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Ref: 10 CFR 50.54(f)

February 9, 2017

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Director, Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

SUBJECT: Comanche Peak Nuclear Power Plant (CPNPP)
Units 1 and 2, Docket Nos. 50-445 and 50-446
Mitigating Strategies Assessment (MSA) Flood Report
NEI 12-06, Appendix G, Revision 2, G.4.1 Path

REFERENCES:

1. NRC letter, Regarding 10 CFR 50.54(f) Request for Information regarding Recommendation 2.1, dated March 12, 2012 (ML 12053A340).
2. Luminant Letter TXX-13053 from R. Flores to the NRC dated March 12, 2013, Flood Hazard Reevaluation Report (ML13074A058)
3. Luminant Letter TXX-14094 from R. Flores to the NRC dated August 14, 2014, Flood Hazard Reevaluation Report Supplement 1
4. NRC COMSECY-14-0037 Integration of Mitigating Strategies for Reevaluation of Flooding Hazards, dated March 30, 2015 (ML15089A236)
5. NEI 12-06, Rev 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," December 2015 (ML 16005A625)
6. NRC, JLD-ISG-2012-01, Rev 1, Compliance with Order EA-12-049, January 22, 2016 (ML 15357A163)
7. NRC Letter to K. Peters, Interim Staff Response – Flood-Causing Mechanism Reevaluation, dated February 11, 2016, (ML16041A228) (CAC Nos MF1099 and MF1100)
8. Luminant Letter TXX-16015 from K. Peters to the NRC dated February 3, 2016, Additional Information for Flood Hazard Reevaluation Report (ML16041A029)

Dear Sir or Madam:

The purpose of this letter is to transmit the Mitigating Strategies Assessment (MSA) Flooding Report by Vistra Operations Company LLC ("Vistra OpCo") for Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 to determine if the FLEX strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 can be implemented considering the impacts of the reevaluated flooding hazard.

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

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licensees to submit a Flood Hazard Reevaluation Report (FHRR). For CPNPP Units 1 and 2, the FHRR was submitted by on March 12, 2013 (Reference 2) and further developed in response to requests for additional information (Reference 3).

Concurrent to the flood hazard reevaluation, Vistra OpCo developed and implemented mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ML12054A735). In Reference 4, the NRC affirmed that licensees need to address the reevaluated flooding hazards within their mitigating strategies for beyond-design basis external events (BDBEE), including the reevaluated flood hazards. Guidance for performing MSA for Flooding is contained in Appendix G of Reference 5, endorsed by the NRC (with conditions) in Reference 6. For the purpose of the MSA for Flooding, the NRC has termed the reevaluated flood hazard, summarized in Reference 7, as the "Mitigating Strategies Flood Hazard Information" (MSFHI).

In Reference 7, the NRC concluded that the "reevaluated flood hazards information, as summarized in the Enclosure, is suitable for the assessment of mitigating strategies developed in response to Order EA-12-049" for CPNPP Units 1 and 2.

The Attachment to this letter provides the Mitigating Strategies Assessment for Flooding Report for CPNPP Units 1 and 2. The assessment concluded that the existing FLEX strategies can be successfully implemented as designed and without modification when considering the impacts of the MSFHI identified in Reference 7.

The CPNPP response (input parameters and results) to the Mitigating Strategies Assessment required by the NRC 10 CFR 50.54(f) letter Recommendation 2.1 Flooding Hazard Revaluation are not intended to be used in design basis applications or in regulatory activities beyond the scope of performing assessments associated with Near-Term Task Force Recommendation 2.1 “Flooding” (e.g., the MSA and Focused Evaluation). Results of the MSA do not require updates to the applicable design basis sections in the FSAR.

This letter contains no new regulatory commitments and commitment 5220609 (parameters to be used in MSA) previously identified in Reference 8 is now closed.

If you have any questions regarding this submittal, please contact Carl B. Corbin at (254) 897-0121 or carl.corbin@luminant.com.

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

Executed on February 9, 2017.

Sincerely,

Vistra Operations Company LLC

Thomas P. McCool
Site Vice President

Attachment Mitigating Strategies Assessment for Flooding Report
Comanche Peak Nuclear Power Plant, Units 1 and 2

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Mitigating Strategies Assessment for Flooding
Comanche Peak Nuclear Power Plant Units 1 & 2

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Acronyms:

- CPNPP – Comanche Peak Nuclear Power Plant
- DB – Design Basis
- DGFOST – Diesel Generator Fuel Oil Storage Tank
- ELAP – Extended Loss of Alternating Current (AC) Power
- FIP – Final Integrated Plan
- FHRR – Flood Hazards Reevaluation Report
- FLEX DB – FLEX Design Basis (flood hazard)
- LIP – Local Intense Precipitation
- LUHS – Loss of normal access to the Ultimate Heat Sink
- MSA – Mitigating Strategies Assessment
- MSFHI – Mitigating Strategies Flood Hazard Information (from the FHRR and MSFHI letter)
- NGVD29 – National Geodic Vertical Datum of 1929
- PMF – Probable Maximum Flood
- SCR – Squaw Creek Reservoir
- SSI – Safe Shutdown Impoundment
- SWIS – Service Water Intake Structure

