Dominion Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
Web Address: www.dom.com

Dominion®

November 27, 2012

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 12-205G
NL&OS/WDC R4
Docket Nos. 50-336/423
License Nos. DPR-65
NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNITS 2 AND 3
REPORT IN RESPONSE TO MARCH 12, 2012 INFORMATION REQUEST
REGARDING FLOODING ASPECTS OF RECOMMENDATION 2.3

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," to all power reactor licensees and holders of construction permits in active or deferred status. Flooding Recommendation 2.3 requires licensees to perform flood protection walkdowns to identify and address plant-specific degraded, non-conforming, or unanalyzed conditions and verify the adequacy of monitoring and maintenance for protection features.

For Flooding Recommendation 2.3, Enclosure 4 of the letter states that within 180 days of the NRC's endorsement of the walkdown process, each licensee will submit its final response for the requested information. The response should include a list of any areas that are unable to be inspected due to inaccessibility and a list of any areas designated "Restricted Access" during the site walkdowns, along with a schedule for when the walkdowns will be completed. It should also include an evaluation and justification of reasonable assurance that the inaccessible features are available and will perform the external flood protection or mitigation function for the full duration of the flood condition.

In a letter dated May 31, 2012, the NRC endorsed NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features," which Dominion Nuclear Connecticut, Inc. (DNC) used to conduct its flooding walkdowns for Millstone Power Station (MPS) Units 2 and 3. Attachment 1 provides the walkdown report as DNC's response to Flooding Recommendation 2.3 for MPS2 and MPS3.

Walkdowns were performed for the flood protection features identified for MPS2 and MPS3. For MPS2, two areas were designated as "Inaccessible" and two areas were designated as "Restricted Access" during the site walkdowns. The "Inaccessible" areas have been evaluated, including the aggregate effect for two "Inaccessible" areas, and there is reasonable assurance that these features are able to perform their credited flood protection

A001
NRR

function. The walkdowns of both "Restricted Access" areas for MPS2 are scheduled to be completed by July 1, 2013.

For MPS3, no areas were designated as "Inaccessible" and no areas were designated as "Restricted Access" during the site walkdowns. Therefore, no subsequent walkdowns are scheduled for MPS3.

If you have any questions regarding this information, please contact Wanda Craft at (804) 273-4687.

Sincerely,

David A. Heacock
President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.

VICKI L. HULL
Notary Public
Commonwealth of Virginia
140542
My Commission Expires May 31, 2014

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by David A. Heacock, who is President and Chief Nuclear Officer of Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 27TH day of November, 2012.

My Commission Expires: May 31, 2014

Vicki L. Hull
Notary Public

Commitments made in this letter:

1. Perform walkdown of the Security Electrical Cable Pull Box PBG1 prior to July 1, 2013.
2. Perform walkdown of the Security Electrical Cable Pull Box located in the West Condenser Pit of the MPS2 turbine building prior to July 1, 2013.

Attachments:

1. Millstone Power Station, Flooding Walkdowns Results Report for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Flooding

cc: U.S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

J. S. Kim
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08 C2A
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT 1

FLOODING WALKDOWNS RESULTS REPORT FOR RESOLUTION OF FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATION 2.3: FLOODING

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION

Dominion Nuclear Connecticut, Inc.

Millstone Power Station Units 2 and 3

Flooding Walkdowns Results Report for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Flooding

November 2012

Millstone Power Station Units 2 and 3
Flooding Walkdowns Results Report for
NTTF Recommendation 2.3

Table of Contents

SECTION PAGE

I. Introduction 3
II. Flooding Walkdowns Summary 5
A. Design Basis Flood Hazard Level(s) 5
B. Protection and Mitigation Features Considered in the Licensing Basis 11
C. Warning Systems to Detect the Presence of Water 18
D. Effectiveness of Flood Protection Features 18
E. Implementation of the Walkdown Process 22
F. Results of the Flood Protection Feature Walkdowns 24
G. Cliff-edge Effects and Available Physical Margin 29
H. Other Planned and/or Newly Installed Flood Protection Features or Measures 29
III. Conclusions 31
IV. References 34

I. Introduction

Following the accident at the Fukushima Dai-ichi nuclear power plant resulting from the March 11, 2011, Great Tohoku Earthquake and subsequent tsunami, the U.S. Nuclear Regulatory Commission (NRC) established the Near Term Task Force (NTTF) in response to Commission direction. The NTTF was tasked with conducting a review of NRC regulations and processes and determining if the NRC should make additional improvements to its regulatory system.

A set of recommendations made by the task force was included in a report provided to the Commission. Although the NRC concluded that continued plant operation did not pose an imminent risk to public health and safety, the Commission directed the Staff (in the Staff Requirements Memorandum (SRM) to SECY-11-0093) to determine those recommendations that should be implemented without unnecessary delay. In SECY-11-0124, the NRC identified the recommendations that should be implemented without delay, including the development of three information requests to be made under 10 CFR 50.54(f).

The NRC issued its request for information pursuant to 10 CFR 50.54(f) on March 12, 2012 (Reference 1), requesting information related to the following NTTF Recommendations:

- Recommendation 2.1: Seismic
- Recommendation 2.1: Flooding
- Recommendation 2.3: Seismic
- Recommendation 2.3: Flooding
- Recommendation 9.3: Emergency Preparedness

Enclosure 4 to the NRC 50.54(f) letter addressed gathering information related to NTTF Recommendation 2.3: Flooding, as amended by the SRM associated with SECY-11-0124 and SECY-11-0137, and requested that licensees:

1. Perform flood protection walkdowns using an NRC-endorsed walkdown methodology,
2. Identify and address plant-specific degraded, nonconforming, or unanalyzed conditions, as well as, cliff-edge effects through the corrective action program, and consider these findings in the Recommendation 2.1 hazard evaluations, as appropriate,
3. Identify any other actions taken or planned to further enhance the site flood protection,
4. Verify the adequacy of programs, monitoring, and maintenance for protection features, and

5. Report to the NRC the results of the walkdowns and corrective actions taken or planned.

As noted above, the NRC 50.54(f) letter states that licensees are to report "cliff-edge effects" in response to the NRC request for information. However, the Nuclear Energy Institute (NEI) document NEI 12-07, *Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features* (Reference 2), provides clarification regarding reporting of "cliff-edge effects." NEI 12-07 states that "cliff-edge effects" were defined by the NRC NTTF Report, which noted that "the safety consequences" of a flooding event may increase sharply with a small increase in the flooding level. While the NRC used the same term (cliff-edge effect) as the NTTF Report in its 50.54(f) information request related to Flooding Recommendation 2.3, the information that the NRC expects utilities to obtain during the Recommendation 2.3 walkdowns is different. The NRC is now differentiating between cliff-edge effects (which are dealt with in Recommendation 2.1) and a new term, Available Physical Margin (APM). Therefore, as clarified in NEI 12-07, APM information was collected during the flooding walkdowns, but is not reported in this response to the 50.54(f) information request.

As stated in Dominion's letter to the NRC dated June 11, 2012 (Reference 3), Dominion confirmed that it would use the NRC-endorsed guidance in NEI 12-07 as the basis for performing the flooding walkdowns at Millstone Power Station (Millstone). Consistent with this commitment, Appendix D of NEI 12-07 was used as the basis for developing the responses to the questions in the NRC 50.54(f) letter. The NRC acknowledged its endorsement of the NEI 12-07 walkdown guidance in letters to NEI dated May 31, 2012 (Reference 4) and June 14, 2012 (Reference 5). This report is formatted to be aligned with the questions posed in NRC 50.54(f) letter and outlined in NEI 12-07.

II. Flooding Walkdowns Summary

The information presented in this report is a summary of the flooding walkdown packages and results report providing documentation of the required inspections. The sections of the report below, A through H, respond to the NRC 50.54(f) information request and are consistent with the outline provided by NEI 12-07, Appendix D. NEI 12-07, Appendix D, provided additional clarification on the specific information requested in Enclosure 4 of the NRC 50.54(f) letter.

Note that the elevations provided herein are from Mean Sea Level (MSL) unless otherwise noted.

A: Design Basis Flood Hazard Level(s)

NRC Information Request:

Describe the design basis flood hazard level(s) for all flood-causing mechanisms, including groundwater ingress.

