



November 26, 2012  
RC-12-0174

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

Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
SOUTH CAROLINA ELECTRIC & GAS (SCE&G) FINAL FLOODING  
WALKDOWN RESPONSE TO NRC REQUEST FOR INFORMATION  
PURSUANT TO 10 CFR 50.54(f) REGARDING THE FLOODING ASPECTS  
OF RECOMMENDATIONS 2.3 OF THE NEAR-TERM TASK FORCE  
REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT

- References:
1. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012 [ML12053A340]
  2. NRC Letter, Endorsement Of Nuclear Energy Institute (NEI) 12-07, 'Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features', May 31, 2012
  3. SCE&G Letter, South Carolina Electric & Gas (SCE&G) Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flooding Aspects of Recommendations 2.1 and 2.3 of the Near-Term Task Force Review of Insights From the Fukushima Dai-ichi Accident, dated June 7, 2012 [ML12160A347]

On March 12, 2012, the NRC issued Reference 1 to all power reactor licensees and holders of construction permits which are either active or deferred status. Enclosure 4 of Reference 1 contains specific Requested Actions, Requested Information, and Required Responses associated with Recommendation 2.3 for Flooding Walkdowns. South Carolina Electric & Gas, acting for itself and as an agent for South Carolina Public Service Authority, provides the following verification walkdown report of VCSNS plant flood protection features.

VCSNS performed walkdowns to verify that plant flood protection features credited in the current licensing basis (CLB) for protection and mitigation from external flood events, are available, functional and properly maintained to ensure the operation of safety systems in the

event of a credible flood event. SCE&G used the flooding walkdown procedure (NEI 12-07, *Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features*) endorsed by Reference 2 as the basis for the flooding walkdowns at VCSNS Unit 1. The flooding walkdowns were also performed in compliance with the 10 CFR 50 Appendix B program.

This letter contains no new regulatory commitments.

Should you have any questions concerning the content of this letter, please contact Bruce L. Thompson at (803) 931-5042.

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

11-26-12

Executed on



Thomas D. Gatlin

BQ/TDG/ts

Attachment: (SCE&G's Flooding Walkdown Verification Report)

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## 1. Purpose

The purpose of this Technical Report is to provide a written response to the U. S. Nuclear Regulatory Commission (NRC) pursuant to the requirements in Title 10 of the Code of Federal Regulations (10 CFR), Section 50.54(f) letter, dated March 12, 2012 (NRC 50.54(f) Letter), as applicable to the Virgil C. Summer Nuclear Station, Unit 1 (VCSNS). As part of this request, licensees are required to perform walkdowns to verify that plant flood protection features, credited in the current licensing basis (CLB) for protection and mitigation from external flood events, are available, functional and properly maintained to ensure the operation of safety systems in the event of a credible flood event. This report documents the results of the flooding walkdowns that were performed at the plant on July 13-16, 2012, August 6-9, 2012 and October 1-3, 2012. The work for the flooding walkdowns was performed in compliance with the 10 CFR 50 Appendix B program. Walkdown Record Forms and any other supplementary data supporting this Technical Report are included in Report TR02060-002. Report TR02060-002 is available at the VCSNS for review.

For purposes of this report, flooding refers to the external ingress of water resulting from local intense precipitation and severe weather conditions, which could adversely affect system, structures, and components (SSCs) important to safety and includes Probable Maximum Precipitation (PMP) and Probable Maximum Flood (PMF).

## 2. Scope

This report is prepared by WorleyParsons under SCE&G Purchase Order NU-02SR747671, "Fukushima Flooding Walkdowns and Re-Evaluation."

The scope of this report is to respond to specific information requests from the NRC 50.54(f) Letter, which includes the following items:

1. Description of the design basis flood hazard levels for all flood-causing mechanisms, including groundwater ingress.
2. Description of the protection and mitigation features that are considered in the licensing basis elevation to protect against external ingress of water into SSCs important to safety.
3. Description of any warning systems to detect the presence of water in rooms important to safety.
4. Discussion of the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discussion of how these systems and barriers were evaluated using the acceptance criteria developed in Item 1.h of 50.54(f) Enclosure 4.
5. Information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures) and includes actions taken in response to the peer review.