Definitions:

- FLEX Design Basis Flood Hazard – the controlling flood parameters used to develop the FLEX flood strategies. For CPNPP, the FLEX Design Basis Flood Hazard is the same as the plant design basis flood hazard.
- MSFHI – the reevaluated flood hazard information developed in response to the NRC's 50.54(f) letter, defined in NEI 12-06 Appendix G

Assessment

1.0 Summary

This assessment was performed in accordance with the guidance provided in Appendix G of NEI 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," (Reference 1). The Comanche Peak Nuclear Power Plant (CPNPP) overall strategy for the storage and deployment of FLEX equipment is unaffected by the Mitigating Strategies Flood Hazard Information (MSFHI) and can be implemented as designed. Details of the FLEX strategies along with evaluation of the impacts of the non-bounded reevaluated flood hazards will be discussed later in this document. The non-bounding reevaluated flood hazards, Local Intense Precipitation (LIP) and Probable Maximum Flood (PMF), do not impact site FLEX capabilities. Therefore, the current FLEX strategies can be deployed fully with no modifications or any additional operator actions required.

2.0 Documentation

2.1. NEI 12-06, Rev. 2, Section G.2 – Characterization of the MSFHI

NRC letter ML16041A228 (Reference 2) provides the reevaluated information MSFHI that is suitable for the assessment of mitigating strategies for CPNPP. Table 2 of the enclosure to Reference 2 describes the reevaluated flood hazards that exceed the current design basis flood hazards. This information is included for reference in Table 1 below. Note that all elevations presented in this MSA are reported in National Geodic Vertical Datum of 1929 (NGVD29), which is essentially equivalent to Mean Sea Level (MSL) as described in the CPNPP FSAR and Reference 13.

Table 1 – Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves / Runup	Reevaluated Hazard Evaluation	Reference
Local Intense Precipitation	810.6 ft NGVD29	Minimal	810.6 ft NGVD29	Letter to the NRC dated September 25,2015, "Comanche Peak Nuclear Power Plant (CCNPP) Docket Nos. 50-445 and 50-446 Submittal of Request for Additional Information Regarding Fukushima Lessons Learned -Flooding Hazard Reanalysis Report", ADAMS Accession No. ML 15278A306 and Letter to the NRC dated February 3, 2016, "Comanche Peak Nuclear Power Plant, Docket Nos. 50-445 and 50-446, Submittal of Request for Additional Information Regarding Fukushima ~ Lessons Learned -Flooding Hazard Reanalysis Report", ADAMS Accession No. ML 16041A029.
Streams and Rivers				
PMF Scenario + wave runup on Cooling [i.e., Circulating] Water Intake Structure Side	792.6 ft NGVD29	2.3 ft	794.9 ft NGVD29	FHRR Supplement 1 Table 3-3
PMF Scenario + Wave runup on Safe Shutdown Impoundment Dam From Squaw Creek Reservoir Side	792.7 ft NGVD29	1.9 ft	794.6 ft NGVD29	FHRR Supplement 1 Table 3-3
PMF Scenario + Wave Runup on Safe Shutdown Impoundment Dam From Safe Shutdown Impoundment Side	792.7 ft NGVD29	1.5 ft	794.2 ft NGVD29	FHRR Supplement 1 Table 3-3
PMF Scenario + Wave runup on Service Water Intake Structure Embankment	792.7 ft NGVD29	0.6 ft	793.3 ft NGVD29	FHRR Supplement 1 Table 3-3
PMF Scenario + Wave runup on Service Water Intake Structure Vertical Face	792.7 ft NGVD29	3.1 ft	795.8 ft NGVD29	FHRR Supplement 1 Table 3-3

2.2. NEI 12-06, Rev. 2, Section G.3 – Comparison of the MSFHI and FLEX DB Flood

PMF and LIP flood hazards exceed the current FLEX Design Basis (DB) floods. All other reevaluated flood hazards are bounded by the FLEX DB flood as described in NRC letter ML16041A228 (Reference 2). The parameters for the non-bounded flood hazards are shown in Tables 2 and 3. The plant Design Basis (DB) and FLEX DB flood levels are the same and are found in CPNPP's Flood Hazard Reevaluation Report (FHRR) as supplemented, hereafter referred to as the FHRR (Reference 3).

Table 2 - Reevaluated PMF Parameters

Flood Scenario Parameter		Plant DB/FLEX DB Flood Hazard	MSFHI	MSFHI Bounded (B) or Not Bounded (NB) by FLEX DB
Flood Level and Associated Effects	1. Max Stillwater Elevation (ft)	790.5	792.7	NB
	2. Max Wave Run-up Elevation (ft)	790.5	795.8	NB
	3. Max Hydrodynamic/Debris Loading	N/A	Minimal	NB
	4. Effects of Sediment Deposition/Erosion	Minimal	Minimal	B
	5. Other Associated Effects	N/A	N/A	B
	6. Concurrent Site Conditions	N/A	N/A	B
	7. Effects on Groundwater	N/A	N/A	B
Flood Event Duration	8. Warning Time (hours)	N/A	N/A	B
	9. Period of Site Preparation (hours)	N/A	N/A	B
	10. Period of Inundation (hours)	N/A	N/A	B
	11. Period of Recession (hours)	N/A	N/A	B
Other	12. Plant Mode of Operations	All	All	B
	13. Other Factors	N/A	N/A	B