Dominion Response:

Because of the vintage of Millstone Unit 2, it was designed and constructed to the draft General Design Criterion (GDC) for flooding GDC 2, *Design Bases for Protection Against Natural Phenomena*, dated July 11, 1967, which states:

> "Those systems and components of reactor facilities that are essential to the prevention of accidents that could affect the public health and safety or to the mitigation of their consequences shall be designed, fabricated, and erected in accordance with performance standards that enable the facility to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice, and other local site effects. The design bases so established shall reflect:
>
> 1) Appropriate consideration of the most severe of these natural phenomena that have been recorded for the site and the surrounding area, and
> 2) An appropriate margin for withstanding forces greater than those recorded, in view of uncertainties about the historical data and their suitability as a basis for design."

On February 20, 1971, the Atomic Energy Commission published the General Design Criteria for Nuclear Power Plants (Appendix A to 10 CFR Part 50). As stated in Millstone Unit 2 Final Safety Analysis Report (FSAR) (Reference 6), Appendix 1A, since February 20, 1971, Millstone attempted to comply with the intent of the newer General Design Criteria to the extent possible recognizing previous design commitments. Prior to issuance of the Millstone Unit 2 operating license, the design and construction of the

nuclear power facility was evaluated against the newer General Design Criteria. With respect to GDC 2, Unit 2 FSAR, Appendix 1A, states that, "All structures, systems, and components important to safety have been designed to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena," and that, "Appropriate natural phenomena are considered in the designs of structures, systems, and components." Based on this evaluation, Millstone Unit 2 identified no exceptions to the current GDC 2 with respect to flooding. Millstone Unit 2 was confirmed to comply with the current GDC 2 for natural phenomena related to flooding.

Millstone Unit 3 was designed, constructed, and licensed in accordance with the current GDC 2 which states:

> "Systems, structures, and components important to safety shall be designed to withstand the effects of natural phenomena, such as earthquakes, tornados, hurricanes, floods, tsunami, and seiches without the loss of capability to perform their safety functions. The design basis for these structures, systems, and components shall reflect:
>
> 1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.
> 2) Appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena.
> 3) The importance of the safety functions to be performed."

In addition, the design basis flood levels for the Millstone Unit 3 site comply with NRC Regulatory Guide 1.59, *Design Basis Floods of Nuclear Power Plants*, Revision 2, as follows:

1) The design basis flood levels comply with Regulatory Guide 1.59, Revision 2, Positions C.1.b, C.1.e, and C.4.
2) Regulatory Guide 1.59, Revision 2, Positions C.1.a, C.1.c, C.1.d, C.2.a, C.2.b, C.2.c, C.2.d, and C.3 are not applicable.

Flood protection at the Millstone Unit 3 site complies with Regulatory Guide 1.102, *Flood Protection for Nuclear Power Plants*, as follows:

1) Regulatory Position C1 flood protection is accomplished by the unit's location on a "Dry Site," with the exception of the circulating and service water pumphouse which utilizes "Incorporated Barriers."
2) Regulatory Position C2 is not applicable.

Existing (current) design and licensing documents including flood response procedures were reviewed to identify site-specific features credited for protection and mitigation against external flooding events. The Millstone Unit 2 FSAR, Section 2.5, describes the Unit 2 current licensing basis flooding events and resultant flooding levels.

Millstone Unit 3 FSAR (Reference 7) Sections 2.4 and 3.4 describe the Unit 3 current licensing design basis external flooding event and resultant flooding level. The event applicable to external flooding for Millstone Unit 2 is a probable maximum hurricane (PMH) surge event. The events applicable to external flooding for Millstone Unit 3 are a PMH surge event and a probable maximum precipitation (PMP) event.

The Millstone site is located in the Town of Waterford, New London County, Connecticut, on the north shore of Long Island Sound. The 524-acre site occupies the tip of Millstone Point between Niantic Bay on the west and Jordan Cove on the east and is situated 3.2 miles west-southwest of New London and 40 miles southeast of Hartford. The Millstone Unit 2 site is at El. 14 feet and is flood protected up to El. 22 feet. The Millstone Unit 3 site is at El. 24 feet, and entrances (doorways) into the main power block structures are typically six inches higher than site grade or El. 24.5 feet.

Unit 2 Flood Hazard Levels

Flood Due to Probable Maximum Hurricane Surge Event

Flooding due to a PMH surge event was evaluated for Millstone Unit 2. Several maximum probable hurricane studies were performed resulting in total stillwater surge elevations between El. 16 feet and El. 19.17 feet. After several reviews, the AEC accepted a PMH total stillwater surge height of El. 18.2 feet.

In general, the maximum surge and maximum wave need not be coincidental. For this reason, surge, wave heights, and corresponding run-up at different times were considered. The maximum combination of the surge and run-up on various plant structures were considered as the most severe flood level for the site. A stillwater level of El. 18.1 feet was coupled with a wind driven wave height of 3.2 feet to a peak elevation of 21.3 feet at the power block buildings. The Unit 2 site is protected by flood gates and walls to an elevation of 22.0 feet.

Per Unit 2 FSAR Section 2.5.4.2.3, the service water pump motors and associated electrical and control equipment inside the Unit 2 intake structure are protected to El. 22 feet. However, the maximum water level inside the intake structure caused by the standing wave condition is calculated to reach El. 26.5 feet. Therefore, one service water pump motor is protected from this higher calculated flood water by installing protection for the service water motor.

There were no differences or contradictions in the flood hazard levels due to a PMH surge event found in the design of licensing basis document.

Flood Due to Maximum Rainfall Event

Flooding due to a severe rainfall event was evaluated for Millstone Unit 2. This event is only generally discussed in the Unit 2 FSAR Section 2.5.4.2.2 which describes the rainfall event with respect to the design features of the site. With a rainfall intensity of 9.4 inches per hour, the total runoff is 60.0 cubic feet per second. The storm sewer from Catch Basin Number 9 to its outfall into Niantic Bay adjacent to the intake structure is twenty-four inches in diameter and has a maximum flow capacity of 8.8 cubic feet per second. During the maximum rainfall, the capacity of the sewer will be exceeded. Excess runoff will be accumulated in the yard area until it reaches El. 14.5 feet and will overtop the road. Water will then flow out into Jordan Cove on the east and Niantic Bay on the west. The Unit 2 rainfall event is not considered to produce a more significant impact to the site than the 3-4 feet standing water levels associated with the PMH surge event.

Clapotis Event

The only possibility of a clapotis to form in front of the intake structure would occur at some time beyond the tenth hour after surge conditions. At this time, the wind velocity would be considerably lower than 40 mph and the fetch limited by the Niantic Bay such that a clapotis would be insignificant. However, the intake structure was conservatively designed to withstand the external forces of a clapotis based upon probable maximum conditions, with the winds reoriented to provide perfect reflection of waves.

Wave Run-Up Event

The average ground elevation around the plant buildings is at El. 14.0 feet. With the maximum surge stillwater elevation of 18.1 feet, based on the possible PMH configurations analyzed, the maximum depth near the building (except for the intake structure) is equal to 4.1 feet. A wave height equal to 78 percent of the maximum available depth or 3.2 feet could be generated anywhere around the buildings (except for the intake structure). The waves in the vicinity of the intake structure could produce run-up to an El. 25.1 feet.

Ground Water Ingress

The ground water ingress mechanism was not included as a feasible flooding event at the Millstone Unit 2. Ground water protection is a design consideration, but ground water ingress is not considered a credible flooding event.

Unit 3 Flood Hazard Levels

Flood Level Due to Probable Maximum Precipitation Event

Flooding due to a PMP event was evaluated for Millstone Unit 3. The design maximum rainfall rate for Millstone (used in the original site flooding estimate) was 9.4 inches in one hour. Roof drainage was originally designed for a rainfall rate of 6.5 inches per hour. Site flooding and roof drainage have since been assessed for a rainfall rate of 17.4 inches in one hour. The maximum 24 hour rainfall recorded at Bridgeport was 6.89 inches in June 1972.

Hydrometeorological Report (HMR) No. 33 (U.S. Weather Bureau 1956) was used to develop the original design basis PMP for the site. Subsequently, the most recent PMP guidance available on rainfall depth-duration relations, Hydrometeorological Reports No. 51 (Schreiner 1978) and No. 52 (Hansen 1982), collectively referred to as HMR 51/52, were used to determined the impact of this ultra-conservative PMP-induced site flooding on plant safety-related structures.

