



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

February 12, 2018

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - FLOOD HAZARD  
MITIGATION STRATEGIES ASSESSMENT (CAC NO. MF7927;  
EPID L-2016-JLD-0007)

Dear Mr. Hanson:

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, under Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses (ADAMS Accession No. ML12056A046). Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement 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" (ADAMS Accession No. ML12054A735). In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

By letter dated July 27, 2017 (ADAMS Accession No. ML17208B062), Exelon Generation Company, LLC (the licensee) submitted the mitigation strategies assessment (MSA) for the James A. FitzPatrick Nuclear Power Plant (FitzPatrick). The MSAs are intended to confirm that licensees have adequately addressed the reevaluated flooding hazard(s) within their mitigating strategies for beyond-design-basis external events. The purpose of this letter is to provide the NRC's assessment of the FitzPatrick MSA.

The NRC staff has concluded that the FitzPatrick MSA was performed consistent with the guidance described in Appendix G of Nuclear Energy Institute 12-06, Revision 2, as endorsed by Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01,


B. Hanson

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Revision 1 and that the licensee has demonstrated that the mitigation strategies, if appropriately implemented, are reasonably protected from reevaluated flood hazards conditions for beyond-design-basis external events. This closes out the NRC's efforts associated with CAC No. MF7927.

If you have any questions, please contact me at 301-415-1132 or by e-mail at [Joseph.Sebrosky@nrc.gov](mailto:Joseph.Sebrosky@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Joseph M. Sebrosky", written over a large, stylized circular flourish.

Joseph M. Sebrosky, Senior Project Manager  
Beyond-Design-Basis Management Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Enclosure:  
Staff Assessment Related to the  
Mitigating Strategies for FitzPatrick

Docket No: 50-333

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT RELATED TO THE  
MITIGATION STRATEGIES FOR  
JAMES A. FITZPATRICK NUCLEAR POWER PLANT  
AS A RESULT OF THE REEVALUATED FLOODING HAZARDS REPORT  
NEAR-TERM TASK FORCE RECOMMENDATION 2.1- FLOODING  
CAC NO. MF7927

1.0 INTRODUCTION

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, under Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807). Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses (ADAMS Accession No. ML12056A046).

Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement 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" (ADAMS Accession No. ML12054A735). That order requires holders of operating reactor licenses and construction permits issued under 10 CFR Part 50 to modify the plants to provide additional capabilities and defense-in-depth for responding to beyond-design-basis external events. In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

The NRC staff and industry recognized the difficulty in developing and implementing mitigating strategies before completing the reevaluation of flood hazards. The NRC staff described this issue and provided recommendations to the Commission on integrating these related activities in COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flood Hazards," dated November 21, 2014 (ADAMS Accession No. ML14309A256). The Commission issued a staff requirements memorandum (SRM) on March 30, 2015 (ADAMS Accession No. ML15089A236), affirming that the Commission expects licensees for operating nuclear power plants to address the reevaluated flood hazards, which are considered beyond-design-basis external events, within their mitigating strategies.

Nuclear Energy Institute (NEI) 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16005A625), has been endorsed by the NRC as an appropriate methodology for licensees to perform assessments of the mitigating

strategies against the reevaluated flood hazards developed in response to the March 12, 2012, 50.54(f) letter. The guidance in NEI 12-06, Revision 2, and Appendix G in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. The NRC's endorsement of NEI 12-06, including exceptions, clarifications, and additions, is described in NRC Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML15357A163). Therefore, Appendix G of NEI 12-06, Revision 2, as endorsed, describes acceptable methods for demonstrating that the reevaluated flooding hazard is addressed within the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) mitigating strategies for beyond-design-basis external events.

## 2.0 BACKGROUND

By letter dated September 4, 2015 (ADAMS Accession No. ML15238B540), the NRC issued an interim staff response (ISR) letter for FitzPatrick. The ISR letter provided the reevaluated flood hazards that exceeded the current design basis (CDB) for FitzPatrick and were suitable input for the mitigating strategies assessment (MSA) (i.e., the mitigating strategies flood hazard information (MSFHI) described in NEI guidance document NEI 12-06). For FitzPatrick, the mechanisms listed as not bounded by the CDB in the letter (ISR flood levels) are listed below:

- Local intense precipitation (LIP) – the ISR flood level is higher than the CDB level;
- Flooding in streams and rivers – the probable maximum flood (PMF) height ISR flood level exceeded the CDB;
- Storm surge – the ISR flood level for a combined event coincident with the probable maximum storm surge exceeded the CDB.