Additional Notes pertaining to each Flood Scenario Parameter:

1. Maximum Stillwater elevation at Service Water Intake Structure (SWIS) vertical face.
2. Wave run-up was considered negligible in the plant DB and FLEX DB flood hazard.
3. Hydrodynamic/debris loading is not considered consequential due to the layout of the SWIS structure, Squaw Creek Reservoir (SCR) dam, Safe Shutdown Impoundment (SSI) dam, and SSI equalization channel (Reference 3). See Section 2.3 for further discussion on hydrodynamic/debris loading.
4. Due to the site characteristics described further in this document and in Reference 3, the effects of sediment deposition and erosion to the site are minimal.
5. No additional associated effects were considered.
6. No concurrent site conditions were considered.
7. The PMF does not significantly contribute to groundwater.
8. There is a plant procedure for flood protection, but it does not credit any warning time for PMF.
9. CPNPP does not have any site preparation procedures for flooding.
10. The plant site is not inundated by the FLEX DB or MSFHI PMF.
11. Since the site is not inundated by the PMF, there is no period of recession and the site is in a safe and stable state.
12. The effects of PMF were considered under all Modes of Operation.
13. No other effects were considered.

Table 3 – Reevaluated LIP Parameters

	Flood Scenario Parameter	Plant DB/FLEX DB Flood Hazard	MSFHI	MSFHI Bounded (B) or Not Bounded (NB) by FLEX DB
Flood Level and Associated Effects	1. Max Stillwater Elevation (ft)	N/A	810.6	NB
	2. Max Wave Run-up Elevation (ft)	N/A	N/A	B
	3. Max Hydrodynamic/Debris Loading	N/A	Minimal	NB
	4. Effects of Sediment Deposition/Erosion	N/A	Minimal	NB
	5. Other Associated Effects	N/A	N/A	B
	6. Concurrent Site Conditions	N/A	N/A	B
	7. Effects on Groundwater	793/810 ft	793/810.6 ft	NB
Flood Event Duration	8. Warning Time (hours)	N/A	N/A	B
	9. Period of Site Preparation (hours)	N/A	N/A	B
	10. Period of Inundation (hours)	N/A	6.7 (Turbine Building) 0.4 (Safety Related Buildings)	NB
	11. Period of Recession (hours)	N/A	6.7	NB
Other	12. Plant Mode of Operations	N/A	All	NB
	13. Other Factors	N/A	N/A	B

Additional Notes pertaining to each Flood Scenario Parameter:

1. LIP was not considered in the plant DB or FLEX DB flood hazard. The maximum MSFHI ponding elevation is listed here as the maximum stillwater elevation.
2. The SWIS and SSI dam are the only safety related structures subject to wave action. Wave run-up under PMF conditions is more limiting than wave run-up under LIP conditions. Therefore, the wind-wave activity for the water levels coincident to the PMF is considered bounding for the determination of water levels on the safety related structures (Reference 3).
3. Hydrodynamic loading is not applicable to LIP. No credit is taken for site underground drainage systems due to possible debris blockage of drainage catch basins.
4. Due to the site characteristics described further in this document and in Reference 3, the effects of sediment deposition and erosion to the site are minimal.
5. No additional associated effects were considered.
6. No concurrent site conditions were considered.
7. The FLEX DB considered a groundwater elevation of 793 ft at the SWIS and 810 ft at other plant buildings. It is conservatively assumed that the LIP increases the peak groundwater level to 810.6 ft at other plant buildings. This increase is negligible and well within the design margin provided in the structural integrity analyses. Any potential increase in groundwater at the SWIS due to the MSFHI PMF would also be minimal and within the design margin for the building. Reference 3 concluded that the exterior walls and floors, including penetrations, of Seismic Category I buildings, are acceptable to mitigate the potential effects of groundwater intrusion. Any in-leakage would be minor in nature and well within the margins existing in the design basis internal flooding analysis and the internal flooding

analysis that was performed for LIP.

8. CPNPP does not credit LIP warning time.
9. CPNPP does not have any site preparation procedures for flooding.
10. The maximum duration of inflow into any building entrance is 404 minutes into the Turbine Building equipment ramp, which has a threshold elevation of 809.5 ft (Reference 6). The maximum duration of inflow at door entrances to safety related building areas which have a threshold entrance elevation of 810.5 ft is ≤ 25 minutes (0.4 hrs) (Reference 8).
11. The period of recession describes when flood waters completely recede from the site and the plant continues to be in a safe and stable state that can be maintained indefinitely. CPNPP determined that the LIP has receded and does not impact the site after water intrusion into the buildings stops. Therefore, the time at which water stops entering buildings was used as the period of recession. This corresponds to 6.7 hours for the Turbine Building (Reference 6) and 0.4 hours for safety related buildings which have a threshold entrance elevation of 810.5 ft (Reference 8).
12. The effects of the MSFHI LIP were considered under all Modes of Operation.
13. No other effects were considered.

