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10 CFR 50.54(f)

September 13, 2017
Serial: HNP-17-062

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

Shearon Harris Nuclear Power Plant, Unit 1
Docket No. 50-400
Renewed License No. NPF-63

Subject: Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 3, Flooding Focused Evaluation Summary Submittal

References:

1. U.S. Nuclear Regulatory Commission (NRC) Letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, 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, March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340)

2. Duke Energy Letter to NRC, Flooding Hazard Reevaluation Report, March 12, 2013 (ADAMS Accession No. ML13079A253)

3. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 - Request for Additional Information Regarding Fukushima Lessons Learned - Flooding Hazard Reanalysis Report (TAC No. MF1103), February 10, 2014 (ADAMS Accession No. ML14030A419)

4. Duke Energy Letter to NRC, Response to Request for Additional Information Regarding Fukushima Lessons Learned - Flooding Hazard Reanalysis Report, March 24, 2014 (ADAMS Accession No. ML14087A165)

5. Duke Energy Letter to NRC, Flood Hazard Reevaluation Report, Revision 1, April 1, 2015 (ADAMS Accession No. ML 15091A590)

6. NRC Letter, Supplemental Information Related to Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, March 1, 2013 (ADAMS Accession No. ML13044A561)

7. NRC Staff Requirements Memorandum to COMSECY-14-0037, Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards, March 30, 2015 (ADAMS Accession No. ML15089A236)

8. NRC Letter, Coordination of Requests for Information Regarding Flooding Hazard Reevaluations and Mitigating Strategies for Beyond-Design-Basis External Events, dated September 1, 2015 (ADAMS Accession Number ML15174A257)

9. Nuclear Energy Institute (NEI), Report NEI 16-05, Revision 1, External Flooding Assessment Guidelines, dated June 30 2016 (ADAMS Accession Number ML16165A178)

10. U.S. Nuclear Regulatory Commission, JLD-ISG-2016-01, Revision 0, Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flood Hazard Reevaluation; Focused Evaluation and Integrated Assessment, dated July 11, 2016 (ADAMS Accession Number ML16162A301)

11. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 – Staff Assessment of Response to 10 CFR 50.54(f) Information Request Flood Causing Mechanism Reevaluation (TAC No. MF1103), April 29, 2015 (ADAMS Accession No. ML15104A370)

12. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 - Supplement to Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (TAC No. MF1103), November 2, 2015 (ADAMS Accession No. ML15301A557)

Ladies and Gentlemen:

On March 12, 2012, the NRC issued Reference 1 to request information associated with Near-Term Task Force (NTTF) Recommendation 2.1 for Flooding. One of the required responses in Reference 1 directed licensees to submit a Flood Hazard Reevaluation Report (FHRR). For Shearon Harris Nuclear Power Plant, Unit 1 (HNP), the FHRR was submitted on March 12, 2013 (Reference 2), and a revision to the FHRR was provided April 1, 2015 (Reference 5). In response to a Request for Additional information from the NRC (Reference 3), Duke Energy provided a response (Reference 4).

Following the Commission's directive to NRC Staff (Reference 7), the NRC issued a letter to industry (Reference 8) indicating that guidance is being prepared to replace existing instructions, and provide for a "graded approach to flooding reevaluations and provide for more focused evaluations of local intense precipitation and available physical margin in lieu of proceeding to an integrated assessment."

Guidance for performing flooding reevaluations is contained in Reference 9, which has been endorsed by the NRC in Reference 10. Reference 9 indicates that each flood-causing mechanism that is not bounded by the design basis flood (using only stillwater and/or wind-wave run-up levels) shall follow one of the following five assessment paths:

Path 1: Demonstrate Flood Mechanism is Bounded
Path 2: Demonstrate Effective Flood Protection
Path 3: Demonstrate a Feasible Response to Local Intense Precipitation (LIP)
Path 4: Demonstrate Effective Mitigation
Path 5: Scenario Based Approach

Non-bounded flood-causing mechanisms in Paths 1, 2, or 3 require a Focused Evaluation to complete the actions related to external flooding required by Reference 1. Mechanisms in Paths

4 or 5 require an Integrated Assessment. The enclosure to this letter provides the Flooding Focused Evaluation Summary for HNP.

