



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

April 16, 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 – STAFF ASSESSMENT  
OF FLOODING FOCUSED EVALUATION (CAC NO. MG0022; EPID  
L-2017-JLD-0028)

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 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). By letter dated March 12, 2015 (ADAMS Accession No. ML15082A250), the licensee<sup>1</sup> responded to this request for James A. FitzPatrick Nuclear Power Plant (FitzPatrick).

On 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 hazard mechanisms that exceeded the current design basis (CDB) for FitzPatrick and parameters that are a suitable input for the mitigating strategies assessment (MSA). As stated in the letter, because the local intense precipitation (LIP), streams and rivers, and storm surge flood-causing mechanisms at FitzPatrick are not bounded by the plant’s CDB, additional assessments of the flood hazard mechanisms are necessary.

By letter dated July 27, 2017 (ADAMS Accession No. ML17208B063), the licensee submitted the focused evaluation (FE) for FitzPatrick. The FEs are intended to confirm that licensees have adequately demonstrated, for unbounded mechanisms identified in the ISR letter, that:

- 1) a flood mechanism is bounded based on a reevaluation of flood mechanism parameters;
- 2) effective flood protection is provided for the unbounded mechanism; or
- 3) a feasible response

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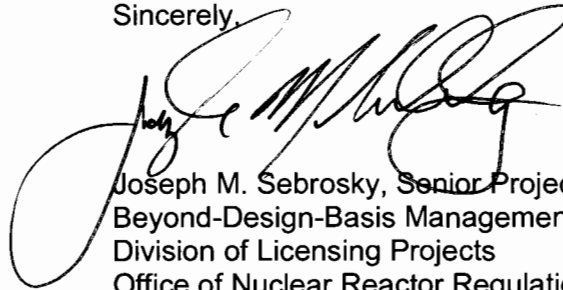
<sup>1</sup> By letter dated March 31, 2017 (ADAMS Accession No. ML17082A283), the NRC staff issued a license amendment reflecting the transfer of the FitzPatrick operating license from Entergy to Exelon Generation Company, LLC (the licensee). References to “the licensee” are to the entity holding the license at the time of the reference.

is provided if the unbounded mechanism is LIP. The purpose of this letter is to provide the NRC's assessment of the FitzPatrick FE.

The NRC staff concludes that the FitzPatrick FE was performed consistent with the guidance described in Nuclear Energy Institute (NEI) 16-05, Revision 1, "External Flooding Assessment Guidelines" (ADAMS Accession No. ML16165A178). Guidance document NEI 16-05, Revision 1, has been endorsed by Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2016-01, "Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flood Hazard Reevaluation" (ADAMS Accession No. ML16162A301). The staff has further concluded that the licensee has demonstrated that effective flood protection exists for the LIP, streams and rivers, and storm surge flood mechanisms during a beyond-design-basis external flooding event at FitzPatrick. This closes out the NRC's efforts associated with CAC No. MG0022.

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 loop.

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  
Flooding Focused Evaluation for FitzPatrick

Docket No. 50-333

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO THE FOCUSED EVALUATION FOR  
JAMES A. FITZPATRICK NUCLEAR POWER PLANT  
AS A RESULT OF THE REEVALUATED FLOODING HAZARD NEAR-TERM TASK FORCE  
RECOMMENDATION 2.1 - FLOODING  
(CAC NO. MG0022)

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 report (ADAMS Accession No. ML111861807).

Enclosure 2 of the 50.54(f) letter requested that licensees reevaluate flood hazards for their respective 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). If the reevaluated hazard for any flood-causing mechanism is not bounded by the plant's current design basis (CDB) flood hazard, an additional assessment of plant response would be necessary. Specifically, the 50.54(f) letter stated that an integrated assessment should be submitted, and described the information that the integrated assessment should contain. On November 30, 2012 (ADAMS Accession No. ML12311A214), the NRC staff issued Japan Lessons-Learned Project Directorate (JLD) interim staff guidance (ISG) JLD-ISG-2012-05, "Guidance for Performing the Integrated Assessment for External Flooding."