2.3. NEI 12-06, Rev. 2, Section G.4 - Evaluation of Mitigating Strategies for the MSFHI

2.3.1. NEI 12-06, Rev. 2, Section G.4.1 - Assessment of Current FLEX Strategies

2.3.1.1. Evaluation of Flood Hazards with Exceedance

There is no water intrusion into any plant building caused by the PMF. Internal room flood levels due to water ingress from the LIP were calculated conservatively assuming the plant exterior doors at site grade are open through the duration of the LIP. To determine the impacts of potential water intrusion into plant buildings due to the LIP, an overview of the FLEX strategies and equipment locations was performed and the FLEX equipment elevations were compared to the maximum LIP flood levels. The bottom portions of some electrical cabinets and panels could potentially be wetted, but it was concluded that there is no electrical equipment in the bottom portion of these cabinets and no equipment important to FLEX or any connection points would be adversely impacted by the flooding. To account for any potential increase in the time required to complete an activity due to the presence of ponded water, it was reasonably assumed the water would increase the time required to complete an action that is performed in an area that may be affected by flooding by 20%. The validation has sufficient margin to accommodate for the potential time increases caused by the reevaluated flood hazards and could accommodate for potential increases in time typically by much greater than 20% without adverse impact. The evaluation concluded that the FLEX strategies can be performed as designed given the impact of the MSFHI and no additional flood protection measures or operator actions are required.

The six bulleted items below correspond to those given in NEI 12-06, Rev. 2, Section G.4.1 (Reference 1) for the evaluation of exceeded flood hazards.

- *In the sequence of events for the FLEX strategies, if the reevaluated flood hazard does not cause the ELAP/LUHS, then the time when the ELAP/LUHS is assumed to occur should be specified and a basis provided (e.g., the ELAP/LUHS occurs at the peak of the flood).*

  The reevaluated flood hazard does not cause the Extended Loss of Alternating Current (AC) Power (ELAP)/Loss of normal access to the Ultimate Heat Sink (LUHS) for CPNPP. The reevaluated flood hazard can occur at any time with respect to the ELAP/LUHS without adversely impacting the FLEX strategies.

  Effect from PMF:

  The PMF does not reach any locations critical to performing FLEX strategies, as described in further detail in the following sections. Therefore, the ELAP/LUHS can occur at any time with respect to the PMF with no adverse effects to equipment storage or deployment.

  Effect from LIP:

  The internal flooding analysis was performed assuming all exterior doors located slightly above site grade and the Turbine Building equipment ramp are fully open. This analysis also accounted for any doors which may be opened in response to the event and calculated conservative peak flood levels in affected rooms. Since the flooding analysis assumed the most limiting door configurations, it is applicable with the ELAP/LUHS occurring at any time with respect to the LIP and no equipment or strategies are adversely impacted. Additionally, the debris removal/transportation and any FLEX equipment that must be transported is of sufficient robustness that it will not be adversely impacted by rainfall or ponding. The time validation has significant margin in areas that may be impacted by the LIP to account for an increase in the time required to perform actions in locations that may be affected by rainfall or ponding conditions. Therefore, the ELAP/LUHS can occur at any time with respect to the LIP and the FLEX strategies can still be performed as designed.

- *The impacts of the MSFHI should be used in place of the FLEX DB flood to perform the screening and evaluation per Section 6.*

  The reevaluated flood hazards have no impact on the conclusions reached in the FHRR (Reference 3) or the Final Integrated Plan (FIP) (Reference 4). The protection and deployment of FLEX strategies, procedural interfaces, and considerations in utilizing offsite resources can be performed without modification. No changes to manual operator actions are required.

  Effect from PMF:

  <u>Susceptibility to External Flooding</u>

  The Service Water Intake Structure (SWIS) is the only area of the plant site in which FLEX strategies are performed that is reached by the PMF. The elevation of the operating deck of the SWIS is 796 ft. The elevation of the MSFHI PMF at the vertical face of the SWIS is 792.7 ft stillwater and 795.8 ft including wave runup. As wave runup is a transient condition, the close proximity of the flood water to the operating deck of the SWIS is acceptable and will have no negative effects on FLEX strategies or any connection points at the SWIS. Since the MSFHI PMF does not reach site grade or any elevation at which FLEX strategies are performed, CPNPP remains a "dry" site with respect to the MSFHI PMF. CPNPP utilizes administrative controls from an existing severe weather abnormal procedure to provide flood protection. The impact of the MSFHI PMF on this procedure is described in the last bullet item of this section. The utilization of offsite resources will not be impacted by the MSFHI PMF since it does not reach site grade. It is concluded that protection and deployment of FLEX strategies, procedural interfaces, and considerations in utilizing offsite resources can be performed without modification.

Effect from LIP:

Susceptibility to External Flooding

Under current design basis, CPNPP is considered a "dry" site, meaning that the plant is built above the design basis flood level. The peak MSFHI LIP level is 0.1 ft above the majority of the door thresholds into safety related buildings, so the plant would not be considered "dry" with respect to the beyond design basis MSFHI LIP. Therefore, Section 6.2.2 and 6.2.3 of NEI 12-06 are addressed in accordance with the guidance.