The flooding analysis described in References 11 and 12 was utilized as an input to this Flooding Focused Evaluation. The Flooding Focused Evaluation reaffirms that HNP has reliable, passive protection of key structures, systems, and components (SSCs) to maintain key safety functions (KSFs). For the LIP, Flooding in Streams and Rivers, and Storm Surge, passive protection features are solely relied upon to maintain KSFs. HNP does not require human actions to protect key SSCs, so an evaluation of the overall site response is not necessary.

The Flooding Focused Evaluation follows Path 2 of Reference 9 and utilizes Appendix B of Reference 9 for guidance on evaluating the site protection features. This submittal completes the actions related to external flooding required by Reference 1.

This letter contains no new regulatory commitments and no change to existing regulatory commitments.

Should you have any questions regarding this submittal, please contact Jeff Robertson, Regulatory Affairs Manager, at 919-362-3137.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 13, 2017.

Sincerely,

Tanya M Hamilton

Tanya M. Hamilton

Enclosure: Flooding Focused Evaluation Summary

cc: Mr. J. Zeiler, NRC Resident Inspector, HNP
Ms. M. Barillas, NRC Project Manager, HNP
Mr. S. R. Monarque, NRC Japan Lessons-Learned Project Manager, HNP
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SERIAL HNP-17-062

ENCLOSURE

FLOODING FOCUSED EVALUATION SUMMARY

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

RENEWED LICENSE NUMBER NPF-63

Table of Contents

1. Executive Summary

Shearon Harris Nuclear Power Plant, Unit 1 (HNP), has reevaluated its flooding hazard in accordance with the NRC's March 12, 2012, 10 CFR 50.54(f) request for information (Reference 1). The request for information was issued as part of implementing lessons learned from the Fukushima Dai-ichi accident; specifically, to address Recommendation 2.1 of the NRC's Near Term Task Force (NTTF) report. Duke Energy submitted the response to the 10 CFR 50.54 (f) letter in a Flood Hazard Reevaluation Report (FHRR) sent to the NRC on March 12, 2013 (Reference 2). A revision to the FHRR was sent to the NRC on April 1, 2015 (Reference 5).

The NRC Staff reviewed the information provided by Duke Energy in References 2 and 5 and determined that sufficient information was provided in response to the 10 CFR 50.54(f) letter (Reference 11). Reference 12 provided a supplement to this staff assessment. The supplement updated the original staff assessment to address changes in the NRC's approach to the steps following the review of the flood hazard reevaluations as directed by the Commission (Reference 7).

The HNP FHRR evaluated nine flooding hazards (References 2 and 5). As documented in Reference 12, three mechanisms were found to exceed the Current Design Basis (CDB) flood level at HNP. The mechanisms that were found to exceed the CDB are listed below, along with a description of how the site is protected from each.

1. Local Intense Precipitation – Flood protection is provided by site topography and plant structures (i.e. doors and structural barriers). The potential flow paths where external flood water can enter the Waste Processing Building (WPB) have been evaluated and it has been determined that Key Safety Functions (KSFs) will not be affected by this event.
2. Flooding in Streams and Rivers – Flood protection is provided by site topography.
3. Storm Surge – Flood protection is provided by site topography.

The Focused Evaluation concludes that permanent, passive features and plant grade provide adequate protection against ingress of floodwater from the revised reevaluated flood levels. This Focused Evaluation follows Path 2 of Nuclear Energy Institute (NEI) 16-05, Revision 1 (Reference 9) and utilizes Appendix B of Reference 9 for guidance on evaluating the impact of the reevaluated flood level to HNP. This submittal completes the actions related to external flooding required by Reference 1.