PMP values for durations of 5 to 15 minutes for drainage basins of less than one square mile are applicable to the Millstone site. The storm drains are designed to pass, without flooding, a rainfall intensity of 6.5 inches per hour for an unlimited duration.

The computed storm water flows were used to determine the water surface profile for each basin area. The swales and depressions that form drainage channels were divided into reaches to construct the flow model. Cross sections were taken to accurately describe the channel, site topography, and project features such as road crowns and railroad tracks. PMP runoff was proportioned into local incremental flows and then introduced at the appropriate cross sections.

The surface area of buildings that were within the basin areas were included in the runoff calculations. The following two conservative assumptions were made for this analysis: 1) no credit was taken for the site storm drainage system, and 2) zero infiltration rate was assumed for the analysis.

The computed water surface elevations at the safety related structures are El. 24.27 feet for the Control Building and Emergency Generator Enclosure and El. 24.85 feet for the other safety-related structures.

There were no differences or contradictions in the flood hazard levels due to a PMP event found in the design of licensing basis document.

Flood Level Due to Probable Maximum Hurricane Surge Event

Flooding due to a PMH surge event was evaluated for Millstone Unit 3. As discussed in Millstone Unit 3 FSAR, Section 2.4.5, the PMH as defined in HUR 7-97 (Reference 8)

was used to compute the design storm surge level at the site. The calculated total surge height or still water level includes the wind setup, the water level rise due to barometric pressure drop, the astronomical tide and forerunner or initial rise.

Use of the bathystrophic storm surge program required the input of several meteorological and physical parameters including: the central pressure, the peripheral pressure, the maximum wind speed, the radius to maximum wind, the speed of translation, the initial rise, the astronomical tide, the bottom profile along the track of the maximum winds, the bottom friction coefficient, and the shape of the curve describing the relationship between the ratio of wind speed at any point to maximum surface wind speed and the ratio of the radius at any point to the radius to maximum wind. In addition, provision was made to enter a wind stress correction factor.

Surge analyses based on different types of hurricanes show that the large radius, slow forward speed hurricane produces the maximum stillwater level at the Millstone site. The calculated maximum high water level corresponding to a hurricane storm surge is a stillwater level of El. 19.7 feet coupled with a wind driven wave run-up of 4.1 feet. This yields a maximum water level resulting from a PMH surge of El. 23.8 feet, which is below the typical site grade of El. 24 feet.

There were no differences or contradictions in the flood hazard levels due to a PMH surge event found in the design of licensing basis document.

Clapotis Event

A clapotis event was analyzed in the licensing basis for Millstone Unit 3. The water depth at the intake structure and the characteristics of the incident waves determine what type of waves would be formed at the intake, i.e., nonbreaking, breaking, or broken waves. Detailed analysis of incident waves showed that only nonbreaking and broken waves are possible at the intake of Millstone Unit 3. The maximum water level on the front wall of the intake structure was calculated to be El. 41.2 feet.

Seiche Event

As described in the Millstone Unit 3 FSAR, the PMH event was determined to be the design storm surge level. Also, flooding from a seiche event is not a limiting flood mechanism for other flood hazard considerations such as warning time and dynamic loading. Details of seiche event evaluation are provided in Unit 3 FSAR Section 2.4.5.2.

Wave Run-Up Event

The wave run-up mechanism was evaluated and screened out at Millstone Unit 3 for Flooding Walkdown purposes because the calculated value for the maximum run-up was El. 23.8 feet, which is the same as the flood event from a PMH and is less than the

typical site grade elevation of 24 feet. Flooding from a clapotis event is not a limiting flood mechanism for other flood hazard considerations such as warning time and dynamic loading. Details of this evaluation are provided in Unit 3 FSAR Section 2.4.5.3.5.

Ground Water Ingress

The ground water ingress mechanism was not included as a feasible flooding event at the Millstone Unit 3. Ground water protection is a design consideration, but ground water ingress is not considered a credible flooding event.

Tsunami Event

The tsunami flood mechanism was not included as a feasible event at the Millstone Unit 3 site. Per Unit 3 FSAR Section 2.4.6, because Millstone Point is located on the North Atlantic coastline, it is considered to have an extremely low probability of a tsunami. Therefore, tsunamis are not considered to be credible natural phenomena that could affect the safety of the Millstone site.

B: Protection and Mitigation Features Considered in the Licensing Basis

NRC Information Request:

Describe protection and mitigation features that are considered in the licensing basis evaluation to protect against external ingress of water into SSCs important to safety.

Dominion Response:

Unit 2 Flood Protection and Mitigation Features

Probable Maximum Hurricane Event Protection

The average ground elevation around the plant buildings is at El. 14.0 feet. With the maximum surge stillwater elevation of 18.1 feet, the maximum depth near the building (except for the intake structure) is equal to 4.1 feet. A wave height equal to 78 percent of the maximum available depth or 3.2 feet could be generated anywhere around the buildings (except for the intake structure). These waves could produce run-up to an El. 25.1 feet. The containment building, auxiliary building and the warehouse building have exterior concrete walls up to El. 54.5 feet minimum. The turbine building and the enclosure building have metal siding above the top of the flood wall at El. 22.0 feet. The metal siding is continuous over the exterior flood wall and is connected to the flood wall with waterproof caulked connections. Although run-up to El. 25.1 feet could be generated, the siding would prevent water resulting from splashing effects from entering

the building. It is concluded that there can be no adverse effects on the safety-related buildings due to the design waves.

Penetrations into the auxiliary and turbine buildings are provided with hinged flood gates or stop logs to El. 22 feet to assure water tightness against both the water and debris in the water. Flood gates, with sealing compressive membranes, are used wherever possible. If the gates at an opening pose an operational encumbrance, stop logs with equivalent sealing capability are used in those locations.

At the interface between Millstone Unit 2 and Unit 1, the flood protection capability of Millstone Unit 1 was originally credited in the evaluation of Millstone Unit 2 flood protection capability. The entire periphery of Millstone Unit 1 was flood protected. However, with the decommissioning of Millstone Unit 1, the flood boundary was revised to support the decommissioning effort. A flood wall is provided to a minimum elevation of 22 feet along the common area between Unit 1 and the Unit 2 Turbine Building. Protection for the Millstone Unit 2 Auxiliary Building is provided by the adjacent Millstone Unit 1 Control Building which is provided with flood protection on the south and east walls to a minimum elevation of 22 feet and at the 14.5 feet floor elevation. Therefore, the entire southern interface between Millstone Units 2 and 1 is flood protected to a minimum elevation of 22 feet.

Intake Structure Flood Protection

The intake structure is constructed of reinforced concrete with an invert elevation of -27 feet, operating deck at El. 14 feet, and a cutoff wall to El. -10 feet.

The only safety-related system in the intake structure is the service water system. The service water pump motors and associated electrical and control equipment are protected to El. 22 feet.

Provisions for protecting one service water pump motor would be implemented by plant personnel for flood levels above El. 22 feet. This would be accomplished by de-termination of electrical connections from one of the Unit 2 service water pump motors and installation of a cover to protect the motor from potential flood waters in the intake structure.

Rainfall Event Protection

The drainage system throughout the Millstone Unit 2 site, including the roof and yard drainage, is designed based on an intensity of three inches per hour rainfall.

The yard, immediately adjacent to Millstone Unit 2 buildings, is divided into ten subareas, each one draining into a catch basin. The catch basins, except for Catch Basin Number 1, are connected by a storm sewer system draining into Niantic Bay next

to the north side of Millstone Unit 2 intake structure. Catch Basin Number 1 is connected to the existing Catch Basin Number 1 of Millstone Unit 1.

With a rainfall intensity of 9.4 inches per hour, the total runoff is 60.0 cubic feet per second. The storm sewer from Catch Basin Number 9 to its outfall into Niantic Bay adjacent to the intake structure is twenty-four inches in diameter and has a maximum flow capacity of 8.8 cubic feet per second. During the maximum rainfall, the capacity of the sewer will be exceeded. Excess runoff will be accumulated in the yard area until it reaches El. 14.5 feet and will overtop the road. Water will then flow out into Jordan Cove on the east and Niantic Bay on the west.

Drain connections from the buildings to the Millstone Unit 2 storm drain system are provided with backwater valves, preventing water to backflow into the buildings; also, stop logs and flood gates are provided at the entrances to prevent water from flowing in.