Characterization of the Applicable Flood Hazard

The MSFHI LIP is characterized in Tables 1 and 3 of this document. CPNPP does not credit warning time for the LIP event. The LIP can occur during any Mode of plant operation, and may occur at any time with respect to the ELAP/LUHS without adversely impacting FLEX strategies.

Protection and Deployment of FLEX Strategies

The protection and deployment of FLEX strategies were evaluated given the impacts of the MSFHI LIP. These evaluations determine that water intrusion into plant buildings including any residual ponding adjacent to safety related buildings after peak LIP stillwater levels have receded does not cause any detrimental impact to FLEX equipment, deployment routes, connection points, or staging locations and the strategies can still be performed with sufficient available time margin. The utilization of offsite resources will not be adversely impacted by the LIP because the site access point is approximately one mile away from the power block area at a higher elevation than the power block. Therefore, this location and surrounding areas would not retain enough ponded water to prevent offsite access.

- *The equipment storage guidance of Section 11.3 should be reassessed based on the impacts of the MSFHI.*

  Effect from PMF:

  The MSFHI PMF has no impact on FLEX equipment storage or transportation. The greatest PMF elevation is 795.8 ft at the Service Water Intake Structure vertical face, and the FLEX Equipment Storage Building floor elevation is 810.5 ft. The equipment transportation from the storage area is not affected since the transportation areas are above the PMF elevation, as shown in the topographic data in Rizzo calculation 14-5213 F-05 (Reference 5).

Effect from LIP:

The effects of the LIP do not require any modifications to FLEX equipment storage or transportation. The maximum flood height in the FLEX Equipment Storage Building due to LIP is 0.4 inches (Reference 6). Based on a field walkdown, the only equipment sensitive to water that is stored below 0.4 inches from the ground are battery minders connected to various batteries in the building. The battery minder vendor confirmed that these components may be submerged up to 1 meter of water without damaging the connected batteries as long as the input and output cords are intact (Reference 7). Therefore, there is no negative impact due to water ingress from the LIP on equipment stored inside the FLEX Building.

The LIP is a 6-hour rainfall event, and hydrographs for the catchments around the plant site developed in Reference 8 show that the peak ponding at the plant site occurs within the first hour. CPNPP FLEX strategies were designed based upon the assumption from NEI 12-01 that no site access is available for offsite resources from 0-6 hours following the event and that only minimum staff are available onsite at the beginning of the event, so equipment transportation could begin as late as 6 hours after the event. If the LIP occurs while equipment transportation or deployment haul path debris removal is being implemented, such equipment, due to their construction and robustness, will not be impacted by the rainfall event or developing ponding effects. The time validation for strategies occurring in areas susceptible to flooding has sufficient margin to reasonably account for an increase in the time required to perform activities due to the rainfall event. Thus, the FLEX strategies remain valid and equipment transportation from the FLEX Equipment Storage Building is not affected by the LIP and no changes are required.

- *The impacts of the MSFHI should be used in place of the FLEX DB flood in the consideration of robustness of plant equipment as defined in Appendix A. For determining robustness only the MSFHI should be used as the applicable hazard.*

Plant equipment is still considered robust given the impact of the MSFHI.

Effect from PMF:

The SWIS is the only plant structure important to FLEX strategies that is subjected to the effects of the MSFHI PMF. The peak reevaluated combined events water level of 795.95 ft including wave run-up was determined to have negligible structural impact to the integrity of the SWIS in the FHRR (Reference 3). Therefore, the MSFHI PMF level of 795.8 ft has no detrimental impact to the integrity of the building and it remains robust. From the FHRR, "The south vertical wall of the SWIS represents a partial separation between the SSI main body of water and the Service Water pump intake area. The wall has large openings below the normal SSI pool water elevation to allow water to flow freely into the SWIS pump intake area below the 796 ft operating deck. As such, the elevation of the water on both sides of the wall will be equal. Any hydrodynamic pressure loads would balance out on all sides of the SWIS walls subjected to the SSI PMF elevation (SSI PMF = 792.69 ft from Table 3-3) and have negligible structural impact to the integrity of the SWIS structure."

Debris loading originating from SCR on the SWIS south wall has not been considered due to the location of inflow (equalization channel) of the flood waters into the SSI being located within an inlet, and the direction of the flow in the equalization channel being from the SSI to the SCR for both the river flooding hazard and combined events hazard on the Squaw Creek watershed. Flood waters flowing down Squaw Creek will collect debris in the areas around the SCR dam and not at the equalization channel (Reference 3). Debris loading originating from the SSI on the SWIS south wall is non-impactive and within the design of the SWIS. The SWIS is equipped with two levels of debris barriers located ahead of the water entry through the large submerged openings in the south wall as discussed above. These barriers and supporting structures are designed to Seismic Category I requirements to withstand the effects of natural phenomena and maintain their structural integrity without loss of capability to perform their safety function.

Effect from LIP:

Ponding levels adjacent to plant buildings due to the MSFHI LIP are transient in nature and have a peak elevation of 810.6 ft. Groundwater is accounted for in the existing design basis for plant buildings. The transient ponding due to the LIP may potentially have minor contributions to groundwater hydrostatic loading effects that will be well within the existing structural design margin for plant structures important to FLEX strategies. This is further discussed in the exterior walls and floors section below. Peak transient flood heights internal to the plant building are of insufficient height or energy to cause any detrimental effects to internal or external plant equipment. Thus, plant equipment remains robust given the MSFHI LIP.