2. Background

By letter dated March 12, 2012 (Reference 1), the NRC issued a request for information under Title 10 of the Code of Federal Regulations, Section 50.54(f) to all nuclear power reactor licensees and construction permit holders. Enclosure 2 of Reference 1 requested that licensees perform a flooding hazard reevaluation using present-day methodologies and guidance, and then assess the impact of the reevaluated hazard on the plant. For HNP, the FHRR was submitted on March 12, 2013 (Reference 2). Additional information was provided in References 4 and 5.

Following the Commission's directive to NRC Staff (Reference 7), the NRC issued a letter to industry (Reference 8) indicating that new guidance is being prepared to provide a "graded approach to flooding reevaluations and provide more focused evaluations of local intense precipitation and available physical margin in lieu of proceeding to an integrated assessment." The NEI prepared the new "External Flooding Assessment Guidelines" in NEI 16-05 (Reference 9), which was endorsed by the NRC in Reference 10. NEI 16-05, Revision 1, indicates that each flood-causing mechanism not bounded by the design basis (DB) flood (using only stillwater and/or wind-wave run-up level) should follow one of the following five assessment paths:

Path 1: Demonstrate Flood Mechanism is Bounded
Path 2: Demonstrate Effective Flood Protection
Path 3: Demonstrate a Feasible Response to Local Intense Precipitation (LIP)
Path 4: Demonstrate Effective Mitigation
Path 5: Scenario Based Approach

Non-bounded flood-causing mechanisms in Paths 1, 2, or 3 only require a Focused Evaluation to complete the actions related to external flooding required by Reference 1. Mechanisms in Paths 4 or 5 require an Integrated Assessment. This Flooding Focused Evaluation follows Path 2 of NEI 16-05, Revision 1 (Reference 9), and utilizes Appendix B of Reference 9 for guidance for the evaluation of site protection features.

3. References

1. U.S. Nuclear Regulatory Commission (NRC) Letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, 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, March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340)

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7. NRC Staff Requirements Memorandum to COMSECY-14-0037, Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards, March 30, 2015 (ADAMS Accession No. ML15089A236)

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12. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 - Supplement to Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (TAC No. MF1103), November 2, 2015 (ADAMS Accession No. ML15301A557)

13. Duke Energy Letter, Notification of Full Compliance with Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" and with Order EA-12-051, "Order Modifying Licenses With Regard To Reliable Spent Fuel Pool Instrumentation" - Shearon Harris Nuclear Power Plant, Unit 1, July 10, 2015 (ADAMS Accession No. ML15192A006)

14. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 – Staff Assessment of the Flooding Walkdown Report Supporting Implementation of Near-Term Task Force Recommendation 2.3 Related to the Fukushima Dai-ichi Nuclear Power Plant Accident (TAC No. MF0233), June 27, 2014 (ADAMS Accession No. ML14169A520)

15. Engineering Change (EC) Evaluation 409305, Rev. 0, Beyond Design Basis Flooding Impact Evaluation

16. Engineering Change (EC) Evaluation 404716, Rev. 0, 2016 Mitigating Strategies Assessments for Flooding Documentation Requirements Shearon Harris Nuclear Plant, Unit 1

17. Duke Energy Letter, Mitigating Strategies Assessment Report for Flooding Hazard Information, December 21, 2016 (ADAMS Accession No. ML16356A665)

18. Engineering Change (EC) Evaluation 289895, Rev. 0, Fukushima NTTF 2.1: Shearon Harris Nuclear Plant Flood Hazard Reevaluation

19. Engineering Periodic Test (EPT) Procedure EPT-040, Rev. 0, Flood Barrier Penetration Seal Visual Inspection

20. NRC Letter, Shearon Harris Nuclear Power Plant, Unit 1 - Flood Hazard Mitigation Strategies Assessment (CAC No. MF7931), May 9, 2017 (ADAMS Accession No. ML17100A780)