Flood Protection of Electrical Equipment

With the provision for concrete flood protection walls around the enclosure building, turbine building and auxiliary building up to El. 22 feet, and with flood gates or stop logs at external openings in these walls, overflow into and subsequent accumulation of flood water within these buildings is expected to be negligible for the maximum PMH event. Some essential electrical MCCs, switchgear and panels located below El. 22 feet are in close proximity to stairways or other openings to lower floors to reduce the risk of accumulation of water at these locations. Where this is not the case, the equipment is mounted on a four inch raised pad.

Power and control cables, cable terminations, and electrical devices required for the trouble-free operation of the service water pumps in the intake structure are located above El. 22 feet, where possible. Any of these located below this point are of tight construction.

Physical separation is provided between redundant essential electrical equipment and circuits required for safe shutdown.

Entry of cables connecting outdoor equipment to equipment within the flood protected areas is so designed to preclude leakage or overflow of flood water into these areas by provision of proper seals and/or by carrying cable raceways to elevation at or above El. 22 feet.

Unit 3 Flood Protection and Mitigation Features

Flood Protection Measures for Seismic Category I Structures

The design basis flood (maximum combination of storm surge and wave runup) established for Millstone Unit 3 is El. 23.8 feet and the maximum still water level is El. 19.7 feet. Unit 3 safety-related structures and equipment, except the circulating and service water pumphouse, are protected from flooding by the site grade of El. 24 feet.

Each pair of service water pumps and pump motors is located at El. 14.5 feet inside individual watertight cubicles in the seismically designed pumphouse. The walls of these cubicles are watertight up to El. 25.5 feet, protecting the pump motors and associated electrical equipment from wave action and PMH surge.

Accesses to safety-related structures and facilities are at an elevation of 24.5 feet above the nominal site grade elevation of 24 feet and are consequently protected from flooding due to groundwater, storm surge, and direct rainfall, except for the doors that are discussed in Unit 3 FSAR Section 2.4.2.3. The two access openings to the service water cubicles inside the pumphouse are fitted with watertight steel doors capable of withstanding the maximum hydrostatic load occurring at their respective location. Equipment access openings on the pumphouse roof over the service water cubicles are fitted with watertight covers. During normal plant operation, the service water cubicles have open drain lines installed in the cubicle sump to enable the service water pump seal water leak off to drain directly into the intake structure pump bay. During severe weather or flooding conditions, the drain lines are isolated and the service water cubicle sumps are drained using portable sump pumps.

Foundations of safety-related structures are constructed of reinforced concrete and subgrade joints between walls and slabs are sealed with waterstops cast in the concrete.

The storm drain system uses catch basins and underground conduits and/or drainage ditches to convey runoff to Niantic Bay. Roof and site storm drain systems are designed for a maximum precipitation of 6.5 inch per hour. The probable maximum precipitation of 70.4 inch per hour for a 5-minute period (Hansen, et al., 1982) would result in temporary flooding of the site area in the vicinity of the safety-related buildings. In addition to the storm drains, surface runoff from the higher ground to the north and east of plant perimeter roads is intercepted by open ditches and drained into Niantic Bay.

The seaward wall of the intake structure is constructed of reinforced concrete, designed to withstand the forces of a standing wave, or clapotis, with a maximum crest elevation of 41.2 feet. Further discussion on the effects of PMH storm surge and wave action, including the resultant pressure distribution on the intake wall, can be found in Unit 3 FSAR Section 2.4.5.

Combinations of the maximum surge level with a coincident wave and the maximum wave height with a coincident surge for three different speed PMHs were examined to determine the maximum uplift pressure on the pumphouse floor. The most critical combination is the maximum wave height of 16.2 feet and a surge level of El. 19.7 feet associated with the slow speed PMH.

The calculated maximum uplift pressure on the pumphouse floor due to the most critical combination of wave action and storm surge during PMH conditions is 863 lbs/sq ft. The floor is designed to withstand more than this pressure, precluding the possibility of failure.

The water level fluctuations within the pumphouse, resulting from storm surge and wave action, are dampened by the energy lost in passage through the restricted openings in the trash racks, traveling screens, and operating deck. Internal water level fluctuations are further attenuated because water must enter the structure through a submerged opening (El. -7 to El. -30 feet) through which the pressure response factor is less than unity.

The discharge outfall structure is also designed to withstand maximum wave forces induced by the most critical combination of wave action and storm surge during PMH conditions. The maximum horizontal pressure is determined for the combination of a maximum wave height of 20.1 feet and a maximum surge level of El. 19.7 feet. The maximum vertical pressure on the upper outfall structure is obtained for a minimum water submergence at the surge level of El. 9.46 feet and a coincident breaking wave of 14.7 feet. The calculated maximum horizontal pressure and the maximum vertical pressure on the discharge outfall structure for the above-mentioned combination events are 2,325 lbs/sq ft and 585 lbs/sq ft, respectively.

Flood Protection from PMP Event

Site ground elevation surrounding buildings is El. 24.0 feet with the safety related building entrances and ground level floors set at El. 24.5 feet except the Demineralized Water Storage Tank (DWST) Block House and Refueling Water Storage Tank (RWST) Valve Enclosure. The entrance elevation for the DWST Block House is El. 24.33 feet with ground level floor set at El. 24.0 feet and the entrance and ground level floor for the RWST Valve Enclosure is set at El. 24.33 feet. The yard area north of the control building and the waste disposal building is depressed below El. 24.0 feet to create a swale to drain the PMP flood flow. The site was considered to be rendered impermeable due to saturation prior to the onset of the precipitation of highest intensity.

The site was divided into drainage basins according to the topography and plant. The surface area of buildings that were within the drainage basins were included in the runoff calculations. The following two conservative assumptions were made for this analysis: 1) no credit was taken for the site storm drainage system, and 2) zero

infiltration rate was assumed for the analysis. Modifications were made to the grading plan at the site boundary to prevent water offsite from flowing into areas where the safety related structures are located. Flood water is directed to areas near the intake structures and/or the discharge outfall structure.

The computed water surface elevations at the safety related structures are El. 24.27 feet for the Control Building and Emergency Generator Enclosure and El. 24.85 feet for the other safety-related structures. Per Unit 3 FSAR 2.4.2.3, accumulating precipitation runoff is considered to slow down and backup to cause water to enter the safety related structures with the exception of the Control Building and the Emergency Generator Enclosure. The quantity and location of water calculated to enter these buildings has been evaluated and determined to not interfere with safety related equipment inside these structures.

Abnormal Procedures - Millstone Units 2 and 3

Corporate Hurricane Response Plan

Dominion hurricane response plan HRP-N, *Hurricane Response Plan (Nuclear)* (Reference 9), provides a corporate-level assessment of station operational status, delineation of corporate responsibilities and support staff requirements, and provides guidelines for instituting command and control of hurricane preparedness and response activities at the station level. The plan provides for an assessment of pre-storm preparedness and implementation of associated contingency activities. The plan also establishes post-storm guidelines, and addresses emergency staffing in terms of management, supervision, and support personnel. The plan is intended to provide general guidelines for management to prepare for and recover from a hurricane. The plan contains activity checklists developed to expedite preparations for impending severe weather, as well as post-storm response actions. A management decision to implement the plan would be made when the projected onsite arrival time of hurricane force winds is greater than 36 hours.

Emergency Plans

Corporate and Station Emergency Plans are designed to be activated for certain severe weather conditions. Upon notification that weather conditions are deteriorating, the emergency response organization would activate emergency response facilities to the extent determined by senior management. A Notice of Unusual Event (NOUE) would be declared at Millstone should hurricane surge levels reach pre-determined levels, i.e., El. 19 feet for Unit 2 and El. 19.7 feet for Unit 3. A NOUE would also be declared if onsite sustained wind speed is greater than or equal to 75 mph. If sustained on-site wind speed exceeds 90 mph or if flooding causes damage affecting safe shutdown systems, an Alert is declared.

Millstone 2 & 3 Common Operating Procedure

Millstone procedure C OP 200.6, *Storms and Other Hazardous Phenomena (Preparation and Recovery)* (Reference 10), provides guidance to shift managers, department managers, station officers, and emergency response personnel for preparation, response, and recovery from significant storms and other hazardous phenomena. This procedure may be implemented by a unit shift manager, station director or officer when a natural phenomenon or external condition poses or is predicted to pose a situation that threatens the safety of the plant and/or a situation that significantly hampers site personnel in performance of duties necessary for safe operation of the plant.

