



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

June 30, 2014

Mr. C. R. Pierce  
Regulatory Affairs Director  
Southern Nuclear Operating Company, Inc.  
Post Office Box 1295, Bin- 038  
Birmingham, AL 35201-1295

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2 – STAFF ASSESSMENT OF THE FLOODING WALKDOWN REPORT SUPPORTING IMPLEMENTATION OF NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT (TAC NO. MF0234 AND MF0235)

Dear Mr. Pierce:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information letter per Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (50.54(f) letter). The 50.54(f) letter was issued to power reactor licensees and holders of construction permits requesting addressees to provide further information to support the NRC staff's evaluation of regulatory actions that may be taken in response to lessons learned from Japan's March 11, 2011, Great Tōhoku Earthquake and subsequent tsunami. The request addressed the methods and procedures for nuclear power plant licensees to conduct flooding hazard walkdowns to identify and address degraded, nonconforming, or unanalyzed conditions through the corrective action program, and to verify the adequacy of the monitoring and maintenance procedures.

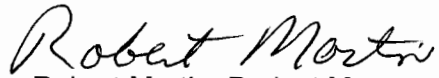
By letter dated November 27, 2012, as supplemented September 23, 2013, Southern Nuclear Operating Company, Inc. (SNC) submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Edwin I. Hatch Nuclear Plant, Units 1 and 2, (HNP) site. By letter dated January 29, 2014, SNC provided a response to the NRC request for additional information for the staff to complete its assessments.

C. Pierce

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The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

Sincerely,



Robert Martin, Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-321 and 50-366

Enclosure:  
Staff Assessment of Flooding  
Walkdown Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT OF FLOODING WALKDOWN REPORT  
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO  
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT  
SOUTHERN NUCLEAR OPERATING COMPANY, INC.  
EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-321 AND 50-366

1.0 INTRODUCTION

On March 12, 2012,<sup>1</sup> the U.S. Nuclear Regulatory Commission (NRC) issued a request for information per Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (50.54(f) letter) to all power reactor licensees and holders of construction permits in active or deferred status. The request was part of the implementation of lessons learned from the accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 4, "Recommendation 2.3: Flooding,"<sup>2</sup> to the 50.54(f) letter requested licensees to conduct flooding walkdowns to identify and address degraded, nonconforming, or unanalyzed conditions using the corrective action program (CAP), verify the adequacy of monitoring and maintenance procedures, and report the results to the NRC.

The 50.54(f) letter requested licensees to include the following:

- a. Describe the design basis flood hazard level(s) for all flood-causing mechanisms, including groundwater ingress.
- b. Describe protection and migration features that are considered in the licensing basis evaluation to protect against external ingress of water into structures, systems, and components (SSCs) important to safety.
- c. Describe any warning systems to detect the presence of water in rooms important to safety.
- d. Discuss the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discuss how these systems and barriers were evaluated using the acceptance criteria developed as part of Requested Information item 1.h.
- e. Present information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures) using the documentation template

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<sup>1</sup> ADAMS Accession No. ML12053A340.

<sup>2</sup> ADAMS Accession No. ML12056A050.

discussed in Requested Information item 1.j, including actions taken in response to the peer review.

- f. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using guidance in Regulatory Issues Summary 2005-20, Revision 1, Revision to the NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program.
- g. Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the corrective action program. Also include a detailed description of the actions taken or planned to address these effects.
- h. Describe any other planned or newly installed flood protection systems or flood mitigation measures including flood barriers that further enhance the flood protection. Identify results and any subsequent actions taken in response to the peer review.

In accordance with the 50.54(f) letter, Enclosure 4, Required Response Item 2, licensees were required to submit a response within 180 days of the NRC's endorsement of the flooding walkdown guidance. By letter dated May 21, 2012,<sup>3</sup> the Nuclear Energy Institute (NEI) staff submitted NEI 12-07, Revision 0, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features" to the NRC staff to consider for endorsement. By letter dated May 31, 2012,<sup>4</sup> the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012<sup>5</sup>, Southern Nuclear Operating Company, Inc. (SNC, the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Edwin I. Hatch Nuclear Plant, Units 1 and 2 (HNP). The licensee submitted a supplement dated September 23, 2013<sup>6</sup> in addition to the letter dated November 27, 2012. The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.<sup>7</sup> The licensee responded by letter dated January 29, 2014.<sup>8</sup>

The NRC staff evaluated the licensee's submittals to determine if the information provided in the walkdown report met the intent of the walkdown guidance and if the licensee responded appropriately to Enclosure 4 of the 50.54(f) letter.