21. HNP Site Plan Drawing 5-G-0003

4. Acronyms

- ADAMS – Agencywide Documents Access and Management System
- APM – Available Physical Margin
- BDB – Beyond Design Basis
- CDB – Current Design Basis
- CLB – Current Licensing Basis
- DB – Design Basis
- EC – Engineering Change
- ESW – Emergency Service Water
- FHRR – Flood Hazard Reevaluation Report
- FIAP – Flooding Impact Assessment Process
- FLEX – Flexible and Diverse Coping Strategies
- FHB – Fuel Handling Building
- HNP – Shearon Harris Nuclear Power Plant, Unit 1
- Key SSC – A Structure, System or Component relied upon to fulfill a Key Safety Function
- KSF – Key Safety Function(s)
- LIP – Local Intense Precipitation
- MSFHI – Mitigating Strategies Flood Hazard Information
- NEI – Nuclear Energy Institute
- NGVD29 – National Geodetic Vertical Datum of 1929
- NRC – U.S. Nuclear Regulatory Commission
- NTTF – Near-Term Task Force
- PMH – Probable Maximum Hurricane
- RAB – Reactor Auxiliary Building
- WPB – Waste Processing Building

5. Flood Hazard Parameters for Unbounded Mechanisms

NRC has issued a staff assessment (References 11 and 12) related to HNP's FHRR (References 2 and 5). In Reference 12, the NRC concluded that the HNP's reevaluated flood hazards information is suitable for the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and NRC Staff) for HNP. Further, the NRC Staff has concluded that HNP's reevaluated flood hazard information is suitable for other assessments associated with Near-Term Task Force Recommendation 2.1, "Flooding." In Table 2.2-1 of Reference 11, the NRC lists the following flood-causing mechanisms for the DB flood:

- Local Intense Precipitation and Associated Drainage
- Streams and Rivers
- Failure of Dams and Onsite Water Control/Storage Structures
- Storm Surge
- Seiche
- Tsunami
- Ice Induced Flooding
- Channel Migrations or Diversions

In Table 4.0-2 of Reference 12, the NRC lists flood hazard information for the following flood-causing mechanisms that are not bounded by the DB hazard flood level:

- Local Intense Precipitation and Associated Drainage
- Streams and Rivers
- Storm Surge

The flood-causing mechanisms that are not bounded by the DB hazard flood level are the reevaluated flood-causing mechanisms that need to be addressed in the external flooding assessment. The non-bounded flood-causing mechanisms for HNP are described in detail in the FHRR submittals (References 2 and 5). Table 5.1 shown on the next page summarizes how each of these unbounded mechanisms is addressed in this external flooding assessment.

Table 5.1 – Flood-Causing Mechanisms Not Bounded by the Design Basis Hazard Flood Level

	Flood-Causing Mechanism	Summary of Assessment
1	Local Intense Precipitation and Associated Drainage	This flood-causing mechanism will follow Reference 9, Flooding Impact Assessment Process (FIAP), Path 2, as described in Table 6.3, "FIAP Evaluation Path Determination Criteria," of Reference 9. Path 2 is appropriate since the reevaluated flood levels are addressed solely by passive, permanent protection features, and the available physical margin (APM) is adequate to protect Key Structures, Systems, or Components (SSCs) and maintain KSFs.
2	Streams and Rivers	This flood-causing mechanism will follow Reference 9, FIAP, Path 2, as described in Table 6.3, of Reference 9. Path 2 is appropriate since the reevaluated flood levels are addressed solely by passive, permanent protection features, and the APM is adequate to protect key SSCs and maintain KSFs.
3	Storm Surge	This flood-causing mechanism will follow Reference 9, FIAP, Path 2, as described in Table 6.3, of Reference 9. Path 2 is appropriate since the reevaluated flood levels are addressed solely by passive, permanent protection features, and the APM is adequate to protect key SSCs and maintain KSFs.