Millstone 2 Site-Specific Abnormal Operating Procedures

Weather service forecasts provide adequate hurricane status such that there will be sufficient time to secure the plant against flooding. Securing the plant will be done at the discretion of the shift supervisor and can be accomplished by one man who would close and lock the hinged gates and install the flood stop logs. The flood stop logs are specifically designated as pieces of flood protection equipment and stored in the vicinity where they will be used.

During a hurricane, the plant operations will be in accordance with normal, abnormal and/or emergency operating procedures. Procedure AOP 2560, *Storms, High Winds and High Tides*, provides actions to place Millstone Unit 2 in a safe condition during a severe storm, high winds, or high tides. This procedure includes direction to de-terminate the electrical connections from one of the Unit 2 service water pump motors and install a cover to protect the motor from potential flood waters in the intake structure.

The emergency shutdown equipment, including the auxiliary power sources are flood protected.

Millstone 3 Site-Specific Abnormal Operating Procedures

For the pumphouse, Procedure AOP 3569, *Severe Weather Conditions*, addresses safety measures to be taken in the case of severe weather conditions. These measures ensure that watertight doors are in place and the pump cubicle sump drain lines are isolated and thus safety-related structures and components are protected from flooding.

Plant Operating Configurations – Millstone Units 2 and 3

The plant configuration (modes of operation) is not specifically discussed in the CLB, and therefore it is assumed that the function of flood protection from this event would be applicable to each mode of plant operation. Each mode of plant operation was considered in the development of the flooding walkdown list.

C: Warning Systems to Detect the Presence of Water

NRC Information Request:

Describe any warning systems to detect the presence of water in rooms important to safety.

Dominion Response:

Units 2 and 3 Flood Warning Systems

There are no room water level warning systems that are credited as a flood protection feature for an external flooding event.

There are sump alarms that alarm when the sump water levels reach certain setpoints throughout safety-related structures. However, these alarms and their associated pumps are not credited for flood protection or mitigation function due to a CLB external flooding hazard event. Several water level detection systems are located throughout the turbine building and auxiliary building for detection of internal flooding. These water level warning systems are available but are not credited for flood protection in the plant's external flooding licensing basis.

D: Effectiveness of Flood Protection Features

NRC Information Request:

Discuss the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discuss how these systems and barriers were evaluated using the acceptance criteria developed as part of Requested Information Item 1.h.

Dominion Response:

Purpose of the Walkdowns

The purpose of the flood protection feature walkdowns was to verify the conformance of flood protection and mitigation features to protect against external ingress of water consistent with the CLB. The walkdowns are to verify that permanent (exterior and incorporated) and temporary (non-permanent) structures, systems, and components (SSCs) for flood protection and mitigation are as designed, and capable of performing their design functions as credited in the CLB for external flood events. The walkdowns also are to verify that plant modifications implemented since original construction, such as the addition of plant structures, security barrier installations, and changes to topography and grading, do not adversely affect plant flooding protection.

In addition to the visual component of the flood protection feature walkdowns, a review of the preventative maintenance (PM) program and surveillance procedures was

performed. The purpose of the review was to validate that the credited features were contained in a program that would ensure their continued conformance with the CLB.

The results of the flood protection feature walkdown inspections will be reviewed against the hazard re-evaluation specified in NTTF Recommendation 2.1, as required, after the re-assessment of flooding levels. If it is determined by the flood hazard re-evaluation that an integrated assessment is warranted, further evaluation of the adequacy of the CLB will be performed as a result of the integrated assessment.

Acceptance Criteria Development

Considerations that were taken into account when flood protection features were reviewed include the following:

- Flood protection feature configuration is in accordance with as-built drawings, as-built installation records, inspection records, vendor documents, etc.
- Visual inspection does not identify any material degradation that challenges the flood protection function.
- Instructions contained within implementation procedures can be implemented as written and within allowed time considering the warning time available for the applicable flood hazard and expected conditions during the event.
- When applicable, PMs or periodic inspections are in place, within their required periodicity and of adequate scope.
- There are no unresolved adverse PM or periodic inspection implementation results.
- No topography changes or barrier installations prevent the site run-off and drainage plan from performing its intended function.

Observations that were not immediately judged as acceptable were entered into the Corrective Action Program (CAP), where an evaluation of the observation was made in accordance with established procedures. Flood protection features were considered acceptable if no conditions adverse to quality were identified during walkdowns, verification activities, or program reviews as determined by the CAP. Conditions adverse to quality that would have prevented the flood protection feature from performing its credited function during a design basis external flooding event are "Deficiencies" and are reported in Section II.F of this report.

Evaluation of the Overall Effectiveness of the Plant's Flood Protection Features

A total of 50 walkdown packages covering both flood protection and mitigation features were identified and evaluated at Millstone Unit 2. There were 47 packages covering

physical plant features and three packages covering procedures. A total of 33 walkdown packages covering both flood protection and mitigation features were identified and evaluated at Millstone Unit 3. There were 32 packages covering physical plant features and one package covering a procedure.

Features – The results of the flood protection feature walkdown effort show that the flood protection features appear to be effective overall in meeting their intended credited functions based upon the defined acceptance criteria. In cases where observations suggested that acceptance criteria were not met or where compliance could not be readily confirmed, the potential issue was entered into the CAP to determine if it is a Deficiency and what actions would be taken.

Procedures – Reasonable simulation activities required by the NEI guidelines for credited procedures were satisfactorily completed for Millstone Units 2 and 3. Site procedures that perform actions in preparation or in response to severe weather events were evaluated. These procedures can be executed as written within the time available to perform the actions. Equipment and tools necessary for implementation of these actions are appropriately available/staged and adequate personnel are available to perform the specified actions. These instructions and actions were verified based on Operating Experience (OE) and tabletop discussions with the department representative responsible for performing the specified actions. The evaluation determined that applicable procedures could be executed as written and in the required timeframe under the conditions associated with impending severe weather.

Accessibility – The flood features that could be accessed were evaluated against the defined acceptance criteria. Some flood features were determined to be "Restricted Access" or "Inaccessible," as defined in NEI 12-07, during the walkdown process. These areas were entered into the CAP for each condition identified.

Documentation of conduit seals – Inspections found no electrical conduit seals installed on the "uphill" end of the conduit except for conduits running from the intake structure to the plant. Based on OE, conduit seals on the "uphill" end of the conduit are much less likely to catastrophically fail and cause significant leakage than a "downhill" seal alone. For Millstone Units 2 and 3, seal rating is the limiting factor in determining seal adequacy. In addition, in the case of "downhill" seals, seal ratings needs to be considered when evaluating the significance of apparently small APMs in accordance with Section 5.8 of the NEI walkdown guidance.

Degraded Conduit Seals – Inspections found some electrical conduit seals that were degraded. For example, the seal material is crumbling or has apparently shrunk so that the seal has gaps around the circumference. Condition reports were entered into the CAP to address degraded seals

Missing conduit seals – Inspections found some electrical conduits where seals were expected. Conduits where seals are missing are potentially significant leakage paths where flood water can enter protected areas. Condition reports were entered into the CAP to address the missing seals

Periodic Monitoring Program for Penetrations and Conduit Seals – Fire Barrier Penetration seals are monitored, checked, and controlled by program because of the operating license requirements. Flooding penetration and flooding conduit seals have no such program. The program that implements the Maintenance Rule looks at the structures but does not look at penetration and conduit seals credited for flood protection.

Configuration Control of Yard Changes – The current Unit 3 licensing basis for the PMP event presumes the storm drains systems are blocked. However, some programmatic controls for placement of Sea-Vans and outage equipment are needed to ensure site water runoff pathways are not unnecessarily blocked.

Other Existing Plant Equipment, Structures, and Procedures that Might Mitigate the Effects of an External Flood under a Variety of Plant Configurations

The current basis for protection and mitigation of an external flooding event, including plant equipment, structures, and procedures, is discussed in Section II.B of this report.

No other existing plant equipment, structures, or procedures were identified as being able to mitigate an "external flooding" event that are not already credited in the CLB.