On June 30, 2015 (ADAMS Accession No. ML15153A104), the NRC staff issued COMSECY-15-0019, describing the closure plan for the reevaluation of flooding hazards for operating nuclear power plants. The Commission approved the closure plan on July 28, 2015 (ADAMS Accession No. ML15209A682). COMSECY-15-0019 outlines a revised process for addressing cases in which the reevaluated flood hazard is not bounded by the plant's CDB. The revised process describes a graded approach in which licensees with hazards exceeding their CDB flood will not be required to complete an integrated assessment, but instead will perform a focused evaluation (FE). As part of the FE, licensees will assess the impact of the hazard(s) on their site and then evaluate and implement any necessary programmatic, procedural, or plant modifications to address the hazard exceedance.

Nuclear Energy Institute (NEI) 16-05, Revision 1, "External Flooding Assessment Guidelines" (ADAMS Accession No. ML16165A178), has been endorsed by the NRC as an appropriate methodology for licensees to perform the FE in response to the 50.54(f) letter. The NRC's endorsement of NEI 16-05, including exceptions, clarifications, and additions, is described in NRC JLD-ISG-2016-01, "Guidance for Activities Related to Near-Term Task Force

Recommendation 2.1, Flood Hazard Reevaluation” (ADAMS Accession No. ML16162A301). Therefore, NEI 16-05, Revision 1, as endorsed, describes acceptable methods for demonstrating that James A. FitzPatrick Nuclear Power Plant (FitzPatrick) has effective flood protection.

## 2.0 BACKGROUND

This NRC staff assessment is the last staff assessment associated with the information that the licensee<sup>1</sup> provided in response to the reevaluated flooding hazard portion of the 50.54(f) letter. Therefore, the background section includes a discussion of the reevaluated flood information provided by the licensee and the associated staff assessments. The reevaluated flood information includes: 1) the flood hazard reevaluation report (FHRR); 2) the mitigation strategies assessment (MSA); and 3) the FE.

### Flood Hazard Reevaluation Report

By letter dated March 12, 2015 (ADAMS Accession No. ML15082A250), the licensee responded to the 50.54(f) request for FitzPatrick and submitted the FHRR. After the review of the licensee’s response, 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 hazard mechanisms that exceed the CDB for FitzPatrick and parameters that are a suitable input for the MSA. As stated in the letter, because the local intense precipitation (LIP), streams and rivers, and storm surge flood-causing mechanisms at FitzPatrick are not bounded by the plant’s CDB, additional assessments of the flood hazard mechanisms were necessary. The NRC staff issued a final staff assessment of the FHRR by letter dated March 27, 2017 (ADAMS Accession No. ML17067A469). The NRC staff’s conclusion regarding LIP, streams and rivers, and storm surge flood-causing mechanisms exceeding the CDB remained unchanged from the information in the ISR letter.

### Mitigation Strategies Assessment

By letter dated July 27, 2017 (ADAMS Accession No. ML17208B062), the licensee submitted the MSA for FitzPatrick for review by the NRC staff. The MSAs are intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigation strategies for beyond-design-basis external events. By letter dated February 12, 2018 (ADAMS Accession No. ML18019A269), the NRC issued its assessment of the FitzPatrick MSA. The NRC staff concluded that the FitzPatrick MSA was performed consistent with the guidance described in Appendix G of NEI 12-06, Revision 2, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide” (ADAMS Accession No. ML16005A625). The NRC’s endorsement of NEI 12-06, Revision 2, is described in 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). The NRC staff further concluded 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.

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<sup>1</sup> By letter dated March 31, 2017 (ADAMS Accession No. ML17082A283), the NRC staff issued a license amendment reflecting the transfer of the FitzPatrick operating license from Entergy to Exelon Generation Company, LLC (the licensee). References to “the licensee” are to the entity holding the license at the time of the reference.