Relevant Associated Effects:
Flooding in Streams and Rivers and Storm Surge do not inundate the site and therefore, relevant associated effects are not considered applicable for these flood-causing mechanisms. The relevant associated effects identified in Table 5.2 on the following pages are for the Local Intense Precipitation and Associated Drainage (LIP event) only.

Table 5.2 – LIP Flood Mechanism Parameters

	Parameter Description	**Description**
1	Max Stillwater Elevation	Max Stillwater Elevation is 261.41 feet (ft) National Geodetic Vertical Datum of 1929 (NGVD29). All plant site structures other than the WPB are protected to 262 ft and are not affected by the LIP. The WPB max Stillwater elevation is 261.36 ft. The WPB change in flood level is 0.09 ft above DB, or approximately 1 inch.
2	Max Wave Run-up Elevation	n/a
3	Hydrodynamic Effects	The potential for erosion due to high velocity flow is low at the site. According to the results presented in Reference 5, Table 3, the maximum velocity at safety-related structures is 1.27 feet per second (fps). For flow velocity less than 3 fps, the earth bed will not be eroded.
4	Debris Effects	The areas within the protected area that could potentially provide a source for debris are either paved or covered with gravel or paved surfaces with little vegetation or loose materials available. The protected area is also surrounded by a vehicle barrier system and security fences, which would significantly decrease the potential for any debris to impact safety-related structures. In addition, relatively low velocities would limit the movements of debris throughout the power block. Therefore, debris effects at HNP were considered negligible.
5	Effects Caused by Sediment Deposition and Erosion	As described previously, the maximum velocity throughout the site is 1.27 fps. Since most areas within the power block are paved, erosion is not expected because maximum values of flow velocity that may be sustained without significant erosion are higher than the maximum velocity. The LIP event is a localized flooding event, which is not expected to carry a significant amount of sediment. Therefore, sediment deposition at HNP is considered negligible.
6	Concurrent Site Conditions	The meteorological events that could potentially result in significant rainfall approaching the LIP magnitude are mesoscale convective systems, synoptic systems with embedded thunderstorms, and tropical cyclones. These meteorological events can also be accompanied by hail, strong winds, and possible tornadoes.

	Parameter Description	**Description**
7	Groundwater Ingress	Groundwater levels on-site will not increase due to LIP where floodwaters will be above site grade for approximately 1 hour. The plant DB groundwater level is 251 ft. HNP is protected against groundwater ingress to 259 ft NGVD29.
8	Warning Time	Per Reference 12, the time for site preparation for a LIP event is zero hours, since it may occur without warning from localized storms.
9	Period of Site Preparation	0 hours
10	Period of Inundation	1 hour
11	Period of Recession	1 hour
12	Plant Mode of Operation	Any

6. Overall Site Flooding Response

6.1 Description of Site and Overall Flooding Response

HNP lies within the floodplain of Buckhorn Creek in Wake and Chatham Counties in central North Carolina. The site grade at the power block is elevation 260 ft NGVD29. Associated and nearby water storage impoundments include the Main Reservoir and the Auxiliary Reservoir. These two reservoirs are collectively referred to as Harris Lake. The Auxiliary Reservoir is formed by the Auxiliary Dam, which impounds the Tom Jack Branch, a tributary of Buckhorn Creek. The Auxiliary Dam has a crest elevation of 260.0 ft.