Millstone has several flood protection and mitigation features installed to cope with internal flooding events. Should water from an external flood source enter an area of the site that contains safety-related equipment, internal flood barriers and mitigation equipment would limit the impact of such an event. For this to happen, however, the event would involve a failure of the credited flood protection features evaluated during these walkdowns or would be due to conditions beyond the current licensing and design basis. In the event of a beyond design basis event, additional on-site equipment such as portable pumps and portable generators are available to mitigate the consequences of the event.

Assessment of Maintenance Activities that Expose SSCs to Flood Hazards

Temporary removal of flood protection barriers for maintenance activities could potentially create a pathway for flood water to enter areas otherwise protected from external flooding. However, the plant risk assessment processes provides sufficient controls to ensure planned contingency action for flood events are prepared in advance of the maintenance activity. Also, sufficient warning of postulated PMH or severe storm

events provides reasonable assurance that the contingency action can be implemented prior to a flooding event.

No other maintenance activities were found that further exposed SSCs to flood hazards during their performance.

E: Implementation of the Walkdown Process

NRC Information Request:

Present information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures), using the documentation template discussed in Requested Information Item 1.j, including actions taken in response to the peer review.

Dominion Response:

Walkdown Procedures and Guidance Documents

Per the March 12, 2012, NRC 50.54(f) letter, Millstone is one of four Dominion nuclear sites required to perform flooding walkdowns in accordance with the guidance provided in NEI 12-07. In order to ensure that the NEI guidance was uniformly implemented across the Dominion nuclear sites, a fleet Guidance and Reference Document (GARD) was prepared. This fleet GARD, CM-AA-BDB-1002, *Beyond Design Basis Project – Walkdowns of Flood Protection and Mitigation Features* (Reference 11), incorporated the content of NEI 12-07 and applied the Dominion specific details to portions of the NEI guidance where utility discretion or requirements were identified. GARD CM-AA-BDB-1002 was reviewed and approved by the Dominion Fleet Engineering Peer Group and by the engineering organization at each nuclear site.

CM-AA-BDB-1002 covered the full scope of the flooding walkdown efforts including the development of the CLB, development of the site-specific flooding features walkdown lists, selection and training of inspection team members, inspection documentation via the Flooding Walkdown Form (NEI 12-07, Appendix B), and reporting requirements of flood walkdown results. In addition, a site-specific procedure was prepared for each Dominion nuclear site for conduct of that site's walkdowns to ensure compliance with the flood feature walkdown scoping, execution, and documentation based on the criteria outlined in NEI 12-07, Section 5.3, Section 7, and Appendix B. For Millstone Units 2 and 3, procedure ER-MP-BDB-FLD-001, *Walkdown of Flood Protection Features* (Reference 12), was used to document inspection team member qualifications, provide inspection guidance and examples, and to direct the inspection documentation activities in accordance with NEI 12-07.

No exceptions were taken to the NRC endorsed NEI flood walkdown guidance in either the fleet GARD or the site-specific walkdown procedure.

Flooding Walkdown Team Members and Training

Training was provided, as recommended in the NEI 12-07, Section 5.3. Walkdown team members completed both the NANTeL Flood Protection Training and site-specific training prior to performing the walkdown inspections. The site-specific training was developed and implemented in accordance with the Dominion Nuclear Training Department's systematic approach to training procedure and addressed the learning objectives identified in the NEI 12-07, Appendix C.

In addition to the training discussed above, qualification as a walkdown inspector also required: 1) completion of a required reading list regarding the background of the Fukushima event and the NRC recommendations, and 2) documentation of previous walkdown experience. Procedure ER-MP-BDB-FLD-001 provided the forms to document an individual's qualifications and the requirement that the qualification records be maintained as a station QA record. Engineering Technical Evaluation (ETE) documents (ETE-MP-2012-1160, for Unit 2, and ETE-MP-2012-1177, for Unit 3) were used to transmit inspector qualification forms to station Records Management along with the documentation of each walkdown package. The inspection team members and most project management personnel directly involved in the execution and review of the flooding walkdowns were trained and qualified as walkdown inspectors.

Walkdown teams at Millstone Units 2 and 3 were comprised of a mix of station engineering personnel and corporate engineering support. Various disciplines were represented including civil and mechanical engineering. Corporate support was used to provide consistency in the flooding walkdown process across the Dominion fleet. Corporate support included both engineering and licensing support personnel. Station support provided the advantage of overall site familiarity and specific experience with flood protection and mitigation features and procedures. Each inspection team consisted of a minimum of two qualified inspectors. Whenever possible, both corporate and station personnel participated on each walkdown team. Walkdown feature assignments considered the composition, discipline, and experience of the team members. Several vendor personnel (trained and qualified as inspectors) participated in the walkdowns primarily as additional support. The flood walkdown teams were also supported by station personnel (operations, maintenance, health physics, security, craft, etc.) in the performance of the walkdowns. These additional station support personnel were not required to be trained as walkdown inspectors.

Identification of Restricted Access or Inaccessible Areas

The Dominion fleet GARD for implementation of flooding walkdowns describes the process for identification and classification of Inaccessible or Restricted Access areas and what actions are allowed/required when Inaccessible/Restricted Access areas are found. Discussions with the flooding walkdown teams during conduct of the inspections

and review of each flooding walkdown package were used to identify Inaccessible or Restricted Access areas.

Peer Reviews

Peer review was accomplished throughout the process. Procedures were created in accordance with appropriate nuclear standards which include the preparer / reviewer process. The fleet GARD CM-AA-BDB-1002 was reviewed and approved by a Dominion fleet peer group. The walkdown teams each included a minimum of two inspectors for peer checking. Training material was peer checked, reviewed, and approved. The Flooding Walkdown Forms were signed by both inspectors and were independently reviewed.

F: Results of the Flood Protection Feature Walkdowns

NRC Information Request:

Results of the walkdown including key findings and identified degraded, non-conforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using the guidance in Regulatory Issues Summary 2005-20, Rev 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program.

Dominion Response:

The Millstone 2 and 3 flood protection and mitigation features walked down include site topography, structural walls, floors, penetrations and seals, doors, and dikes and were found to be consistent with the description provided in the CLB. The majority of the protection features examined were passive protection SSCs. These features were found to be available, functional, and fairly well maintained. In addition, evaluations were performed on four flood-related procedures.

Fifty walkdown packages were developed to inspect flood protection and mitigation features for Unit 2. Thirty-three packages were developed to inspect flood protection and mitigation features for Unit 3. For Millstone Unit 2, two features were identified as having Restricted Access in accordance with the definitions provided in NEI 12-07. Two flood protection features were identified as being Inaccessible in accordance with the definitions provided in NEI 12-07. For Millstone Unit 3, no features were identified as having Restricted Access or Inaccessible in accordance with the definitions provided in NEI 12-07.

Conditions identified as unacceptable were entered into the CAP during the flooding walkdowns resulting in 36 new condition reports (CRs) for Millstone Unit 2 and seven new CRs for Millstone Unit 3. Most of these condition reports were due to material

condition: for example, component rusting or wall staining, degraded gaskets, seals, and weather stripping. Some of the condition reports were due to configuration management: for example, below grade unsealed penetrations.

Some of these conditions challenged flood protection and mitigation features to the extent that would cause them not to be able to perform their intended flood protection function and, thus, are Deficiencies (as defined by NEI 12-07). Thirteen Deficiencies were identified at Millstone Unit 2 and Unit 3 during the flooding walkdowns. Corrective actions taken or planned to restore full qualification of these flood protection and mitigation features are being addressed through the CAP.

Deficiencies

The first Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Condensate East Condenser Pit. A condenser pit plug had failed and water was entering the condenser pit from floor seal. This repair was completed during the current refueling outage (2R21).

The second Deficiency is associated with Millstone Unit 2 and was found at the Separation Flood Wall between Millstone Units 1 and 2, specifically at the east Radwaste Building flood wall, south of Flood Gate 21. The penetration is 16 inches off the ground and approximately 7 feet south of Flood Gate 21. The seal for a penetration containing nitrogen tubing to the Chemistry Lab counting room was non-functional. The penetration contained an open-ended piece of stainless tubing, and there was material missing from the seal itself. This repair was completed during the current refueling outage (2R21).

The third Deficiency is associated with Millstone Unit 2 and was found at the south wall of the Unit 2 Auxiliary Building. One penetration was identified where the penetration was not sealed between the Auxiliary Building wall and the conduit. Installation of new conduit seals was completed during the current refueling outage (2R21).