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<sup>3</sup> ADAMS Package Accession No. ML121440522.

<sup>4</sup> ADAMS Accession No. ML12144A142.

<sup>5</sup> ADAMS Accession No. ML12333A148.

<sup>6</sup> ADAMS Accession No. ML13266A367.

<sup>7</sup> ADAMS Accession No. ML13325A891.

<sup>8</sup> ADAMS Accession No. ML14030A255.

## 2.0 REGULATORY EVALUATION

The SSCs important to safety in operating nuclear power plants are designed either in accordance with, or meet the intent of Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 2: "Design Bases for Protection Against Natural Phenomena;" and Appendix A "Seismic and Geological Criteria for Nuclear Plants," to 10 CFR Part 100. GDC 2 states that SSCs important to safety at nuclear power plants shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.

For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, identify the specific functions to be performed by an SSC, and the specific values or ranges of values chosen for controlling parameters as reference bounds for the design.

The design bases for the SSCs reflect appropriate consideration of the most severe natural phenomena that have been historically reported for the site and surrounding area. The design bases also reflect sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

The current licensing basis (CLB) is the set of NRC requirements applicable to a specific plant, and a licensee's written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis.

## 3.0 TECHNICAL EVALUATION

### 3.1 Design Basis Flooding Hazard (Edwin I. Hatch Nuclear Plant)

The licensee reported that the HNP site is considered to be a dry site per the definition provided in NRC Regulatory Guides 1.59 and 1.102. The design basis flood hazard for the site is flooding due to groundwater ingress. The nominal plant grade is 129 ft. MSL with a groundwater level "flood" elevation of 122 ft. MSL. This elevation was selected for the basement wall design and buoyancy effects or as the design basis flood elevation. Safety-related equipment is protected from groundwater ingress by sealing each below-grade penetration.

The licensee also evaluated the flood hazard posed by a probable maximum precipitation (PMP) event (flood level not applicable), a probable maximum precipitation flood event (PMF) on the Altamaha River (108.3 ft. MSL with wave runup), and a dam break PMF (105.3 ft. MSL) resulting from breaching of three major upstream dams. The flood elevation for these flood hazards is lower in elevation than the flood elevation expected from groundwater sources, the licensee's design flood basis elevation. Neither the PMP or dam break PMF is limiting for plant design. The Altamaha River PMF is the basis for design for the intake structure but not limiting for the power block design.

The licensee reported that the HNP site is not near a large body of water, therefore flooding induced by surge, seiche, or tsunami is not possible. There is no modern record of freezing of the Altamaha River. Therefore, flooding due to these causes is screened out.

Based on its review, the NRC staff concludes that the licensee has described the design basis flood hazard level(s) as indicated in Requested Information item 2.a of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance.

### 3.2 Flood Protection and Mitigation

#### 3.2.1 Flood Protection and Mitigation Description

The licensee reported that the current licensing basis flood protection is to an elevation of 129.5 ft. MSL (plant finished grade elevation). The licensee reports that none of the safety-related facilities at the HNP site are exposed to river flooding by the most severe flood at the site due to the nature of the topography. A maximum PMF event would create a wave crest no larger than 108.3 ft. MSL, which is below the plant finished floor elevation of 130 ft. MSL and below the maximum ground water level (122 ft. MSL).

The licensee stated that the pumps and motors of the intake, a safety-related structure, are located above the most severe PMF elevation. The reinforced concrete intake pump structure walls, which could be affected by the wave runup, are designed to withstand an impact load of 4,000 lbs. at a wind speed of 50 mph over a 25 ft<sup>2</sup> area. Water rising inside the intake structure well would not reach more than 108.3 ft. MSL, which is below the pump room floor. The residual heat removal service water pump discharge sleeves, which penetrate the wall between the pump well and valve pit, are required to be protected by seals. The foundation slabs and exterior walls of the safety-related structures are designed to prevent upward and lateral pressure caused by the maximum level flood.

