replaced with in kind replacements. Visual inspections identified some coating damage in the pipe riser that transitions from soil to the slab floor. The degraded coating was repaired. This portion of the Fire Protection System is not within the scope of license renewal. Warehouse 13 was originally built as a temporary structure and the associated services, such as Fire Protection, were also intended for temporary service.

Building Sewage:

In August 2008, a leak was observed on the "B" Sewage Lift Pump discharge pipe inside a sewage lift station tank located below grade. This condition was entered into the Corrective Action Program. The leaking pipe, which was not direct buried, was ductile iron. The leak was due to external pipe wall corrosion caused by exposure to a harsh sewage water environment inside the lift station tank, and was located near the

penetration to the sewage lift station wall. The exterior portion of the pipe outside the sewage lift station tank was excavated to replace the piping through the penetration. Upon excavation, it was found that the piping outside of the sewage lift station was in good condition. The section of pipe inside the sewage lift station tank and in the penetration was replaced with PVC pipe. There is no buried Building Sewage System piping within the scope of license renewal.

Domestic Water:

In May 2007, water was found bubbling up through a pool of standing water. This condition was entered into the Corrective Action Program. The source of leakage was found to originate from the buried Domestic Water System piping. Upon excavation, the leakage was determined to be a result of loose flange bolts. The bolts were tightened and the system returned to service with no further leakage. The ductile iron piping that was excavated was found coated with a tar/felt coating and encased in fillcrete. The coating was in excellent condition.

In August 2008, a portion of the Domestic Water System was suspected to be leaking. This condition was entered into the Corrective Action Program. Upon excavation it was found that a PVC pipe fitting threaded into a carbon steel valve had cracked, which was the source of the leakage. The valve was replaced with a similar PVC material and returned to service. In June 2010, this same valve and pipe was again cracked and led to leakage of the Domestic Water System. The configuration of this valve and pipe was improved to include a thrust block to prevent the reoccurrence of failure.

There is no buried Domestic Water System piping within the scope of license renewal.

2. Operating Experience Impact on Aging Management Reviews and Aging Management Programs

Hope Creek has considered site specific and recent industry operating experience related to buried and underground piping for its impact on aging management reviews and aging management programs. Results of this review are provided below.

Aging Management Reviews
Hope Creek has evaluated aging management review results to confirm an appropriate program has been credited to manage the effects of aging of buried piping within the scope of license renewal. Hope Creek has also confirmed that aging management review results are appropriate for underground piping (e.g. pipe that is located within below grade vaults and pipe tunnels) within the scope of license renewal.

Hope Creek Aging Management Program
The Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs manage aging effects of buried piping for the following systems within the scope of license renewal: Service Water, Fire Protection, and the Condensate Storage and Transfer System. The Hope Creek Buried Pipe Program (BPP) also manages aging effects of twenty five (25) additional systems that are not within the scope of license renewal

The program has risk ranked all buried piping sections, based on National Association of Corrosion Engineers (NACE) and Electric Power Research Institute (EPRI) guidance,

according to their relative risk of failure. Based on the risk rankings, inspections are scheduled and performed to verify and assess coating and external pipe surface conditions. 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. Planned inspections are expected to occur periodically throughout the period of extended operation.

Aging effects of underground pipe (e.g. pipe that is located within below grade vaults or pipe tunnels) will be managed by the following programs:

- The External Surfaces Monitoring aging management program (Hope Creek LRA Appendix B, Section B.2.1.25), which performs visual inspection for loss of material of carbon steel component surfaces at least once per refueling cycle, and

- The Periodic Inspection aging management program (Hope Creek LRA Appendix B, Section B.2.2.2), which performs visual inspections for loss of material of non-carbon steel component surfaces at frequencies based on plant and industry operating experience.

Industry Operating Experience
Hope Creek has an operating experience review program that monitors industry-wide operating experience from a number of sources (e.g. INPO reports and NRC Information Notices). These items are reviewed by the program managers for applicability to Hope Creek. Applicable items are entered into the Corrective Action Program and assigned to a responsible individual for disposition.

Corrective Action Program
Lessons learned from internal and external industry experience are input and resolved in the Corrective Action Program. Deficiencies or off normal findings are entered into the site Corrective Action Program. For deficiencies assessed to be adverse to quality, the cause is determined and corrective actions are developed to preclude repetition. In addition, extent of condition evaluations are performed based on the inspection results for similar configurations and environments. Industry OE is reviewed and input, as applicable, into the Corrective Action Program. This program assures proper evaluation of operating experience and is consistent with the guidance contained in NUREG-1801, Revision 1, AMP XI.M34, "Buried Pipe and Tanks Inspection."