## Focused Evaluation

By letter dated July 27, 2017 (ADAMS Accession No. ML17208B063), the licensee submitted the FE for FitzPatrick. The FEs are intended to confirm that licensees have adequately demonstrated, for unbounded mechanisms identified in the ISR letter, that: 1) a flood mechanism is bounded based on further reevaluation of flood mechanism parameters; 2) effective flood protection is provided for the unbounded mechanism; or 3) a feasible response is provided if the unbounded mechanism is local intense precipitation. These 3 options associated with performing an FE are referred to as Path 1, 2, or 3, as described in NEI 16-05, Revision 1. The purpose of this staff assessment is to provide the results of the NRC's evaluation of the FitzPatrick FE.

### 3.0 TECHNICAL EVALUATION

As described in the ISR letter, the LIP, streams and rivers, and storm surge flooding mechanisms were found to exceed the plant's CDB flood at FitzPatrick. The licensee stated that its FE followed Path 2 of NEI 16-05, Revision 1 and utilized Appendix B for guidance on evaluating the site strategy.

The FE credits passive protection features to demonstrate that key structures, systems, and components (SSCs) are protected from the LIP, streams and rivers, and storm surge flooding mechanisms. The LIP and streams and rivers reevaluated hazard water levels are 272.8 feet (ft.) United States Lake Survey of 1935 (USLS35). This water surface elevation is greater than the existing CDB flood elevation of 262 ft. USLS35 and is also above the site grade of 272 ft. USLS. Because of the similarities associated with the impacts of the LIP and streams and rivers flood mechanism they are evaluated together in Section 3.1 of this assessment. The storm surge combined event reevaluated hazard water level with wind wave runup included is 268 ft. USLS35, which is less than site grade. The staff's assessment of the storm surge mechanism is in Section 3.2 of this document.

#### 3.1 Evaluation of Flood Impact Assessment for Local Intense Precipitation and Streams and Rivers Probable Maximum Flood

##### 3.1.1 Description of Impact of Unbounded Hazard

The FitzPatrick FE identified the potential impacts to key SSCs as a result of water ingress due to LIP and streams and rivers probable maximum flood (PMF). Figure 3.1-1 provides the FitzPatrick site layout. The LIP stillwater elevation is 272.8 ft. USLS35, and the streams and rivers PMF reaches the same maximum elevation of 272.8 ft. USLS35. These values are greater than the existing CDB controlling flood elevation of 262 ft. USLS35 and is slightly above site grade, which is nominally 272 ft. USLS35. Although the reevaluated flood heights for the LIP and streams and rivers PMF are the same, the duration of the flood is different.

##### 3.1.2 Evaluation of Available Physical Margin and Reliability of Flood Protection Features

The licensee relies on passive features and existing doors to justify that there is still margin available using a deterministic approach. The staff notes that the LIP analysis is conservative and results in 0.8 ft. of flood waters above the 272 ft. USLS35 plant grade elevation. The licensee referenced an evaluation of leakage through exterior doors that is documented in Sections 5.1 and 5.2 of its March 12, 2015, FHRR. The FHRR describes an assessment that was documented in JAF-RPT-14-00035, "Fukushima Project Walkdown of Plant Features that

are Potentially Subject to BDBEE Flood Water Infiltration,” dated February 11, 2015. The assessment included a walkdown and inspection of potentially affected outer doors, hatches, and access-ways and calculation of leakage rates through each pathway that had the potential to adversely affect key SSCs based on the water level at the location and the flood event duration for the particular mechanism.

The evaluation also included how the leakage through these pathways, if applicable, would be collected. For example, for the Reactor Building, leakage not collected in the Reactor Building floor drains would be collected in either the East Crescent portion of the plant or the bottom of the Torus Room. The volume of space capable of being inundated is large compared to the leakage past the doors such that the resulting water level rise is well below the level where safety-related SSCs are impacted in an adverse manner. Similarly, the calculated value of Turbine Building inflow was considered; given the volume provided in the Turbine Building at elevation 252.0 ft. USLS35, the water level rise would be a few inches. The licensee concluded that under the peak LIP and PMF floods, no equipment important to safety is affected in the Turbine Building.