- *The impacts of the MSFHI should be used to evaluate the location of connection points in accordance with Section 3.2.2.17.*

The MSFHI does not render any connection points unavailable.

Effect from PMF:

The only structure important to FLEX strategies that is reached by the PMF is the Service Water Intake Structure (SWIS). The elevation of the operating deck of the SWIS is 796 ft. The elevation of the MSFHI PMF at the vertical face of the SWIS is 792.7 ft Stillwater and 795.8 ft including wave runup. As wave runup is a transient condition, the proximity of the flood water to the operating deck of the SWIS is acceptable and will have no negative effects on FLEX strategies or any connection points at the SWIS.

Effect from LIP:

An internal flooding analysis due to the MSFHI LIP determined the maximum flood height in each plant room, conservatively assuming that all of the plant exterior doors located slightly above site grade are open throughout the duration of the rainfall event. The location of all the FLEX equipment and connections inside the plant were evaluated against the room flood heights and it was concluded that no connection points are rendered unavailable due to the LIP. Likewise, connection points to FLEX equipment located outside the plant buildings and their staging locations were evaluated for the 810.6 ft peak LIP ponding height resulting in no impact to the FLEX strategies.

- *Any flood protection features credited in the FLEX strategies meet the performance criteria in Section G.5.*

  All flood protection features at CPNPP are considered passive and are described in the FHRR (Reference 3). The MSFHI does not change the conclusions reached in the FHRR. The flood protection features will perform the intended functions under the MSFHI flooding conditions and meet the performance criteria outlined in Section G.5.

  Passive flood protection features at CPNPP as identified in the FHRR include the SWIS, Safe Shutdown Impoundment (SSI) dam, exterior walls and floors, Seismic Category I roofs, Class 1E cable vaults and manholes, manhole covers, onsite natural drainage, and severe weather abnormal procedures. No new planned flood protection measures were implemented as a result of the FHRR, so this list of flood protection features remains current. The effects of the MSFHI on each flood protection feature are discussed below.

  <u>SWIS</u>

  Effect from PMF:

  FHRR Section 4.3.2 provides reasonable assurance that the SWIS will maintain its function given a combined events PMF with wave run-up level of 795.95 ft. The discussion includes the acceptability of any hydrodynamic or debris loading effects on the SWIS wall, obstruction of the SWIS intake area due to debris, and sedimentation. The MSFHI PMF with wave run-up level is 795.8 ft and is bounded by the discussion in the FHRR. Therefore, the SWIS will perform its function given the MSFHI PMF.

  Effect from LIP:

  According to the current design basis internal flooding analysis for the SWIS, consequential internal flooding of the building cannot occur due to the open grating configuration in the operating deck at elevation 796 ft which routes any flooding directly to the pump intake area below. The SWIS subgrade walls were designed for a groundwater elevation of 793 ft. Any groundwater hydrostatic loading or intrusion attributed to the MSFHI LIP ponding levels which are marginally higher than plant grade would be minute in nature and well within the margin for the design of the structure.

  Technical Requirements Manual Surveillance Requirement (TRS) 13.7.33.2 performs an inspection of sedimentation in the SWIS intake channel which has historically shown minimal deposition of silt and sedimentation within the intake channel area since initial operation of the facility. This can be attributed primarily to an upstream Panther Branch watershed basin having limestone based flow channels with a predominately grassland/ herbaceous type land use not subject to significant erosion characteristics. Additionally, runoff from the plant site into the SSI has limited potential to erode soil particles. The current plant grade was established after excavating to unweathered limestone. Since the plant grade including onsite drainage features and the embankments around the SWIS are covered with an additional surface layer of crushed limestone rock and rip rap and/or concrete, erosion potential including sediment transport and deposition within the SSI is minimal. Therefore, there is reasonable assurance that the SWIS will perform its function given the MSFHI LIP.

SSI Dam

Effect from PMF:

FHRR Section 4.3.2 provides reasonable assurance that the SSI dam, which is a seismically qualified dam with an impervious earthen core and a top of crest elevation of 796 ft, will maintain its structural integrity and UHS design function given a combined events PMF with wave run-up level of 794.75 ft on the Squaw Creek Reservoir (SCR) side of the SSI dam and 794.43 ft on the SSI side of the dam. These combined events PMF levels bound the MSFHI PMF levels including wave run-up of 794.6 ft and 794.2 ft, respectively. Therefore, as discussed in the FHRR, the SSI dam will continue to maintain its structural integrity and perform its function considering the effects of embankment erosion and the potential for debris loading from both the SCR side of the SSI dam and within the SSI given the MSFHI PMF.

Effect from LIP:

The LIP is bounded by the PMF with respect to impact on the SSI dam.

Exterior Walls and Floors (Including Penetrations)

Effect from PMF:

The PMF only reaches elevation of the SWIS, and the impacts to the building have previously been discussed in this section and are acceptable.