By letter dated July 27, 2017 (ADAMS Accession No. ML17208B062), Exelon Generation Company, LLC (Exelon, the licensee) submitted the MSA for FitzPatrick. The MSA is intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events.

At FitzPatrick the licensee considered LIP, flooding in streams and rivers, and storm surge mechanisms provided in the ISR letter in the FLEX design-basis. Based on a comparison between ISR letter flood levels and the FLEX design-basis the licensee concluded that no changes to the FLEX strategy were identified.

The ISR letter also stated that NRC staff would evaluate, as applicable, the flood event duration (FED) parameters (including warning time and period of inundation) and flood-related associated effects developed by the licensee during the NRC staff's review of the MSA. This is consistent with the guidance provided in Revision 2 of NEI 12-06. Relevant information regarding the flood event duration parameters and associated effects was submitted in the MSA.

## 3.0 TECHNICAL EVALUATION

### 3.1 Mitigating Strategies under Order EA-12-049

The NRC staff evaluated the FitzPatrick strategies as developed and implemented under Order EA-12-049, as described in the Final Integrated Plan (FIP) submitted by the licensee in a letter dated August 29, 2017 (ADAMS Accession No. ML17241A248). The NRC staff's safety evaluation is dated December 18, 2017 (ADAMS Accession No. ML17342A006). The safety

evaluation concluded that the licensee has developed guidance and proposed designs that, if implemented appropriately, will adequately address the requirements of Order EA-12-049.

A brief summary of FitzPatrick's FLEX strategies are listed below:

- For Phase 1, the reactor core isolation cooling (RCIC) system injects cooling water into the reactor pressure vessel (RPV). The condensate storage tanks (CSTs) are the initial supply for the RCIC system. Pressure control of the RPV is accomplished using the pneumatically-operated safety relief valves (SRVs). The station batteries and the Class 1E 125 volts direct current distribution system provide power to RCIC components and instrumentation. FLEX load shedding is completed 90 minutes into the event. The load shedding will extend the battery capacity to power the Phase I systems and instrumentation up to 9.5 hours and allow time for the FLEX diesel generator (DG) to be deployed.
- For Phase 2, core cooling is transitioned from RCIC to one of two plant diesel-driven fire pumps (DDFP) with suction from the ultimate heat sink (UHS) prior to depletion of the CSTs, which occurs by 22 hours after the initiation of the ELAP [extended loss of alternating current power] event. Installation of temporary pipe adapters and fire hoses, combined with completion of local valve alignments enables either one of the plant DDFPs to inject water into the reactor pressure vessel (RPV). The primary electrical strategy is to connect the pre-staged 600 Volts alternating current (Vac) FLEX diesel generator (located in the "N" FLEX equipment storage building (FESB)) to the Division I electrical distribution system. The 600 Vac FLEX DG is connected to a safety-related, seismic Category I motor control center (MCC).

The FLEX equipment is stored in two structures primarily to ensure sufficient ("N") FLEX equipment availability following a tornado events by providing separation. The licensee refers to the two structures as the "N" FLEX Equipment Storage Buildings (FESB) and the "N+1" FESB. The "N" FESB is located within the protected area close to the deployment locations of the equipment and the "N+1" FESB is located outside the protected area. The "N+1" FESB is located across Lake Road from the main FitzPatrick power block buildings, near the site wellness center, on owner-controlled property.

- For Phase 3, equipment from the National SAFER [Strategic Alliance of FLEX Emergency Response] Response Center (NSRC) will be transported to on site to continue Phase 2 strategies.

### 3.2 Evaluation of Current FLEX Strategies

By letter dated July 27, 2017, the licensee submitted its MSA for FitzPatrick. The MSA is intended to confirm that licensees have adequately addressed the reevaluated flooding hazard(s) within their mitigating strategies for beyond-design-basis external events.