In the FHRR the licensee evaluated the impact of the LIP and PMF floods at select locations that included not only doors but also hatches and manholes. The evaluation was based on the results of the reevaluated hazards. Table 3.1-1 provides a summary of the flood depths for the LIP and PMF hazards at select locations. This table is based on information the licensee provided in its FHRR and includes data from FHRR table 4.3, “LIP Flood Depths and Durations at Select Locations,” and FHRR table 4.5, “Unnamed Local Stream PMF Flood Depths and Durations at Select Locations.” The staff’s basis for the determination that key SSCs potentially affected by the flood at these locations are reasonably expected to maintain their functions in the event of a LIP or PMF at the site can be found in the discussion portion of Table 3.1-1 of this evaluation.

In an inspection report dated November 6, 2015 (ADAMS Accession No. ML15314A130), the NRC documented its activities to verify the licensee’s conclusion that no interim actions were required for the reevaluated hazards (including LIP and the PMF) that are described in the FHRR. Engineering Report JAF-RPT-14-00035 was reviewed as part of the inspection. As documented in the licensee’s FE and in a licensee letter dated December 9, 2015 (ADAMS Accession No. ML15343A505), NRC inspectors identified a condition with some of the door seals which are assumed to minimize leakage into buildings. In response, a new walkdown was performed to inspect weather stripping on doors credited in the FHRR and JAF-RPT-14-00035 for minimizing leakage into the plant. In addition, the licensee noted in its FE that procedure AP-12.04, “Seasonal Weather Preparations,” now includes yearly inspections of the door weather stripping to identify degradation or gaps greater than 1/8 inch, which is consistent with the doorway gap size assumption in JAF-RPT-14-00035.

The staff performed an audit of AP-12.04, Revision 25, in accordance with the NRC staff’s audit plan for flooding focused evaluations dated July 18, 2017 (ADAMS Accession No. ML17192A452), to confirm the inclusion of the yearly inspection of appropriate door weather stripping. The staff verified that Step 7 of the warm weather checklist specifies doors to be inspected; the areas of the doors to be inspected to ensure weather stripping is in good condition and to verify that with the door closed, any gaps are less than 1/8 inch. The procedure directs the work control center to track any open item related to the checklist until the item is appropriately addressed and the verification is completed.

The licensee's FE for the LIP and PMF flood hazard notes that the only plant action assumed is to close the exterior doors during periods of intense precipitation per AOP-13, "Severe Weather Procedure." The staff audited AOP-13, Revision 27. The entry conditions for this procedure include a National Weather Service Bulletin for flooding that affects the site. The staff verified that the flood warning portion of the procedure directs licensee staff to verify water intrusion is not occurring at building outer doors and to close doors as appropriate if sustained local intense precipitation is occurring.

Guidance is provided in NEI 16-05, Revision 1, Appendix B, as endorsed by the NRC, that negligible or zero available physical margin (APM) can be justified if the use of conservative inputs, assumptions, and/or methods in the flood hazard reevaluation can be established. The LIP evaluation includes the following conservative assumptions:

- the site drainage network was assumed to be non-functional and culverts were assumed to be blocked and storm sewers were not considered.
- The vehicle barrier system was not assumed to re-direct overland flow away from the site.

Both the LIP and PMF evaluations include the following assumptions:

- The LIP and PMF flood depths are small relative to the site grade such that hydrodynamic, hydrostatic, and debris impact forces on exterior features would not reasonably be expected to impact the functionality of these features.
- A door gap of 1/8 inch is used when calculating inflow leakage for standard and rollup doors, which the staff considers reasonable given the steps the licensee has taken to procedurally inspect the weather stripping for these doors on a periodic basis.
- The area available to collect inleakage from a LIP or PMF event for the Reactor Building and Turbine Building is large relative to the amount of inleakage such that key SSCs should not be impacted.