Effect from LIP:

Safety-related plant structures except for the SWIS were designed for hydrostatic loads with the design basis ground water level at elevation 810 ft. Assuming an increase in the hydrostatic load attributed to the LIP peak ponding elevation of 810.6 ft, the ground water hydrostatic pressure on the lowest safety related building elevation (being 773 ft) would increase by the ratio of (810.6-810) / (810-773) = 1.6%. This additional stress level (with all other contributing loads unaffected) in the affected walls and floor base mats are negligible and well within the design margin provided in the structural integrity analyses for all applicable exterior building wall and floor base mat structural elements. The increase in the peak elevation of MSFHI LIP from 810.34 ft as discussed in the FHRR to 810.6 ft has insignificant impact on the FHRR discussion of the continued function of the penetration seals. By design for CPNPP and as previously submitted in Reference 11, subgrade penetration seal locations maintain their structural integrity due to groundwater effects but are not credited to be leak tight at full design differential pressure. Any groundwater intrusion due to the MSFHI LIP would be minor and bounded by conservatisms included in the internal flooding evaluation.

Seismic Category I Roofs

Effect from PMF:

The PMF does not impact roof structures and is bounded by the LIP as discussed below.

Effect from LIP:

The SWIS is the only Seismic Category I roof that is an open slab without parapet walls. Any rainfall event regardless of intensity due to the relatively small footprint and slope will provide direct runoff over the side of the SWIS structure with no measurable holdup on the roof. The 6-hour rainfall intensity used to establish the MSFHI LIP is the same as that previously used to assess the roof impacts in the FHRR (Reference 3). Thus, the discussion in the FHRR still applies. The Seismic Category I roofs have sufficient runoff capacity available to maintain resulting loads within the design margins of the roof slabs. Therefore, the Seismic Category I roofs will perform their functions given the MSFHI and not provide a credible propagation pathway into the safety related building areas.

Class 1E Cable Vaults and Manholes

Effect from PMF:

The PMF does not reach site grade and therefore does not impact these components.

Effect from LIP:

Given the MSFHI LIP level of 810.6 ft, some Class 1E cable vaults and manhole covers may become submerged for a short period of time. The manhole covers are equipped with gasket seals that would only allow the potential for minor inleakage into the cable vaults. Electrical raceway/conduit design drawings show that the conduits that provide entry into safety related buildings all slope up from the manhole within sub-grade ductbanks and enter the buildings into the base mat floor slab as embedded conduit. The conduits then stub-out above the safety related building's 810.5 ft floor slab top elevation approximately four additional inches to elevation 810.83 ft. The maximum LIP ponding level is lower than this stub-out, so no water intrusion could occur through the conduit. The Class 1E cables within the vaults were originally purchased to safety related specifications which requires them to be suitable for use in wet or dry locations, indoors or outdoors in cable trays, conduits, or underground ducts. Existing preventative maintenance inspections on a quarterly basis (90 days) establish controls to open the vaults and effectively pump out any collection of standing water to prevent long term submergence of the cables. Thus, there is sufficient assurance that the Class 1E cable vaults and manholes will not provide a credible propagation pathway into the safety related building areas and will function as designed given the MSFHI.

Manhole Covers

Effect from PMF:

The PMF does not reach site grade and therefore does not impact these components.

Effect from LIP:

The Fuel Building Service Water Pipe Tunnel manhole cover is mounted flush with the plant grade at elevation 810 ft. This manhole cover may be temporarily submerged due to the MSFHI LIP. Any water inleakage through the manhole cover would be minor and bounded by the conservatisms in the design basis internal flooding analysis and the internal flooding analysis for the MSFHI LIP. Additionally, all eight of the Diesel Generator Fuel Oil Storage Tank (DGFOST) cover plates are mounted flush with the plant grade. Based on the peak MSFHI LIP ponding elevation, it is anticipated that all of the (DGFOST) cover plates would become submerged for a short amount of time. Given the two sealed boundaries of surface caulking and cover plate gaskets and the relatively small head of water pressure, it is anticipated that any water intrusion for the short period of time exposed to the 6-hour LIP event will be minimal, consistent with the observations and conclusions made in the Recommendation 2.3 flooding walkdowns (Reference 12). There is no credible propagation pathway from within the DGFOST access area below the cover plates to areas within the safety related buildings. The remainder of the discussion in the FHRR of the acceptability of minor water intrusion through the DGFOST cover plates applies for the MSFHI such that the manhole covers perform their intended function.

Refueling of diesel powered equipment will not be required until 30 hours after the event (Reference 9), and the LIP is a 6-hour rainfall event. If, for any reason, the LIP prevents timely access to the DGFOSTs, local offsite resources are available to replenish onsite fuel supplies, as discussed in the FIP (Reference 4).

Onsite Natural Drainage

Effect from PMF:

The PMF does not reach site grade and therefore does not impact onsite natural drainage.

Effect from LIP:

The general assumption made to develop the resultant LIP water levels around the plant site was that varying degrees of hydraulic drainage features were considered blocked. All runoff flow from inter-connecting catchments was attributed to natural drainage and limited availability of open pathways to the SCR or SSI outfalls given the current topography of the plant site. No credit was taken for the underground drainage system or the catch basins that support it. The MSFHI LIP does not have any impact to the onsite natural drainage system. The MSFHI LIP resulted in a peak ponding level that allows some water intrusion into the safety related buildings. This water intrusion was determined to have no impact to FLEX strategies.