The licensee indicates that during high river stages from a PMF on the Altamaha River, a temporary flattening of the gradient of the minor confined aquifer could occur. Regions next to the Altamaha River could be affected, but flooding would not extend to the plant due to the low permeability of a minor confined aquifer and the short duration of the flood.

#### 3.2.2 Incorporated and Exterior Barriers

The licensee reported that the site has incorporated and/or exterior barriers that are permanently in-place, requiring no operator manual actions. These barriers include site grade elevation, topography, exterior walls, floors, penetration seals, waterstops, piping, and electrical tunnels.

#### 3.2.3 Temporary Barriers and Other Manual Actions

The licensee reported that the site does not have manual actions such as sump pumps, portable pumps, or isolation and check valves that require operator action. Provisions for a

temporary sandbagging barrier existed in the HNP site's procedure 34AB-Y22-002-0, but a simulation by the licensee revealed that sandbagging was not needed and was subsequently removed from the operating procedure as discussed below in Section 3.2.4.

#### 3.2.4 Reasonable Simulation and Results

The licensee performed a simulation of sandbagging the Intake as part of the walkdown process. After the sandbagging simulation, the licensee determined that sandbagging was not necessary, and the procedures have been revised to remove this requirement. Currently, HNP Units 1 and 2 do not rely on sandbagging or any other temporary measure for flood hazard protection.

#### 3.2.5 Conclusion

Based on the NRC staff's review, the licensee appears to have described protection and mitigation features as requested in the 50.54(f) letter and consistent with the walkdown guidance.

#### 3.3 Warning Systems

The licensee indicated that several design features exist to warn operators in advance of potential flooding prior to affecting safety-related equipment. The licensee stated that these features include control room annunciation of high water level in drain sumps associated with various tunnels and compartments through which system piping is routed. The warning systems are designed to detect water accumulating from internal pipe leaks and breaks. Based on its review, the NRC staff concludes that the licensee has provided information to describe any warning systems as indicated in Requested Information item 2.c of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance.

#### 3.4 Effectiveness of Flood Protection Features

The licensee concluded that none of the safety-related facilities at the HNP site are susceptible to flooding by the most severe external flood at the site. The intake structure, which is designed to preclude flooding by the PMF, is the lowest elevation Category I structure, system or component. The licensee indicated that the Unit 1 and 2 power blocks and intake structure are protected from external flooding by design, rather than reliance on mitigation measures.

The licensee stated that the onsite Independent Spent Fuel Storage Installation (ISFSI) is susceptible to flooding from a local PMP. Flooding of the ISFSI from a PMP event could cause the air cooling vents of the ISFSI to be submerged for several hours.

Based on the NRC staff's review, the licensee appears to have discussed the effectiveness of flood protection features as requested in the 50.54(f) letter and consistent with the walkdown guidance.

### 3.5 Walkdown Methodology

By letter dated June 8, 2012,<sup>9</sup> the licensee responded to the 50.54(f) letter that it intended to utilize the NRC endorsed walkdown guidelines contained in NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features."<sup>10</sup> The licensee's walkdown submittal dated November 27, 2012, as supplemented, indicated that the licensee implemented the walkdowns consistent with the intent of the guidance provided in NEI 12-07. The licensee did not identify any exceptions from NEI 12-07.

Based on the NRC staff's review, the licensee appears to have presented information related to the implementation of the walkdown process as requested in the 50.54(f) letter and consistent with the walkdown guidance.

### 3.6 Walkdown Results

#### 3.6.1 Walkdown Scope

The licensee performed walkdowns of 39 flood protection features including sump pumps, doors, penetration seals, walls, floors, drains, topography, and structures. The licensee noted the following conditions identified during the walkdown: deteriorated door seals and thresholds, drainage issues, electrical conduit and piping seal issues, preventative maintenance issues, staining on walls. The licensee indicated that they evaluated these conditions during the flood walkdowns in accordance with station processes and entered them into the CAP. The licensee used acceptance criteria consistent with the intent of NEI 12-07.

#### 3.6.2 Licensee evaluation of flood protection effectiveness, key findings, and identified deficiencies

The licensee performed an evaluation of the overall effectiveness of the plant's flood protection features. The licensee concluded that none of the safety-related facilities at the HNP site are susceptible to flooding by the most severe external flood at the site.