The fourth Deficiency is associated with Millstone Unit 2 and was found at the Unit 3 Fire Water Pump House (credited for flood protection by Unit 2). The block wall construction of the Fire Water Pump House walls were found to have several cracks. The original pump house block wall analysis assumed no cracks in the walls. A "V-groove" repair was completed during the current refueling outage to remove the cracked areas. An evaluation of the structural integrity of the building walls is underway. This evaluation is scheduled to be completed by March 31, 2013.

The fifth Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Auxiliary Building exterior walls. Two ventilation ducts which pass through an exterior wall of the Auxiliary Building below the minimum flood protection elevation of 22 feet were not sealed between the duct piping and the wall. This repair was completed during the current refueling outage (2R21).

The sixth Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Turbine Building cable pits. Several electrical conduits entering the cable pits were not sealed between the conduit and the cable(s). Further investigation concluded that there were no seals between the Turbine Building cable pits and the service water pump room in the intake structure. Installation of new conduit seals was completed during the current refueling outage (2R21).

The seventh Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Auxiliary Building (-25.5' floor elevation). This Deficiency is an unsealed electrical conduit that penetrates the south wall of the Auxiliary Building. This electrical conduit traverses an external flood barrier. Installation of new conduit seals was completed during the current refueling outage (2R21).

The eighth Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Hot Shop. Several electrical conduits that traverse an external flood barrier were found to be unsealed. Installation of new conduit seals was completed during the current refueling outage (2R21).

The ninth Deficiency is associated with Millstone Unit 3. The Unit 3 conduit seals credited for external flooding protection were found to not have design, installation, or inspection information necessary to ensure they function as a flood protection feature. This issue was entered into the CAP and an evaluation is underway to address this issue. This evaluation is expected to be completed by July 1, 2013.

The tenth Deficiency is associated with Millstone Unit 2. The Unit 2 conduit seals credited for external flooding protection were found to not have the quality documentation necessary to confirm the adequacy of the seals to perform their function as a flood protection feature. This issue was entered into the CAP and an evaluation is underway to address this issue. This evaluation is expected to be completed by July 1, 2013

The eleventh Deficiency is associated with Millstone Unit 2 and was found in the Unit 2 Turbine Building (14.5' floor elevation) west side exterior wall. A group of four electrical conduits have conduit seals that are displaced and separated from both the conduit wall and the electrical cable. It is not apparent that these conduit seals can perform their intended flood protection function. This issue has been entered into the CAP and a work order has been issued to repair the seals. This work is expected to be completed by July 1, 2013.

The twelfth Deficiency is associated with Millstone Unit 2 circulating water discharge tunnel vent. The walkdown inspection identified degraded condition and water leaking from the discharge tunnel vent pipe. This vent line separates the turbine building basement from the water in the discharge quarry and is subject to increased water pressure during a postulated flood event. This issue has been entered into the CAP and the repair is expected to be completed by June 1, 2014.

The thirteenth Deficiency is associated with Millstone Unit 2. Several unsealed electrical conduits were found through the wall of the Unit 2 service water pipe tunnel. These open conduits create a credible flood water pathway into the Unit 2 turbine building and the Unit 2 auxiliary Building. A work order has been issued and is expected to be completed by July 1, 2013.

Other than the Deficiencies identified above, this assessment found reasonable assurance that there were no adverse conditions that would have prevented these features from performing their function as credited in the CLB.

Restricted Access Items

The following Unit 2 areas are identified as Restricted Access as defined in NEI 12-07:

- Security Electrical Cable Pull Box PBG1 located on the west wall of the Unit 2 turbine building is considered as Restricted Access because it requires scaffolding and rigging to remove its large cover plate for inspection of penetration seals. This is consistent with example 3.i in NEI 12-07, Section 3.7, and the flooding walkdown inspection has been deferred and are scheduled to be completed prior to July 1, 2013. Deferral of this NRC-required inspection has been entered into the CAP to track completion.

- The Security Electrical Cable Pull Box located in the West Condenser Pit of the Unit 2 turbine building is considered as Restricted Access because it requires scaffolding and rigging to remove its large cover plate for inspection of penetration seals. This is consistent with example 3.i in NEI 12-07, Section 3.7, and the flooding walkdown inspection has been deferred. A work order has been initiated and this activity is scheduled to be completed by July 1, 2013.

Inaccessible Flood Protection Features

Two areas of Unit 2 flood protection walls were found to be Inaccessible as defined in NEI 12-07 during the flooding walkdown effort. One feature is the credited flood wall between the decommissioned Unit 1 and Unit 2. Portions of this wall on the Unit 2 side of the barrier are covered with drywall preventing a complete visual inspection of the barrier. However, the separation wall between the Unit 1 and Unit 2 areas was specifically erected to ensure flood waters entering Unit 1 could not affect Unit 2.

The second area is a recessed section of wall in the Unit 2 Enclosure Building located above the 60-foot deep tendon access pit. One or more penetrations through this section of wall are likely based on the location of an electrical cable pull box mounted on the exterior of the flood protection wall. This section of wall could not be visually inspected from the outside due to the wall mounted electrical pull box and due to the location above the tendon access pit on the inside.

Impact of not performing these two inspections is quite low. The uninspected area above the enclosure building tendon access pits is quite small and, based on inspection from outside of the wall, there are possibly several conduits through the wall. However, any leakage into this area would accumulate in the tendon access pit and is unlikely to affect any safety related equipment.

In addition, there were several other small areas of the facility that were partially Inaccessible due to installed shielding for radiation concerns. A review of design documents and interviews with experienced operators verified that walls and floors had no penetrations, other than those identified as deficiencies above, in these areas. Although not fully accessible for visual inspection, each of these features has been determined able to perform its flooding protection functions based on review of design documentation. Because these areas are confirmed not to contain penetrations, these small areas are not reported as Inaccessible areas.

Inspection and Preventative Maintenance of Flood Protection Features

As part of this flooding walkdown, a review of the preventative maintenance (PM) program and surveillance procedures was performed and found no programmatic requirements for inspection and maintenance of the storm drains systems. Based on this review, and the inspection findings, it is evident that some form of periodic preventative maintenance is necessary to ensure the storm drains systems continued conformance with the CLB. Also, some programmatic controls for placement of Sea-Vans and outage equipment is needed to ensure site water runoff pathways and storm drains system inlets are not blocked. Although not considered as deficiencies at Millstone, these observations have been entered into the CAP and the programmatic controls are considered as necessary enhancements to ensure the storm drains can perform their intended functions. This is discussed further in Section II.H of this report.

Feasibility and Reliability of Credited Actions to Mitigate Flooding

Credited operator actions at Millstone Units 2 and 3 confirm that doors are physically closed, loose material from the yard and grounds is secured, and the service water pump motor flood protection cover and flood gates are installed. Review of station procedures during the flooding walkdowns determined that these credited operator actions could be readily accomplished as outlined in station procedures.

Review of abnormal procedure AOP 2560 and maintenance procedure MP 2701E identified a few procedure enhancements that would improve preparations for postulated flooding concerns. Specifically, it was recommended that AOP 2560 be revised to include guidance for tightening of floor plugs and it was recommended that MP 2701E be revised to direct tools and materials listed in the procedure be maintained in a centralized location and include specific direction for installation of three flood gates. These procedure enhancements are not Deficiencies, but it is recommended

that these enhancements be made to improve flood hazard preparations. Procedure enhancements are expected to be in place by December 31, 2013.

G: Cliff-edge Effects and Available Physical Margin

NRC Information Request:

Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the corrective action program. Also include a detailed description of the actions taken or planned to address these effects.

Dominion Response:

As documented in Section I of this report, consistent with NEI 12-07, neither cliff-edge effects nor APM are documented in this report. As defined in NEI 12-07, APM is the difference between the licensing basis value of a critical characteristic and the as-found value for that characteristic. Information related to APM was collected during the flooding walkdowns, consistent with the recommendations of NEI 12-07, and is documented in the flooding walkdown records. Cliff-edge effects and associated safety risks will be determined, during the activities associated with NRC NTTF Recommendation 2.1, using the APMs, as well as other information, such as the site-specific SSCs subject to flooding and the potential availability of other SSCs to mitigate risks.