Based on the above assumptions the staff concludes that the FitzPatrick APM for the LIP and streams and rivers PMF events is acceptable.

#### Reliability of Flood Protection Features

Demonstrating reliability of the flood protection features is described in NEI 16-05, Appendix B, for both passive and active features. The licensee's FE does not credit active features, but does credit doors and weather stripping to minimize inleakage during a LIP or streams and rivers PMF event. As described above the licensee performs yearly inspections of door weather stripping for key doors to identify degradation or gaps greater than 1/8 inch. The staff concludes that based on the periodic inspection of the weather stripping this feature is reliable to maintain key safety functions as defined in Appendix B of NEI 16-05, Rev 1, as endorsed by the NRC.

The staff also reviewed other passive features that are described in Sections 5.1 and 5.2 of the licensee's FHRR. For example Table 3.1-1 includes hatches and doors themselves that are credited to withstand the hydrostatic pressure from the LIP or PMF event. The design basis of the site that includes safety related SSCs being protected from pressure loads associated with a



tornado (3 pounds per square inch). Based on the hydrostatic loads associated with a LIP or PMF event at the hatches and doors discussed in Table 3.1-1 being less than the loads associated with a design basis tornado the staff considers the hatches and doors are reliable to maintain key safety functions in the event of a LIP or PMF at the sites as defined in Appendix B of NEI 16-05, Revision 1, as endorsed by the NRC.

Because increased focus has been placed on flood protection since the accident at Fukushima, licensees and NRC inspectors have identified deficiencies with equipment, procedures, and analyses relied on to either prevent or mitigate the effects of external flooding at a number of licensed facilities. Recent examples include those found in Information Notice 2015-01, "Degraded Ability to Mitigate Flooding Events" (ADAMS Accession No. ML14279A268). In addition, the NRC is cooperatively performing research with the Electric Power Research Institute to develop flood protection systems guidance that focuses on flood protection feature descriptions, design criteria, inspections, and available testing methods in accordance with a memorandum of understanding dated September 28, 2016 (ADAMS Accession No. ML16223A495). The NRC staff expects that licensees will continue to maintain flood protection features in accordance with their current licensing basis. The staff also expects that licensees will use the site corrective action program to disposition flood-related maintenance, operations, and design issues, consistent with the provisions of NEI 16-05 and NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features," as endorsed by the NRC, where appropriate. Continued research involving flood protection systems will be performed and shared by the NRC staff with licensees in accordance with the guidance provided in Management Directive 8.7 "Reactor Operating Experience Program" (ADAMS Accession No. ML122750292).

### 3.1.3 Overall Site Response

The licensee does not rely on any personnel actions (other than a verification that doors are closed in accordance with AOP-13) or new modifications to the plant in order to respond to the beyond-design-basis LIP or PMF events. As described above, the licensee's evaluation relied on passive existing flood protection features to demonstrate adequate flood protection. Because the staff considers the verification that doors are closed in accordance with AOP-13 to be a simple action that does not warrant further analysis, the staff concludes there is no need to review overall site response.

## 3.2 Evaluation of Flood Impact Assessment for Storm Surge

### 3.2.1 Description of Impact of Unbounded Hazard

The storm surge combined event reevaluated hazard water level with wind wave runup included is 268 ft. USLS35, which is less than site grade that is generally 272 ft. USLS35. Protection of key SSCs is provided by site grade and building exterior features, which are permanent and passive. The Screenwell Building's interior is connected to Lake Ontario via tunnels, as such the interior of the building is not subjected to wind wave runup. Without wind wave runup the storm surge combined event stillwater elevation is 252.8 ft USLS35, which is below the Screenwell Building's floor elevation of 255 ft USLS. As such the key SSCs inside the Screenwell Building can continue to function under storm surge combined event conditions.