The licensee indicated that no operator actions or instrumentation are credited to protect the plant from external flooding of the HNP site. The licensee cited HNP procedure 34AB-Y22-002-0 titled "Naturally Occurring Phenomena" as the appropriate guidance for preparing a plant to withstand the effects of a potential flooding event. The licensee revised this procedure to include instructions for a PMF and a PMP event.

NEI 12-07 defines a deficiency as follows: "a deficiency exists when a flood protection feature is unable to perform its intended function when subject to a design basis flooding hazard." The licensee identified deficiencies during the course of the flood walkdowns. The licensee identified six deficiencies as described below in Section 3.6.5 and entered these into the CAP.

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<sup>9</sup> ADAMS Accession No. ML12163A253.

<sup>10</sup> ADAMS Accession No. ML12173A215.



All deficiencies were scheduled to be dispositioned on or before April 30, 2014.

### 3.6.3 Flood Protection and Mitigation Enhancements

The licensee has not implemented or planned any flood protection or mitigation enhancements.

### 3.6.4 Planned or newly installed features

The licensee determined that no changes were necessary by the flood walkdowns.

### 3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted deficiencies associated with the following features:

- Penetration seals for sump pump discharge;
- Penetration seals for Residual Heat Removal Service Water piping;
- Sump pump siphoning;
- Intake structure area pull boxes; and,
- Independent Spent Fuel Storage Installation area and topography (includes two separate items)

Condition reports were written for 65 degraded items with the six listed above as deficiencies entered into the CAP for disposition during the walkdown.

### 3.6.6 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 27, 2012, and supplemental letter dated September 23, 2013. The licensee verified that external flooding protection and mitigation features at the HNP site were in place, functional, and maintained. Six deficiencies were identified and scheduled to be addressed in the CAP. The licensee stated that interim compensatory measures have been developed to address the occurrence of a PMF event at the Intake Structure valve pit and a PMP event at the ISFSI facility. The licensee confirmed that the flood walkdowns indicated that the HNP site is a "dry site" that is protected from design basis floods including the flood hazard posed by groundwater ingress, a probable maximum precipitation (PMP) event, a probable maximum precipitation flood event (PMF) on the Altamaha River, and the breaching of three major upstream dams. The licensee concluded that in most cases the plant is protected from design basis flood events, but the site is susceptible to the external ingress of groundwater.

The HNP site is built above the maximum estimated PMF crest wave elevation. The licensee indicates that safety-related SSCs do not require in-room water detection systems specifically for external flooding. Therefore, water detection and warning systems are not relied upon in the CLB for flood hazard protection. However, the licensee notes warning systems designed to detect water accumulating from internal pipe leaks and breaks but indicates that these features are outside the scope of NTTF Recommendation 2.3 (see section 3.3 above).

The licensee reported that of 65 degraded conditions identified during the walkdown, 39 condition reports were written against flood protection features and 26 were written against APM features. The licensee generated condition reports for the following: deteriorated exterior door seals and thresholds, issues with exterior drainage features, issues with piping and electrical conduit seals, issues with preventative maintenance procedures, and staining on walls. The licensee recorded the available physical margin (APM) for each feature inspected that was not identified as a credited flood protection feature. The licensee calculated APM using the older approach in which the APM value equaled the physical difference between the high point of the flood source and the lowest groundwater ingress point feature. The licensee will discuss the resultant hydrologic force, if any, in their responses to NTTF Recommendation 2.1.

The licensee performed a reasonable simulation of sandbagging at the intake as part of the walkdown process. The licensee determined from the simulation that sandbagging was not necessary and therefore removed this requirement from their flood mitigation procedure.

Based on the NRC staff's review, the licensee appears to have provided results of the walkdown and described any other planned or newly installed flood protection systems or flood mitigation measures as requested in the 50.54(f) letter and consistent with the walkdown guidance. Based on the information provided in the licensee's submittals, the NRC staff concludes that the licensee's implementation of the walkdown process meets the intent of the walkdown guidance.

### 3.6.7 Available Physical Margin

NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013<sup>11</sup>. The licensee responded with a letter dated January 29, 2014<sup>12</sup>. The licensee has reviewed their APM determination process, and entered any unknown APMs into their CAP. The NRC Staff reviewed the response, and concluded that the licensee met the intent of the APM determination per NEI 12-07.