H: Other Planned and/or Newly Installed Flood Protection Features or Measures

NRC Information Request:

Describe any other planned or newly installed flood protection systems or flood mitigation measures including flood barriers that further enhance the flood protection. Identify results and any subsequent actions taken in response to the peer review.

Dominion Response:

Walkdown Process and Methodology

No changes were required to the walkdown process/methodology as a result of peer reviews. The walkdown process/methodology was consistent with the NEI guidance; and Dominion nuclear fleet GARD and Millstone Unit 2 and 3 site-specific procedures were approved as required by procedure processes. Dominion made minor additions to the NEI guidance to specify the utility-specific instructions, as necessary (for example, providing a definition of "Small Margin"). Peer review methodology included two inspectors on visual inspections, preparer/reviewer on documentation, and corporate review on the walkdown packages.

Flood Protection Systems / Mitigation Measures

Including the minor maintenance activities and procedural enhancements associated with the CRs discussed in Section II.F of this report, few changes were required to the flood protection systems or flood mitigation measures as a result of the flooding walkdowns. Assessment of the inspection results identified several areas where new or planned improvements could be made and are discussed below.

Control of Yard and Storm Drains Systems Changes
Review of the flooding walkdown results from the Dominion fleet of nuclear plants identified a lack of programmatic control for changes and maintenance to the yard and storm drain systems. A new fleet initiative has been initiated to establish engineering standards for storm drain system changes, and a training initiative has been established to enhance knowledge and understanding of how yard changes can affect the capabilities of storm drain systems. These programmatic controls are scheduled to be in place by December 31, 2013.

Programmatic Inspection and Maintenance for Conduit and Penetration Seals
As discuss above, Millstone lacked adequate periodic programmatic inspection of conduit and penetration seals required for flood protection. Dominion is initiating a fleet-wide initiative for programmatic periodic inspection of conduit and penetration seals for flood protection. These programmatic controls are scheduled to be in place by December 31, 2013.

Procedure Enhancements
One abnormal procedure and one maintenance procedure associated with flood protection preparations have recommended enhancements as discussed in Section II.F above. The procedure enhancements are expected to be completed by December 31, 2013.

There are no other new or modified flood protection equipment or features resulting from the flooding walkdowns.

III. CONCLUSIONS

A comprehensive inspection (flooding walkdowns) of flooding protection features has been performed at Millstone Units 2 and 3, by trained and qualified personnel; using plant procedures developed using the NRC-endorsed guidance of NEI 12-07. Eighty-three walkdown packages, the majority of which were passive protection features, were examined. In general, flood protection features and mitigation measures were found to be available, functional, and fairly well maintained, consistent with the CLB. Two features were identified as having Restricted Access, and two features were considered Inaccessible. The flooding walkdowns also included reviews of operational requirements such as surveillance, inspection, and testing programs; change control processes; and PM practices. In addition, some conditions adverse to quality were identified during the walkdowns. Those items have been entered into the CAP program for their resolution.

Walkdown observations not judged as acceptable were entered into the CAP. In those cases where acceptance criteria were not met or compliance could not be readily confirmed, the issue was addressed in the CAP. Those identified physical conditions where a seal or pressure boundary was found but were deteriorated were considered a degraded condition that was not a threat to the mitigation features of the flood boundary. These items are scheduled for repairs as part of the corrective action process.

Those items that were found to have not been installed per the plant's FSAR and design specification, e.g., missing penetration seals, were entered into the corrective action program and identified as a design basis issue not being met. These removed or never installed flood protection barriers could create a pathway for flood waters to enter areas otherwise protected from external flooding. However, sufficient controls are in place and sufficient warning of postulated PMH or severe storm events provides reasonable assurance that the pathway would be closed prior to a flooding event. These are penetrations that do not meet the CLB as stated in the FSAR; i.e., that penetrations below a design flood height of El. 22 feet shall have flood protection features installed. Several of these work orders were added to the outage work list and repairs are being made during the current refueling outage.

Deficiencies

Twelve Deficiencies were found at Millstone Unit 2 during the flooding walkdowns, and one Deficiency was found at Millstone Unit 3. With the exception of these thirteen Deficiencies at Millstone, flood protection features were found to be available, functional, and fairly well maintained thus allowing them to perform their design function as credited in the CLB. Other than the issues discussed as Deficiencies, no other unavailable flood protection features or unanalyzed conditions were identified.

New or Modified Flood Protection Equipment / Mitigation Measures

Enhancements to one abnormal procedure and one maintenance procedure associated with flood protection preparations were recommended. The procedure enhancements are expected to be completed by December 31, 2013

Dominion is initiating a fleet-wide initiative to provide improved programmatic controls for yard and storm drains changes. These programmatic controls will be in place by December 31, 2013.

Additionally, Dominion is initiating a fleet-wide initiative to provide programmatic periodic inspection of conduit and penetration seals required for flood protection. These programmatic controls will be in place by December 31, 2013.

Restricted Access Flood Features

As discussed above, there were two Restricted Access flood protection features identified at Millstone Unit 2. These inspections are scheduled to be completed prior to July 1, 2013.

Inaccessible Flood Features

There were two Inaccessible flood features identified for Unit 2 during the flooding walkdown effort. One feature is a portion of the credited flood wall between the decommissioned Unit 1 and Unit 2. Portions of this wall on the Unit 2 side are covered with drywall preventing a complete visual inspection of the barrier. However, the separation wall between the Unit 1 and Unit 2 areas was specifically erected to ensure flood waters entering Unit 1 could not affect Unit 2

The other Inaccessible area is a recessed section of wall in the Unit 2 Enclosure Building located above the 60 feet deep tendon access pit. The uninspected area is quite small. Any leakage into this area would accumulate in the tendon access pit and is unlikely to affect any safety related equipment.

As discussed above, assessment of these Inaccessible areas considered factors such as: 1) the walls are specifically designed as flood barriers, 2) the possible number of penetrations in the inaccessible segment of walls is quite small, 3) the penetrations, if any, are most likely sealed per design, and 4) the distance from these penetrations to safety related equipment that could be affected by flood water is quite large. Therefore, there is reasonable assurance that these two flood protection features are able to perform their credited flood protection function. The aggregate affect of there being two areas does not change this evaluation.

There were several other small areas of the facility that were partially Inaccessible due to installed shielding for radiation concerns. A review of design documents and

interviews with experienced operators verified that walls and floors had no penetrations in these areas. Although not fully accessible for visual inspection, each of these features has been determined able to perform its flooding protection functions based on review of design documentation.

Feasibility and Reliability of Credited Operator Actions

Credited operator actions at Millstone Units 2 and 3 confirm that doors are physically closed, loose material from the yard and grounds is secured, and the Unit 2 service water pump motor flood protection cover and flood gates are installed.

IV. REFERENCES

1. NRC Letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3 and 9.3 of the Near-Term Task Force Review of the Insights from the Fukushima Dai-ichi Accident*, dated March 12, 2012 (ML12073A348).

2. NEI 12-07, *Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features*, Revision 0-A, dated May 2012.

3. Dominion letter to the NRC, *90 Day Response to March 12, 2012 Information Request Regarding Flooding Aspects of Recommendations 2.1 and 2.3*, dated June 11, 2012.

4. NRC Letter to NEI, *Endorsement of Nuclear Energy Institute (NEI) 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features,"* dated May 31, 2012 (ML12144A142).

5. NRC Letter to NEI, *Endorsement of Nuclear Energy Institute (NEI) 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features,"* dated June 14, 2012 (ML12159A290).

6. Millstone Power Station Unit 2 FSAR, Revision 30.

7. Millstone Power Station Unit 3 FSAR, Revision 25.

8. Hydrometeorological Branch, U.S. Weather Bureau, *Hurricane, Atlantic and Gulf Coasts of the United States*, Interim Report, HUR 7-97, May 1968.

9. Dominion Procedure HRP-NUCLEAR, *Hurricane Response Plan (Nuclear)*, Revision 11.

10. Millstone Procedure C OP 200.6, *Storms and Other Hazardous Phenomena (Preparation and Recovery)*, Revision 002-07

11. Fleet GARD, CM-AA-BDB-1002, *Beyond Design Basis Project - Walkdowns of Flood Protection and Mitigation Features*, Revision 0.

12. Millstone Procedure ER-MP-BDB-FLD-001, *Walkdown of Flood Protection Features*, Revision 0.