### 3.2.2 Evaluation of Available Physical Margin

The APM for the storm surge combined event is 4 ft., before key SSCs are impacted externally and 2 feet from impacting key SSCs internal to the Screenwell Building. The staff finds this margin to be acceptable. The staff notes that the licensee's FE discusses recent changes to orders that could affect lake levels that are documented in "Regulation Plan 2014 for the Joint International Commission Lake Ontario and St. Lawrence River- Compendium Document," dated December 2016. The new orders would result in assuming a starting lake elevation of 249 ft. USLS35 above the 248 ft. USLS35 value used in the FHRR's combined effects calculation. Given that the FHRR APM of 4 ft. for external key SSCs and 2 ft for key SSCs internal to the Screenwell Building is based on a lake level that is exceeded by the Plan 2014 regulated levels only during non-winter months and the magnitude of the order change (i.e., approximately 1 foot) in comparison to the APM of 4 ft. and 2 ft, respectively, the staff concludes that the APM for the storm surge combined event is acceptable.

### 3.2.3 Overall Site Response

The licensee does not rely on any personnel actions or new modifications to the plant in order to respond to the beyond-design-basis storm surge combined event. As described above, the licensee's evaluation relied on passive existing features to demonstrate adequate flood protection. Therefore, there is no need to review overall site response.

## 4.0 AUDIT REPORT

The July 18, 2017, generic audit plan describes the NRC staff's intention to issue an audit report that summarizes and documents the NRC's regulatory audit of the licensee's FE. The NRC staff's FitzPatrick audit was limited to the review of the procedures described above. Because this staff assessment appropriately summarizes the results of the audit, the NRC staff concludes a separate audit report is not necessary, and that this document serves as the audit report described in the NRC staff's July 18, 2017, letter.

## 5.0 CONCLUSION

The NRC staff concludes that the licensee performed the FitzPatrick FE in accordance with the guidance described in NEI 16-05, Revision 1, as endorsed by JLD-ISG-2016-01, and that the licensee has demonstrated that effective flood protection exists from the reevaluated flood hazards. Furthermore, the NRC staff concludes that FitzPatrick screens out for an integrated assessment based on the guidance found in JLD-ISG-2016-01. As such, the staff concludes that in accordance with Phase 2 of the process outlined in the 50.54(f) letter, additional regulatory actions associated with the reevaluated flood hazard, beyond those associated with mitigation strategies assessment, are not warranted. The staff further concludes that the licensee has satisfactorily completed providing responses to the 50.54(f) activities associated with the reevaluated flood hazards.



Figure 3.1-1 FitzPatrick Site Layout (Adapted from Figure 2-2 of March 12, 2015, FHRR (ADAMS Accession No. ML15082A250))

Table 3.1-1 – Local Intense Precipitation (LIP) and Probable Maximum Flood (PMF) Flood Depths at Select Locations

Feature ID	Building	LIP Flood Depth Above Door Sill (ft.)	LIP flood depth above ground (ft.)	PMF flood depth above door sill elevation (ft.)	PMF flood depth above ground elevation (ft.)	Discussion
Door A	Heater Bay	0.5	0.7	-	-	Leakage through the doors (3 ft. personnel door and 12 ft. rollup door) will flow through floor drains and down the staircase. No equipment important to safety is at risk due to flooding at this location.
Door C	Screenwell Building	0.2	0.6	-0.2	0.3	Leakage through the door drains directly to Lake Ontario via the intake and discharge tunnels. No equipment important to safety is at risk.
Door E1	Diesel Generator Room	-	1.0	-	0.9	<p>The four openings are vertical bolted hatches with caulking. Leakage is at or near zero, and floor drains maintain dry conditions. The equipment is on pedestals.</p> <p>There is also an interior double door that accesses the interior area from Door G. Leakage from this path would be inconsequential because it would flow to the stairwell and local floor drains prior to passing through two doors before entering the Switchgear and the Diesel Generator Rooms, which have high door sills.</p> <p>Switchgear outside the Diesel Bays is raised above any flooding.</p>
Door E2	Diesel Generator Room	-	1.0	-	0.9	
Door F1	Diesel Generator Room	-	1.1	-	1.0	
Door F2	Diesel Generator Room	-	1.0	-	0.9	