#### Local Intense Precipitation and Flooding in Streams and Rivers

The licensee indicated in its MSA that the FLEX design-basis flood is primarily based on the plant's CDB flood, but also incorporates information found in the licensee's flooding hazard reevaluation report (FHRR) dated March 12, 2015 (ADAMS Accession No. ML15082A250). The March 12, 2015, values for LIP and flooding in streams and rivers are consistent with the values the staff provided the license in the ISR letter dated September 4, 2015. The licensee's FHRR letter describes the LIP and the streams and rivers PMF as being the flooding events that cause inundation on the FitzPatrick site near structures, systems, and components (SSCs) important to safety. Both the FHRR and the staff's ISR letter provide maximum values of

272.8 feet (ft.) United States Lake Survey Datum 1935 (USLS 35) for both LIP and flooding in streams and rivers PMF. As noted in the licensee's FHRR dated March 12, 2015, the site grade is approximately 272 ft. USLS 35.

The licensee stated in its MSA that the LIP and the streams and rivers PMF maximum stillwater elevation were considered when determining the outdoor FLEX storage areas and FLEX equipment deployment paths through the site. The licensee explained that the debris, hydrodynamic, and hydrostatic loads are considered negligible when based on the low flow velocity and water depths produced by the LIP and PMF events. The licensee concludes in its MSA that the FLEX design-basis flood hazard is 272.8 ft. USLS 35, such that the FLEX strategies can be implemented in accordance with Section G.3 of NEI 12-06, Revision 2. The licensee notes in its MSA that the LIP and streams and rivers PMF flood mechanisms can cause certain areas along the deployment path from the "N+1" storage building to become inundated. The equipment stored in the "N+1" storage building is not the primary equipment for a flood induced beyond-design-basis event. The primary storage location for a full "N" set of equipment is protected and deployable after an LIP or streams and rivers PMF event. The licensee concludes that the FLEX strategies relying on equipment from the "N" FESB are not affected by the LIP or PMF event and can be implemented successfully.

Section 2.7 of the licensee's August 29, 2017, FIP provides additional information regarding implementation of FLEX strategies for a LIP or streams and river PMF event. This section documents the licensee's evaluation and conclusion that plant equipment credited in the FLEX strategy, (i.e., switchgear, DDFP, fire protection connection points in the screenwell house, and Reactor Building hose connection points) were evaluated and it was determined that they are sufficiently elevated such they will not be affected under the flood elevation found in the FHRR and ISR letters associated with a LIP or streams and rivers PMF. In addition, the licensee evaluated the ability to implement FLEX strategy using the "N" FESB. This evaluation noted that the top of the concrete elevation for both FESBs are above the LIP and streams and river PMF elevations. Therefore, equipment in both locations are protected from these events.

The licensee noted that the FLEX haul path from the "N" FESB could experience about 1.2 inches of water. The licensee concluded that because equipment deployed from the "N" FESB location is small, manually deployed on carts and relatively light weight, there should not be an impediment to implementing this portion of the FLEX strategies under LIP or PMF conditions. The licensee also noted that the cables from the "N" 600 Vac FLEX DG (located inside the "N" FESB) are routed on the ground. However, these cables are designed to be used in wet conditions and submergence in the ponded water will not have an impact on the cables.

The staff finds the analysis associated with implementing the FLEX strategies under conditions associated with a LIP or streams and rivers PMF event found in the licensee's letters dated August 29, 2017, and July 27, 2017, to be based on reasonable assumptions. The staff concludes that this analysis is consistent with the guidance found in Section G.3 of NEI 12-06, Revision 2 for evaluating the ability to implement FLEX strategies during a flood height found in the ISR that is not bounded by the CDB.

### Storm Surge

The licensee noted in its MSA that the ISR level associated with storm surge is 4 feet below plant grade and as a result the SSCs important to safety and the FLEX strategy at FitzPatrick are not impacted. The licensee also noted that after the issuance of the its March 12, 2015, FHRR the International Joint Commission (IJC) issued new orders and directions for controlling the discharge of waters from Lake Ontario and the St. Lawrence River. The result is an increase of 1 ft. in the stillwater elevation such that the ISR level associated with storm surge is

3 ft. below plant grade using conservative assumptions. The licensee concludes that the storm surge margin continues to be adequate under the new IJC orders.

Because the storm surge event does not inundate the site, the staff finds the licensee's conclusions that the FLEX strategies can be implemented under conditions associated with a storm surge to be reasonable and in accordance with the guidance found in Section G.3 of NEI 12-06, Revision 2.