6. Results of the walkdowns including key findings and identified degraded, non-conforming, or unanalyzed conditions.
7. Discussion of any cliff-edge effects identified and the associated basis.
8. Description of any other planned or newly installed flood protection systems or flood mitigation measures, including flood barriers that further enhance the flood protection.

Detailed walkdown report content requirements are included in Appendix D, "Walkdown Report" of NEI 12-07 [Rev. 0-A] (Reference 3.2).

### **3. References**

- 3.1 U. S. Nuclear Regulatory Commission (NRC), "Request for Information Pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012
- 3.2 NEI 12-07 [Rev. 0-A], "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features," May 2012
- 3.3 NEI 12-01 (Revision 0), "Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," April 2012
- 3.4 NRC Letter to NEI, "Endorsement of Nuclear Energy Institute (NEI) 12-07, 'Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features'," June 14, 2012
- 3.5 NEI Letter to NRC, "NRC Endorsement of NEI 12-07, 'Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features'," June 18, 2012
- 3.6 Training Preview (NANTEL for Flooding Taskforce) Rev 0 and related "Learning Objectives\_R4"
- 3.7 TR02060-002, 10 CFR 50.54(f) Regarding the Flooding Aspects of Recommendation 2.3 of the Near-Term Task Force Review of Insights From the Fukushima Accident, Verification Walkdown Report for VCSNS Plant Flood Protection Features - Walkdown Record Forms and Supplementary Data
- 3.8 Certified Survey Data, "V.C. Summer Station Unit 1," Required Survey Ground Shots, Glenn Associates Surveying, Inc., August 1, 2012, Revision 0
- 3.9 Photogrammetric Survey, "SUMMER\_2012\_DTM.DGN," by Glenn Associates Surveying, Inc., August 28, 2012
- 3.10 Photogrammetric Survey, "SUMMER\_2012\_TOPO.DGN," by Glenn Associates Surveying, Inc., August 28, 2012

#### 4. Walkdown Report

Specific walkdown report content requirements are included in Appendix D, "Walkdown Report" of NEI 12-07 [Rev. 0-A] (Reference 3.2). The following subsections provide the requested information.

##### 4.1 Current Licensing Basis (CLB) Flood Hazard Level

The Virgil C. Summer Nuclear Station (VCSNS) site plan is shown on the attached Figure A for reference. The VCSNS site is the equivalent of a dry site as defined in RG 1.102. There are no major potential external sources that could result in flooding on site. The site is protected from flooding and wave run-up on the north side from the adjacent Monticello Reservoir by a properly designed exterior revetment barrier consisting of an embankment with protective stone riprap. The normal water elevation of Monticello Reservoir is 425.0 feet while site grade around the plant is typically at 435.5 feet. Plant grade is raised to 438 feet directly adjacent to the embankment at Monticello Reservoir creating, in effect, a minor levee referred to as the North Berm. The North Berm, including the elevation and riprap protected embankment, are designed to protect the site at a maximum elevation of 437.5 feet from postulated stormwater-related flood conditions, plus wave run-up, from Monticello Reservoir, as described in Chapter 2 of the FSAR.

The Monticello Reservoir is the nearest body of water to the site, and serves as the source of cooling and makeup water for the VCSNS. Monticello Reservoir has a surface area of about 6,800 acres and a storage volume of about 400,000 acre-feet at the normal maximum water surface elevation of 425.0 feet.

The Service Water Pond (SWP) is a Seismic Category 1 impoundment constructed adjacent to Monticello Reservoir that is physically separated by Seismic Category 1 dams and natural land masses. The SWP supplies water for the Service Water System under normal and emergency operations. The interconnecting pipe, through the operation of a butterfly isolation valve, permits the SWP to be supplied from Monticello Reservoir. For normal operating conditions, the Monticello Reservoir and SWP levels will fluctuate between elevations 420.5 feet and 425.0 feet.