The Main Dam and Reservoir impound Buckhorn Creek. The Main Dam, constructed on Buckhorn Creek approximately 2.5 miles North of its confluence with the Cape Fear River, created the 4,000-acre Main Reservoir and is located approximately 4.5 miles South of HNP. An arm of the Main Reservoir, the Thomas Branch, is adjacent to and East of HNP. The Main Dam has a crest elevation of 260.0 ft. The Main Reservoir provides water to the plant through the Cooling Tower Makeup Water Intake Structure that adjoins the plant and is the secondary source of Emergency Service Water (ESW). The Auxiliary Dam created the smaller 317-acre Auxiliary Reservoir. Each dam is equipped with an uncontrolled spillway. The plant island is bounded by the Main Reservoir on the east, south, and southwest sides and by the Auxiliary Reservoir on the west and northwest sides. The Auxiliary Reservoir is the preferred source of ESW.

Based upon the FHRR (References 2 and 5) and the staff assessment of the FHRR (Reference 11 and 12), HNP is potentially exposed to the flood hazards due to the LIP and associated drainage, storm surge, and flooding in streams and rivers. These flood-causing mechanisms are not bounded by the CDB hazard.

The site relies on permanent passive flooding protection features (i.e. site topography and passive structural components) that limit the in-leakage during the LIP event. There are no active flooding protection features or required site response to this event. The plant buildings affected by the flooding loads were evaluated and found to be structurally adequate.

For flooding in streams and rivers and storm surge flood-causing mechanisms, this Focused Evaluation demonstrates that doors, buildings, and propagation pathways that contain key SSCs are not challenged by flood waters during these flood events at HNP. The maximum water levels associated with these events are below site grade.

6.2 Summary of Plant Modifications and Changes

Plant modifications or changes were not required based upon the results of this evaluation.

7. Flood Impact Assessment

7.1 Local Intense Precipitation

7.1.1 Description of Flood Impact

The maximum reevaluated flood evaluation of the LIP event is not bounded by the CDB flood elevation at all exterior locations of the plant. The beyond design basis (BDB) flood water surface elevations are above the plant floor elevations at some locations and have the potential to cause internal flooding to plant buildings. The maximum LIP reevaluated flood elevation at various safety-related structure locations and the associated APM values are shown in Table 7.1 on the following page. The LIP APM is equal to the difference between the top of the protected elevation and the maximum water surface elevation due to the LIP event. Permanent passive protection features, such as site topographic characteristics and plant structures (i.e. doors and structural barriers), are relied upon for protection against a LIP event.

Table 7.1 Maximum Reevaluated Flood Elevations due to a LIP Event at Safety-related Structure Locations

Location	Protected Elevation (ft NGVD29)	CDB Flood Elevation (ft NGVD29)	FHRR Flood Elevation (ft NGVD29)	APM (ft)
Diesel Fuel Oil Storage Tank Building	262.0	261.27	261.41	0.59
Diesel Generator Building	262.0	261.27	261.12	0.88
Waste Processing Building	261.06	261.27	261.36	-0.3
Emergency Service Water Screening Structure	262.0	261.27	260.52	1.48
Emergency Service Water and Cooling Tower Make-Up Water Intake Structure	262.0	261.27	260.82	1.18

The evaluation completed by the site (Reference 15) concludes that all safety-related equipment is capable of performing its design function during the LIP.

7.1.2 Adequate APM Justification and Reliability of Flood Protection

As noted in Table 7.1 shown above, the WPB is the only plant structure that does not maintain adequate APM to prevent flood water from entering the structure during the LIP event. There are two doors in the WPB that do not have flood protection for flood levels higher than 261.06 ft NGVD29 as stated in the HNP Final Safety Analysis Report (Reference 5, Section 3.1.3). Flood water from this event can enter the structure through these two fire protection doors (1FP-D0833 and 1FP-D0838), which are located at ground level. These two doors are standard metal double doors not equipped with gaskets or any weather proofing materials that would seal the door during a flood event. The following discussion addresses the APM available relative to the features protecting the WPB.

Utilizing guidance from Reference 9, Appendix B, APM and reliability must be demonstrated for the following passive features that HNP relies upon for protection against the LIP flood event:
1. Existing exterior entry doors into the WPB
2. Existing concrete walls for the WPB
3. Existing penetration seals

There are no active components, which HNP relies upon for protection against the LIP event.