### 3.2.1 Evaluation of Flood Event Duration

The staff reviewed information provided by the licensee in its July 27, 2017, letter regarding the FED parameters needed to perform the MSA for flood hazards not bounded by the CDB at FitzPatrick. The FED parameters for the flood-causing mechanisms not bounded by the CDB are summarized in Table 3.2.1-1.

The licensee stated in its MSA that three flood-causing mechanisms, including LIP, stream and river PMF, and storm surge (a combined effects flood scenario "PMSS [probable maximum storm surge]+PMP [probable maximum precipitation]+Waves") produce site inundation and/or flood elevations higher than the respective CDB. The staff determined that the licensee's selection of the three bounding flood-causing mechanism for the MSA is reasonable as this approach follows the guideline provided by Appendix G of NEI 12-06, Revision 2 for assessing flooding impacts at the site.

#### 3.2.1.1 Local Intense Precipitation Flood Event Durations

For the LIP flood-causing mechanism, the licensee reported in its MSA letter that a flood warning time is not credited or necessary for the FLEX strategy because it can be implemented following a LIP-induced flooding event. The staff notes that the licensee also has the option to use NEI 15-05, "Warning Time for Local Intense Precipitation Events," Revision 6, April 8, 2015 (ADAMS Accession No. ML18005A076), to estimate warning time for LIP.

The licensee reported in its MSA letter that, for the LIP flood-causing mechanism, the period of inundation is less than 9 hours for doors and less than 20 hours for the plant. The licensee states that the LIP recession time is provided in the March 12, 2015, FHRR and that no adverse impact to the FLEX strategies are noted in the MSA. The licensee used results from a 2-dimensional numerical model to determine these FED parameters as described in the FHRR. The staff confirmed that the licensee's reevaluation of the FED parameters for LIP uses present-day methodologies and regulatory guidance. Based on this review, the staff determined that the licensee's FED parameters for the LIP flood-causing mechanism are reasonable for use in the MSA.

#### 3.2.1.2 Unnamed Stream Probable Maximum Flood - Flood Event Durations

For the streams and rivers flood-causing mechanism, the licensee reported in its MSA letter that a warning time is not credited or necessary for the FLEX strategy because it can be implemented following a PMF event. The staff determined that this approach is consistent with guidance provided by NEI 15-05 and Appendix G of NEI 12-06, Revision 2.

The licensee reported in its MSA letter that, for the streams and rivers flood-causing mechanism, the periods of inundation is less than or equal to 5.5 hours for doors, and 49.5 hours for the PMF event. In its FHRR, the licensee stated that inundation periods of 49.5 hours may be the result of localized topographic low areas with no drainage mechanism (i.e. storm drains, culverts, infiltration, etc.) included in the model analysis. The licensee states that the streams and rivers PMF recession time is provided in the FHRR and that no adverse impact to

SSCs are noted in the MSA. The licensee relied on the U.S. Army Corps of Engineers' (USACE) Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) and FLO-2D computer codes to estimate the flooding elevations, as well as FED parameters. Based on its review of the licensee-provided HEC-RAS model, the staff determined that the licensee's modeling is reasonable and the reported FED parameters for this flood-causing mechanism are reasonable.

### 3.2.1.3 Storm Surge Flood Event Durations

For the storm surge flood-causing mechanism, the license reported in its MSA letter that flood duration parameters are not pertinent to the evaluation of the FLEX strategy because the flood hazard elevation is 4 ft. below the general site grade and therefore SSCs important to safety are not impacted for this mechanism. The staff determined that this approach is consistent with guidance provided by NEI 15-05 and Appendix G of NEI 12-06, Revision 2.

### 3.2.1.4 Conclusions

In summary, the staff determined that the licensee-provided FED parameters for the LIP, stream and river PMF and storm surge flood-causing mechanisms are reasonable for use in the MSA.

### 3.2.1.5 Effect on Mitigating Strategies

As discussed above, the FED can impact the ability to deploy FLEX equipment from the "N+1" FESB, but it does not impact the implementation of FLEX strategies using FLEX equipment and connections within the plant and the use of equipment in the "N" FESB. Based on the ability to employ the FLEX strategies using the equipment in the "N" FESB the staff concludes that FLEX strategies can be implemented in accordance with Section G.3 of NEI 12-06, Revision 2 under the FED parameters assumed in their MSA.