Cathodic Protection
Portions of buried piping systems were originally designed with cathodic protection at Hope Creek. 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 ten (10) linear feet of 1½ inch piping) and this portion of piping is not within the scope of license renewal.

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.

Cathodic protection system rectifiers associated with buried piping within the scope of license renewal are periodically (semi-monthly) monitored in accordance with plant procedures. Rectifier amperage and voltage readings that do not meet acceptance criteria are entered into the Corrective Action Program. The rectifiers are inspected and tested on a yearly basis per NACE standards. Rectifiers that are not functioning are entered into the Corrective Action Program. However, rectifier availability has not typically been trended over the history of the system. A review of the Hope Creek Corrective Action Program over the past five (5) years has shown that rectifier in service time (availability) associated with license renewal in scope buried piping has been greater than 90%. This conclusion is based on a search of the Corrective Action Program and the documented out of service times for each rectifier.

Hope Creek is planning on modifying procedures to trend rectifier availability associated with buried piping in accordance with NACE standards. Rectifier availability for the three rectifiers protecting the applicable in scope buried piping will be trended and maintained with a planned goal of ≥90%. If rectifier availability falls below the goal of 90%, the condition will be entered into the Corrective Action Program to determine appropriate actions.

NEI Initiative
In response to industry operating experience with buried and underground piping, the Nuclear Energy Institute (NEI) established an industry initiative on buried piping integrity (NEI 09-14), which was adopted by the NEI Nuclear Strategic Issues Advisory Committee on November 18, 2009. PSEG is participating in the industry initiative. Summarized below are key elements of the initiative and the associated schedule.

- Establish procedures and oversight for a buried pipe program

- Perform risk ranking of buried piping

- Develop an inspection plan, which includes the following key attributes:
  - Identification of piping segments to be inspected
  - Inspection techniques
  - An inspection schedule for buried piping segments based on risk ranking

Under the timeline established for the NEI initiative, Hope Creek intends to complete the inspection plan by June 30, 2011 and commence inspections under the inspection plan no later than June 30, 2012. Hope Creek is currently performing inspections under the existing Buried Pipe Program.

Recent and Planned Inspections
In 2009 and 2010, Hope Creek performed extensive indirect examinations on a number of medium and higher risk ranked sections of buried pipe. These indirect examinations are used as a screening method to obtain general information on buried pipe conditions and to identify potential excavation locations, as necessary, for direct visual inspections. During the last two years, Hope Creek has indirectly inspected over seventeen (17) medium and high risk lines that encompass nine different systems, including portions of in scope Condensate Storage and Transfer and Fire Protection Systems.

The results from these indirect inspections were used to plan direct inspection on a portion of one CST line, which is within the scope of license renewal, and portions of Aux Boiler, Fuel Oil Transfer, and Liquid Radwaste System buried lines which are not within the scope of license renewal.

During the fall 2010 refueling outage, Hope Creek plans to inspect two individual segments of carbon steel Service Water System piping. These are 36" diameter segments, one located where the Service Water System penetrates the Service Water Intake Structure and the other at the Reactor Building wall penetration. These two carbon steel locations are currently risk ranked highest in the Hope Creek buried pipe database. The pipe segments will be excavated to permit visual inspection and ultrasonic thickness testing from the external surface. Additionally, the pipes will be inspected using a Broadband Electromagnetic (BEM) current system.

License Renewal Enhanced Inspections

In the LRA submitted on August 18, 2009, Hope Creek committed to perform six (6) opportunistic or focused excavations and direct inspections within the ten (10) years prior to entering the PEO and six (6) opportunistic or focused excavations and direct inspections in the first ten (10) years of the PEO (combined total between the Steel and Non-Steel AMPs). NUREG-1801, Revision 1, AMP XI.M34 under element four (4), states that inspections should be performed in areas with the highest likelihood of corrosion problems and in areas with a history of corrosion problems. The risk ranking methodology employed at Hope Creek accounts for likely and known corrosion problems and for the consequences of leakage. Therefore, relying on the risk ranking methodology and results from previous inspections to select the enhanced inspection locations is consistent with the NUREG-1801, Revision 1, AMP XI.M34 guidance.

In addition to the existing twelve (12) enhanced inspections being performed by the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs during the ten (10) years prior to and ten (10) years following entry into the PEO, Hope Creek will also perform six (6) opportunistic or focused excavations and direct inspections in the second ten (10) year period of the PEO. As is the case for the existing twelve (12) committed inspections, these inspections will investigate all six (6) of the different piping materials.

With this commitment change, the total number of enhanced excavations and direct inspections will be: at least six (6) within the ten (10) years prior to entering the PEO, at least six (6) in the first ten (10) years of the PEO, and at least six (6) in the second ten (10) years of the PEO.