7.1.2.1 Loads on Exterior Doors

The plant exterior doors in the WPB are of metal construction and open outwards and, therefore, the external pressure on the door would be distributed on both sides of the doorframe. The external pressure on the door would work to close or seal the door.

The external hydrostatic load for doors 1FP-D0833 and 1FP-D0838 was calculated to be 0.13 psi (Reference 15). The allowable pressure loading on these doors is 1.5 psi. Therefore, it can be concluded that the resultant LIP load is bounded by the existing door loading qualification.

7.1.2.2 Water Ingress through Exterior Doors

The potential water ingress through the WPB doors 1FP-D0833 and 1FP-D0838 at ground level was calculated to be 2,576 ft^3 (Reference 15). There are no safety-related SSCs located within the WPB, 261' elevation area. All flood water will then transfer from the WPB to the Fuel Handling Building (FHB) through 4 wall openings. The FHB, 261' elevation area directly north of the wall has no safety related components in the immediate area. Flood water will continue to propagate from the FHB into the Reactor Auxiliary Building (RAB), draining through stairwells and elevator shafts to lower elevations of the RAB where it will pond. From engineering evaluation, the flood water will potentially pond to a maximum depth of 4.21 inches at the lowest elevation (190' elevation). Per the existing internal flood design for the RAB, the lowest safety-related equipment is located 14 inches above the 190' floor elevation. Therefore, it can be concluded that key SSCs in the RAB would not be impacted by the LIP flood.

Adjacent areas connected to the RAB within the WPB and FHB (Reference 21) where potential water could propagate do not house safety-related SSCs. Therefore, safety related SSCs would not be impacted by the LIP flood.

7.1.2.3 Loads on Exterior Plant Concrete Walls

The site evaluation shows that the effects of the LIP flood loads on the exterior plant concrete walls in the WPB are negligible. The WPB is a safety-related plant structure with exterior walls designed to withstand DB wind, tornado, and missile loads, which far exceed the load exerted by the increased BDB flood level. The slight increase in hydrostatic loading below the ground surface due to the flood level increase would be minimal. The robust design of the concrete walls and foundations are structurally adequate to withstand LIP loading.

7.1.2.4 Penetration Seals

The existing WPB external flood protection penetration seals that are subject to BDB flooding were evaluated as part of the walkdowns completed to address NTTF Recommendation 2.3, Flooding. Per Reference 14, the NRC Staff concluded that HNP provided sufficient information in response to Enclosure 4 of Reference 1 for NTTF Recommendation 2.3 Flooding (Reference 14). Inspection of penetration seals is controlled by a HNP engineering periodic test procedure (Reference 19) and ensures that all external flood barrier penetration seals are inspected at least every 15 years.

7.1.3 Adequate Overall Site Response

Due to the protection provided by the passive features discussed above, manual action is not required in response to a LIP event and thus, this section is not applicable to the HNP Focused Evaluation.

7.2 Flooding in Streams and Rivers

7.2.1 Description of Flood Impact

For flooding in streams and rivers, the maximum reevaluated flood elevation documented in References 2 and 5 is identified in Table 7.2 shown on the following page. The HNP is at a plant grade elevation of 260 ft NGVD29. The crest of the Main Dam and Auxiliary Dam is at 260.0 ft. The APM for this event relative to the site grade and the crest of the Main Dam and Auxiliary

Dam is documented in Table 7.2. The results of this review indicate that the HNP is protected from flooding in streams and rivers.