## 3.2.2 Evaluation of Flood Associated Effects

The staff reviewed the information provided by the licensee in the MSA regarding associated effects (AE) parameters for flood hazards not bounded by the CDB. The AE parameters related to water surface elevation (i.e., stillwater elevation with wind waves and runup effects) were previously reviewed by staff, and were transmitted to the licensee via the ISR Letter dated September 4, 2015. The AE parameters not directly associated with water surface elevation are discussed below and are summarized in Table 3.2.2-1.

As discussed in the previous subsection, the licensee selected the LIP, streams and rivers and storm surge flood-causing mechanisms as bounding events for use in the MSA. Therefore, the staff's review of the AE parameters discusses only these three bounding flood-causing mechanisms.

### 3.2.2.1 Local Intense Precipitation Associated Effects

For the LIP flood-causing mechanism, the licensee stated in its MSA that AEs for hydrodynamic loading and sediment erosion and deposition are considered minimal or not applicable due to the relatively slow water LIP velocities. Wave action associated with LIP was not considered to be credibly associated with LIP. The staff confirmed this statement by reviewing the licensee-provided LIP model input and output files. The staff found that the licensee-estimated inundation depths and water velocities are acceptable and that the modeling is reasonable for use in the MSA. The staff agrees with the licensee's conclusion that the AE parameters for the LIP flood-causing mechanism are either minimal or not applicable to the safety-related plant structures. Hydrodynamic loading was not quantitatively evaluated based on low velocities



associated with the LIP flooding hazards. Erosion and subsequent deposition were not evaluated and not anticipated to be significant based on low velocities.

### 3.2.2.2 Unnamed Stream Probable Maximum Flood Associated Effects

For the streams and rivers flood-causing mechanism, the licensee stated in its MSA letter that hydrodynamic loading will be low (minimal) as a maximum flow velocity is low. The licensee did not specifically state in its MSA that debris loading would be similarly low due to the maximum flow velocity. In its FHRR, the licensee stated that the debris loading was not considered a credible hazard due to the relatively low velocities and shallow depths, which reduces the possibility of large debris loadings. Based on its review of the MSA and FHRR submittals, modeling, topographic maps, and setting of the plant facility, the staff determined that the AE parameters for streams and rivers flood-causing mechanism are minimal.

### 3.2.2.3 Storm Surge Associated Effects

For the storm surge flood-causing mechanism, the licensee stated in its MSA letter that AEs are not pertinent to the evaluation of the FLEX strategy, because the flood hazard elevation is 4 ft. below the general site grade under the conditions assumed in the FHRR and is still below grade using conservative assumptions based on the recent IJC orders change, and therefore SSCs important to safety are not impacted for this mechanism.

### 3.2.2.4 Conclusions

In summary, the staff determined that the licensee's methods are appropriate and that the licensee-provided AE parameters for the LIP and the streams and rivers flood-causing mechanisms are reasonable for use in the MSA. These AE parameters are bounding values for these flood-causing mechanisms.

### 3.2.2.5 Effect on Mitigating Strategies

Based on the fact that AEs for the LIP and streams and rivers PMF are minimal the staff finds that the FLEX strategies can be employed under the assumed AE conditions using FLEX equipment and connections within the plant and using equipment in the "N" FESB. Therefore, the staff concludes that FLEX strategies can be implemented in accordance with Section G.3 of NEI 12-06, Revision 2 under the AE parameters assumed in their MSA.

## 4.0 CONCLUSION

The NRC staff has reviewed the information provided in the FitzPatrick MSA related to the original FLEX strategies, as evaluated against the reevaluated hazards described in Section 2 of this staff assessment, and found that for the LIP flood hazard, streams and rivers PMF, and the storm surge:

- the sequence of events for the FLEX strategies is not affected by the impacts of the MSFHI (including impacts due to the environmental conditions created by the MSFHI) in such a way that the FLEX strategies cannot be implemented as currently developed, and
- the validation performed for the deployment of the FLEX strategies is not affected by the impacts of the MSFHI.