These additional inspections will add to the program knowledge base and will result in a broad characterization of systems within scope of license renewal. The risk ranking methodology may change and improve as the NEI initiative is completed. Hope Creek will use the NEI guidelines and update the program and the risk ranking methodology, if necessary, for selecting the location of the above committed inspections in the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs.

In summary, the Buried Piping Inspection and Buried Non-Steel Piping Inspection aging management programs are revised to specify the performance of at least one excavation and direct inspection of each buried pipe material type during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation. Revisions

to the Buried Piping Inspection program contained in LRA Appendix A, Section A.2.1.24, Appendix B, Section B.2.1.24, and line item 24 of the Table A.5 License Renewal Commitment List are provided in Enclosure B of this letter. Revisions to the Buried Non-Steel Piping Inspection program contained in LRA Appendix A, Section A.2.2.4, Appendix B, Section B.2.2.4, and line item 43 of the Table A.5 License Renewal Commitment List are also provided in Enclosure B of this letter.

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.

As a result of changes to the Buried Piping Inspection aging management program identified in the response to RAI B.2.1.24, LRA Appendix A, Section A.2.1.24, page A-22, Appendix B, Section B.2.1.24, pages B-116 and B-117, and line item 24 of the Table A.5 License Renewal Commitment List, pages A-61 and A-62, are revised as shown below. Revisions are indicated with bolded italics for inserted text and strikethroughs for deleted text.

A.2.1.24 Buried Piping Inspection

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 opportunistic or focused excavation and inspection of carbon steel, galvanized steel, ductile cast iron and gray cast iron piping and components within ten years prior to entering the period of extended operation. Also, upon entering the period of extended operation, a focused inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.~~

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.***

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. ~~Inspection of buried carbon steel, galvanized steel, ductile cast iron, and gray cast iron piping and components will be performed in the ten years prior to the period of extended operation. Upon entering the period of extended operation, a focused inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.~~ ***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.

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 opportunistic or focused excavation and inspection of carbon steel, galvanized steel, gray cast iron, and ductile cast iron piping and components within ten years prior to entering the period of extended operation. Upon entering the period of extended operation, a focused inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period. **Program Elements Affected: Detection of Aging Effects (Element 4)**~~

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. Program Elements Affected: Detection of Aging Effects (Element 4)***

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 opportunistic or focused excavation and inspection of carbon steel, galvanized steel, ductile cast iron and gray cast iron piping and components within ten years prior to entering the period of extended operation. Also, upon entering the period of extended operation, a focused excavation and inspection of each of the above materials shall be performed within the first ten years, unless an opportunistic inspection occurs within this ten-year period.~~ ***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.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***

As a result of changes to the Buried Non-Steel Piping Inspection aging management program identified in the response to RAI B.2.1.24, LRA Appendix A, Section A.2.2.4, pages A-32 and A-33, Appendix B, Section B.2.2.4, page B-197 (4th paragraph), page B-198 (3rd paragraph), page B-200 (3rd paragraph), and page B-204 (Enhancements 1 and 2), and line item 43 of the Table A.5 License Renewal Commitment List, page A-70, are revised as shown below. Revisions are indicated with bolded italics for inserted text and strikethroughs for deleted text.

A.2.2.4 Buried Non-Steel Piping Inspection

~~1. At least one opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

~~2. At least one opportunistic or focused excavation and inspection of buried stainless steel piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation, at least one focused excavation and inspection of buried stainless steel piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

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 buried stainless steel piping and components during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.***

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.*** ~~within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

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 stainless steel buried piping and components ***during each ten (10) year period, beginning ten (10) years prior to entry into the period of extended operation.*** ~~within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components and at least one opportunistic or focused excavation and inspection of stainless steel buried piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

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.*** ~~within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~

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.*** ~~within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried piping and components within the scope of this program will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ 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 opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ ~~**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 opportunistic or focused excavation and inspection of buried stainless steel piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried stainless steel piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ ~~**Program Elements Affected: Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)**~~

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 buried stainless steel 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)***

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.

A.5 License Renewal Commitment List

No.	Program or Topic	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule	Source
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 opportunistic or focused excavation and inspection of buried reinforced concrete piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried reinforced concrete piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ ~~2. At least one opportunistic or focused excavation and inspection of buried stainless steel piping and components will be performed within ten years prior to entering the period of extended operation. Upon entering the period of extended operation at least one focused excavation and inspection of buried stainless steel piping and components will be performed within the first ten years, unless an opportunistic excavation and inspection occurs within this ten year period.~~ ***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.***	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***

No.	Program or Topic	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule	Source
		2. At least one (1) opportunistic or focused excavation and inspection will be performed on buried stainless steel piping and components 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.			