Table 7.2 Maximum Reevaluated Flood Elevations due to Flooding in Streams and Rivers at Safety-related Structure Locations

Location	Protected Elevation (ft NGVD29)	CDB Flood Elevation (ft NGVD29)	FHRR Flood Elevation (ft NGVD29)	APM (ft)
Main Dam	260.0	238.9	243.84	16.16
Auxiliary Dam	260.0	256.0	256.50	3.5
Unit 1 Plant Island	260.0	256.0	256.50	3.5

7.2.2 Adequate APM Justification and Reliability of Flood Protection

HNP relies on the permanent passive features, specifically plant grade with a minimum protection level of 260.0 ft NGVD29, to protect the plant from flooding in streams and rivers. The minimum 3.5 ft APM for this event is adequate considering that the analysis for the Buckhorn Creek Drainage Basis above the Main Dam utilized the following justifications:

- Saturated antecedent moisture conditions were assumed in the entire 70.3-square-mile Buckhorn Creek drainage basin prior to the start of the full PMP event.
- The initial water loss from all sub-basins was conservatively assumed to be zero.
- Base flow on all tributaries is neglected because it is very small compared to flood flows.
- Rainfall intercepted at any location in the Main Reservoir pool was considered immediately available at the downstream end of the pool.
- Level pool routing was used for both the Auxiliary and Main Reservoirs.

7.2.3 Adequate Overall Site Response

Due to the protection provided by the passive features discussed above, manual action is not required in response to flooding in streams and rivers and thus, this section is not applicable to the HNP Focused Evaluation.

7.3 Storm Surge

7.3.1 Description of Flood Impact

For storm surge flooding, the maximum reevaluated flood elevation documented in References 2 and 5 is identified in Table 7.3 on the following page. HNP is situated at a plant grade elevation of 260 ft NGVD29. The crest of the Main Dam and Auxiliary Dam are at 260.0 ft. The APM for this event relative to the site grade and the crest of the Main Dam and Auxiliary Dam is documented in Table 7.3 also. The results of this review indicate that the HNP is protected from flooding due to storm surge.

Table 7.3 Maximum Reevaluated Flood Elevations due to Storm Surge Flooding at Site Grade, the Main Dam, and Auxiliary Dam

Location	Protected Elevation (ft NGVD29)	CDB Flood Elevation (ft NGVD29)	FHRR Flood Elevation (ft NGVD29)	APM (ft)
Main Dam	260.0	-	233.43	26.57
Auxiliary Dam	260.0	256.2	257.85	2.15
Unit 1 Plant Island	260.0	254.9	254.47	5.53

7.3.2 Adequate APM Justification and Reliability of Flood Protection

HNP relies on the permanent passive features, specifically plant grade with a minimum protection level of 260.0 ft NGVD29, to reliably protect the plant from storm surge flooding. The minimum 2.15 ft APM for this event is adequate considering the following justifications:

- The Main and Auxiliary Reservoirs are small inland bodies of water, not subject to storm surge or seiche flooding. Since there is not a large body of water at the site subject to surge or seiche, probable maximum storm surge is taken to mean the effects of wind setup and wave run-up.
- The maximum wind results from a probable maximum hurricane (PMH), which is subject to decay as it moves inland.
- The PMH is assumed to move inland on the most direct path from the Atlantic coast, a distance of 140 miles, and at a maximum forward speed.
- It is assumed that the maximum wind speeds can blow from any direction from which it would generate waves that could affect a safety-related structure.
- The initial reservoir water levels are the maximum controlled water levels and are equal to the spillway crest elevations.

7.3.3 Adequate Overall Site Response

Due to the protection provided by the passive features discussed above, manual action is not required in response to storm surge and thus, this section is not applicable to the HNP Focused Evaluation.

8. Conclusion

In conclusion, SSCs that support HNP's KSFs are protected from the non-bounded reevaluated flood-causing mechanisms by plant grade or permanent, passive features with adequate margin. The site does not require human actions to protect key SSCs so an evaluation of the overall site response was not necessary. This submittal completes the actions related to external flooding required by the March 12, 2012, 10 CFR 50.54(f) letter.