Therefore, the NRC staff concludes that the licensee has demonstrated the capability to deploy the original FLEX strategies, as designed, against a postulated beyond-design-basis event for the LIP, stream and river PMF, and storm surge flood-causing mechanisms, including AEs and

FED, as requested in the COMSECY-14-0037, and affirmed in the corresponding SRM. The NRC staff has reviewed the information presented in the MSA by Exelon for FitzPatrick. The NRC staff confirmed that the licensee's flood hazard MSA was performed consistent with the guidance in Appendix G of NEI 12-06, Revision 2, as endorsed by JLD-ISG-2012-01, Revision 1. Based on the licensee's appropriate hazard characterization, methodology used in the MSA evaluation, and the description of its current FLEX strategy; the staff concludes that the licensee has demonstrated that the mitigation strategies, if appropriately implemented, are reasonably protected from reevaluated flood hazard conditions.

**Table 3.2.1-1. Flood Event Durations for Flood-Causing Mechanisms Not Bounded by the CDB**

<b>Flood-Causing Mechanism</b>	<b>Time Available for Preparation for Flood Event</b>	<b>Duration of Inundation of Site</b>	<b>Time for Water to Recede from Site</b>
Local Intense Precipitation and Associated Drainage <sup>(1)</sup>	None credited	<9.0-h for doors, 20-h for plant	Variable (FHRR <sup>(3)</sup> , Appendix A)
Streams and Rivers PMF <sup>(1)</sup>	None credited	< 5.5-h for doors, 49.5-h for this event	Variable (FHRR, Appendix B)
Storm Surge <sup>(2)</sup>	Not applicable	Not applicable	Not applicable

Notes:

<sup>1</sup> From Exelon letter dated July 27, 2017 (ADAMS Accession No. ML17208B062).

<sup>2</sup> The licensee stated in its July 27, 2017, letter that FED parameters are not applicable because the storm surge flood hazard (including wave effects) is several feet below site grade.

<sup>3</sup> The licensee's FHRR is dated March 12, 2015 (ADAMS Accession No. ML15082A250).

**TABLE 3.2.2-1. ASSOCIATED EFFECTS PARAMETERS NOT DIRECTLY ASSOCIATED WITH TOTAL WATER HEIGHT FOR FLOOD-CAUSING MECHANISMS NOT BOUNDED BY THE CDB**

Associated Effects Factor	Flood-causing Mechanism		
	Local Intense Precipitation <sup>(1)</sup>	Streams and Rivers <sup>(2)</sup>	Storm Surge <sup>(3)</sup>
Hydrodynamic loading at plant grade	No impact on the site identified	No impact on the site identified	Not applicable
Debris loading at plant grade	No impact on the site identified	No impact on the site identified	Not applicable
Sediment loading at plant grade	No impact on the site identified	No impact at critical plant structures identified	Not applicable
Sediment deposition and erosion	No impact on the site identified	No impact at critical plant structures identified	Not applicable
Concurrent conditions, including adverse weather	None considered	No impact from 40-percent PMP identified	Not applicable
Groundwater ingress	Minimal	Minimal	Not applicable
Other pertinent factors (e.g., waterborne projectiles)	None noted	None noted	Not applicable

Note:

<sup>1</sup>The licensee stated in its July 27, 2017, letter (ADAMS Accession No. ML17208B062), that hydrodynamic/debris loading was not quantified based on flow velocities be insufficient to create significant loading and the sediment loading near critical plant structures were below USACE standards for paved surfaces.

<sup>2</sup>The licensee stated in its July 27, 2017, letter that hydrodynamic/debris loading was not quantified based on flow velocities being insufficient to create significant loading and the sediment loading near critical plant structures were below USACE standards for paved surfaces.

<sup>3</sup> The licensee stated in its July 27, 2017, letter that AE parameters are not applicable because the storm surge flood hazard (including wave effects) is several feet below site grade.

**JAMES A. FITZPATRICK NUCLEAR POWER PLANT - FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT February 12, 2018**

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**ADAMS Accession No. ML18019A269**

\*via email

OFFICE	NRR/DLP/PBMB/PM	NRR/DLP/PBMB/LA	NRR/DLP/PBMB/PM	NRR/DLP/PBEB
NAME	JSebrosky	SLent	PBamford	GArmstrong*
DATE	2/1/18	1/19/18	2/1/18	1/19/18
OFFICE	NRO/DSEA/RHM/BC*	NRR/DLP/PBMB/BC(A)	NRR/DLP/PBMB/PM	
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