The Unit 2 non-safety related Turbine Building has an equipment ramp measured at elevation 809.3 ft. The Unit 2 Turbine Building communicates with the non-safety related Unit 1 Turbine Building and the safety related Electrical and Control Building at elevation 778 ft. Both Unit 1 and Unit 2 Turbine Buildings contain sumps and condenser pits below elevation 778 ft that will retain the total rainfall volume that enters through the Unit 2 Turbine Building equipment ramp. Rainfall volume from the LIP that enters the Unit 2 Turbine Building will first fill up the Unit 2 sump and condenser pit, then will flow over the 778 ft elevation into the Unit 1 Turbine Building and collect in the Unit 1 sump and condenser pit. The 778 ft elevation of the Turbine Buildings will have a minor transient ponded water height while the flood water is flowing into the Unit 1 Turbine Building that could potentially communicate with the 778 ft elevation of the Electrical and Control Building.

The 778 ft elevation of the Electrical and Control Building also experiences flooding due to LIP rainfall volume ingress into other safety related buildings. Any potential transient ponding at the Turbine Building 778 ft elevation that could communicate with the Electrical and Control Building is minor and less than the peak flood height calculated for the Electrical and Control Building. This creates a hydrostatic pressure at the location of the doors that separate the two areas and causes flow underneath the door gaps to be from the Electrical and Control Building to the Turbine Building. Thus, the flooding of the Turbine Building 778 ft elevation does not contribute additional volume to the Electrical and Control Building.

Severe Weather Abnormal Procedures

Effect from PMF:

The Electrical and Control Building is protected from flooding through the use of incorporated barriers in the Circulating Water System. The Circulating Water System is a closed system during plant operation and flood protection is only required when the system is open for maintenance. Existing Severe Weather Abnormal Procedures provide response guidance when the SCR water level increases and the system is open for maintenance. These Abnormal Procedures are based on the plant design basis PMF. The design basis PMF hydrograph can be found in DBD-CS-071 (Reference 10) and the MSFHI PMF hydrograph can be found in Figure 3-10B in the FHRR (Reference 3). While the peak SCR elevation of the MSFHI PMF is greater than that of the design basis PMF, the rate of the rise of the SCR from normal elevation (775 ft) to the elevation which allows water to enter the plant through the breached Circulating Water System (778 ft) is comparable. Therefore, it is reasonable to assume that the Abnormal Procedure for the design basis PMF will also provide flood protection for the MSFHI PMF. Potential clarifications and enhancements for administrative implementation of flood protection actions and the features that protect Seismic Category I structures from the effects of the current licensing basis PMP and PMF were identified. These observations were entered into the Corrective Action Program (CAP).

Effect from LIP:

The Severe Weather Abnormal Procedure serves as a flood protection feature for the PMF event. The LIP has no impact on the robustness of this procedure.

2.3.1.2 Conclusions

The current FLEX strategies can be performed as designed and submitted in CPNPP's Final Integrated Plan (Reference 4) and are not required to be modified due to the MSFHI.

References

1. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Rev. 2
2. NRC Letter from Mr. Victor Hall to Mr. Ken J. Peters, February 11, 2016 (ML16041A228)
3. TXX-14094, "Comanche Peak Nuclear Power Plant (CPNPP), Docket Nos. 50-445 and 50-446 Submittal of Fukushima Lessons Learned - Flood Hazard Reevaluation Report Supplement 1 (TAC NOS. MF1099 and MF1100)," August 14, 2014
4. TXX-16051, "Comanche Peak Nuclear Power Plant, Docket No. 50-445, Compliance with NRC Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond Design-Basis External Events (Order Number EA-12-049) (TAC NOS. MF0860 AND MF0861)," July 28, 2016
5. Vendor Document Review Traveler (VDRT)-5189147, Rizzo calculation 14-5213 F-05, "Local Intense Precipitation Refined Analysis," Rev. 0 (available either on site or via NRC e-portal)
6. VDRT-5368395, Rizzo calculation 15-5561 F-02, "Turbine Building and FLEX Storage Building Inflows," Rev. 1 (available either on site or via NRC e-portal)
7. VDRT-5363679, "Battery Tenders for Emergency Response Equipment" (available either on site or via NRC e-portal)
8. VDRT-5332454, Rizzo calculation 15-5561 F-01, "Scaled Stage Hydrographs," Rev. 0 (available either on site or via NRC e-portal)
9. ER-ME-133, "Beyond Design Basis External Event Mitigation Strategies," Revision 1
10. DBD-CS-071, "Probable Maximum Flood (PMF)," Rev. 12 (available either on site or via NRC e-portal)
11. TXX-14013, "Response to NRC 10CFR50.54(F) RAI on NTTF Recommendation 2.3 Flooding Available Physical Margin Assessments," January 30, 2014
12. TXX-12177, "180-Day Response to NRC Request for Information Pursuant to 10CFR50.54(F) Regarding the Flooding Aspects of Recommendation 2.3 of the NTTF review of Insights from Fukushima Dai-Ichi Accident," November 27, 2012