Based on the NRC staff's review, the licensee appears to have documented the information requested for any cliff-edge effects, as requested in the 50.54(f) letter and consistent with the walkdown guidance. Further, the NRC staff reviewed the response, and concludes that the licensee met the intent of the APM determination per NEI 12-07.

## 3.7 NRC Oversight

### 3.7.1 Independent Verification by Resident Inspectors

On June 27, 2012, the NRC issued Temporary Instruction (TI) 2515/187 "Inspection of Near-Term Task Force Recommendation 2.3 Flooding Walkdowns." In accordance with the TI, NRC

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<sup>11</sup> ADAMS Accession No. ML13325A891.

<sup>12</sup> ADAMS Accession No. ML14030A255.

inspectors independently verified that the HNP licensee implemented the flooding walkdowns consistent with the intent of the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of flood protection features. The inspection report dated January 28, 2013<sup>13</sup>, documents the results of this inspection. No findings of significance were identified.

#### 4.0 SSCS NOT WALKED DOWN

The licensee identified restricted access and inaccessible features.

##### 4.1 Restricted Access

Subsequent to the initial walkdown report dated November 27, 2012, the licensee performed walkdowns of restricted access features, and provided a supplemental response dated September 23, 2013, documenting the results.

In the September 23, 2013, supplemental response, the licensee indicated that walkdowns of the restricted access items were completed. In this supplement, the licensee subdivided HNP-F-2012-008-00 (penetrations) into multiple sub items, two of which were reclassified as inaccessible (HNP-F-2012-008-00 Q7 Feature 8, Question 7, Item 2 and HNP-F-2012-008-00 Q7 Feature 8, Question 7, Item 3). These penetrations are covered by steel plates which would require destructive removal.

In lieu of inspection, the licensee noted a minimal amount of discoloration below the HNP-F-2012-008-00 Q7 Feature 8, Question 7, Item 2 plate and determined this to be a legacy issue with no further action necessary. In a discussion of HNP-F-2012-008-00 Q7 Feature 8, Question 7, Item 3, the licensee stated that the penetrations in the associated (Unit 1 Reactor Building East) wall were sealed at the time of construction with membrane seals in the penetration sleeve and planned no further action.

In the September 23, 2013, supplemental response, the licensee stated that feature HNP-F-2012-010-00 was incorrectly listed as restricted access in the initial walkdown report submitted on November 27, 2012, and that the feature was inspected on September 13, 2012, and found to be appropriately sealed. The licensee indicated that feature HNP-F-2012-014-00 was inspected on March 21, 2013, and that the penetrations were found to be appropriately sealed. Feature, HNP-F-2012-014-00, are conduit penetrations in Unit 1 and 2 located behind the junction box which is mounted flush with the wall or very close to the wall preventing inspection.

##### 4.2 Inaccessible Features

The licensee identified waterstops as inaccessible features since they are considered to be incorporated flood barriers and are not directly observable. Sub items of feature HNP-F-2012-

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<sup>13</sup> ADAMS Accession No. ML13028A342

008-00 were reclassified as inaccessible with reasonable assurance as described above in Section 4.1.

The licensee provided a basis for reasonable assurance that inaccessible access features are available and will perform credited functions. The licensee deduced the waterstops to be functioning as designed when the walls and seismic joints were observed to be dry. The licensee did not evaluate the aggregate effect of potential loss of more than one inaccessible feature.

## 5.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of flooding walkdown methodology meets the intent of the walkdown guidance. The NRC staff concludes that the licensee, through the implementation of the walkdown guidance activities and, in accordance with plant processes and procedures, verified the plant configuration with the current flooding licensing basis; addressed degraded, nonconforming, or unanalyzed flooding conditions; and verified the adequacy of monitoring and maintenance programs for protective features. Furthermore, the NRC staff notes that no immediate safety concerns were identified. The NRC staff reviewed the information provided and determined that sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

C. Pierce

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The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

Sincerely,

*/RA/*

Robert Martin, Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-321 and 50-366

Enclosure:  
Staff Assessment of Flooding  
Walkdown Report

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**ADAMS Accession No.: ML14155A405**

\* concurrence by e-mail

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