Feature ID	Building	LIP Flood Depth Above Door Sill (ft.)	LIP flood depth above ground (ft.)	PMF flood depth above door sill elevation (ft.)	PMF flood depth above ground elevation (ft.)	Discussion
Door G	Turbine Building Track Bay	0.5	0.5	-	-	This is a 20 ft. rollup door, and there are numerous floor drains in the area and a stairwell to the Turbine Bldg. 252.0 ft. USLS35 level. Components are positioned on elevated pedestals. No equipment important to safety is at risk due to flooding.
Door I	Electrical Bay	0.3	0.3	0.2	0.2	This is a 12 ft. rollup door. There are numerous floor drains in the area and a stairwell to the Turbine Bldg. 252.0 ft. USLS35 level. Components are positioned on elevated pedestals. No equipment important to safety is at risk due to flooding.

Feature ID	Building	LIP Flood Depth Above Door Sill (ft.)	LIP flood depth above ground (ft.)	PMF flood depth above door sill elevation (ft.)	PMF flood depth above ground elevation (ft.)	Discussion
Door M	Reactor Building Track Bay	0.5	0.5	0.6	0.6	<p>The Track-bay entrance is a double steel door. At the north end of the Track-bay is an interior flood-proof door (R272-2). The door seal is sufficient to keep leakage to seepage which will not affect SSCs important to safety. The south end Door M is of a similar design and again is utilized to maintain a secondary containment pressure when the interior Reactor Building Track-bay door is opened.</p> <p>The west side door (R272-10) a 3 ft. personnel door that goes to the Standby Gas Treatment Area, which door N enters from the east (R272-9). Equipment is on 1 foot high pedestals. The Standby Gas Treatment system is important to safety but is not at risk because the maximum flood level (0.5 ft.) is less than the pedestal height. Note, any leakage not captured by the Reactor Building floor drains would utilize a flow path to the basement of the East Crescent at elevation 227.5 ft. USLS35, or the bottom of the Torus Room at elevation 227.75 ft. USLS35 (via the Torus Room Floor plug). The quantity of water here would only amount to a few inches on the floor and would not jeopardize any SSCs important to safety.</p>

Feature ID	Building	LIP Flood Depth Above Door Sill (ft.)	LIP flood depth above ground (ft.)	PMF flood depth above door sill elevation (ft.)	PMF flood depth above ground elevation (ft.)	Discussion
Hatch 1 (H1)	Reactor Building	-	0.7	-	0.8	Hatches H1 and H2 to the Reactor Building are heavy and sealed hatches. Any leakage would be minor and classified as seepage. The seepage would drain to the crescents. This minor seepage would not put at risk any safety-related equipment.
Hatch 2 (H2)	Reactor Building	-	0.6	-	0.7	
Manhole 1 (M1)	Plant Yard	-	0.8	-	0.9	Manhole M1 provides access to the residual heat removal (RHR) pump C cable. RHR Pump C cable penetrations are sealed and the cables are rated for operating submerged in water. Since there are 4 RHR pumps, the failure of one (1) pump does not put the plant at risk. Also RHR is assumed not to run until outside power is available at which time pump A, B or D would be put in service and the flood event would be finished.

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – STAFF ASSESSMENT OF FLOODING FOCUSED EVALUATION (CAC NO. MG0022; EPID L-2017-JLD-0028) DATED April 16, 2018

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**ADAMS Accession No.: ML18075A432**

\*via email

OFFICE	NRR/DLP/PBMB/PM	NRR/DLP/PBMB/LA	NRR/DLP/PBMB/BC (A)	NRR/DLP/PBMB/PM
NAME	JSebrosky	SLent	EBowman*	JSebrosky
DATE	4/ /18	3/29/18	4/3/18	4/16/18

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