The current licensing basis (CLB) documents were reviewed to compile the Flooding Walkdown Credited Features Checklist. The documents that were reviewed include: FSAR; Procedures; Technical Specifications; Maintenance Rule Procedures; LRA; LRA SER; LRA and SER Commitments; Design Calculations; Construction Drawings; NSR Structures DBD, Topical Seismic DBD, SW DBD; PLEX/LRA Technical Reports including: TR00170-001, -002, and -003; ES-0400 SW Pond Structure & Dam Inspections Guidelines; Fukushima Response letter to INPO IER 11-1 dated 4/15/11; NRC TI 2515-183 inspection results; CR-11-01207 (Lessons Learned from the IER 11-1 walkdowns); and IPEEE conclusions TR00310-001.

A spreadsheet was developed to record the documents that were reviewed to identify credited flood protection features. That spreadsheet, "VCSNS NTTF 2.3 Flooding Walkdowns Review of Current Licensing Basis References" is included as Attachment A in Report TR02060-002.

In summary, the flood hazard levels for VCSNS are as follows:

#### 4.1.1 Flooding from Monticello Reservoir PMF

Monticello Reservoir normal maximum still water level is 425.0 feet, NGVD 29 (FSAR, Section 2.4.10). Maximum water level during Probable Maximum Flood (PMF), with wind storm surge and wave setup is defined as 436.6 feet, NGVD 29. The North Berm top is at design elevation 438.0 feet.

A conservative design basis assumption is that no water is released from the Fairfield Hydro station during the event. The controlled normal maximum reservoir still water level is assumed to be at elevation 425.0 feet. If water were released by Fairfield Hydro station, the water level would be less than 425.0 feet.

#### 4.1.2 Flooding from the Service Water Pond (SWP) PMF

Service Water Pond (SWP) normal maximum still water level is 422.0 feet, NGVD 29 (FSAR, Section 9.2.5.3.2.3.a). Maximum water level during Probable Maximum Flood (PMF), with wind storm surge and wave setup, is defined as 433.6 feet, NGVD 29. The West Embankment top is at design elevation 435.0 feet. The other dams forming the SWP have top design elevations of 438.0 feet.

The SWP is designed to preclude being flooded, or drained, by Monticello Reservoir. An interconnecting pipe is the only hydraulic connection between the SWP and Monticello Reservoir. This pipe is fitted with a butterfly isolation valve that is locked closed during normal operation (FSAR Sections 2.4.8 and 9.2.5).

#### 4.1.3 Local Intense Precipitation

Local intense precipitation, defined as the greatest hourly depth of rainfall during the 6-hour probable maximum precipitation (PMP), has been determined to build up to elevation 436.15 feet on the site assuming no flow in the storm inlets and storm sewer pipe system (completely blocked) before overland flow allows surface runoff to flow off the plant site perimeter away from the main plant buildings (FSAR, Section 2.4.3.1.3).

The centerline elevation of the roads surrounding the perimeter of the plant area is at 436.0 feet. The overflow capacities of the surrounding roads act as weirs up to elevation 436.0 feet, resulting in a maximum ponding elevation of 436.15 feet during the 6-hour PMP (FSAR, Section 2.4.3.1.3).



The roofs of safety-related buildings are designed to safely dispose of or store up to a maximum of 4 inches of local intense precipitation (FSAR, Section 2.4.10).

#### 4.1.4 Broad River Flooding

Flooding from the Broad River was not considered due to the elevation difference from the river to the site. Nominal site grade of 435 feet is 150 feet above the Broad River flood plain.

## 4.2 CLB Credited Flood Protection and Mitigation Features

The current licensing basis (CLB) takes credit for flood protection from several types of features. All of these features are "Incorporated or Exterior Passive" features, as defined in NEI 12-07 [Rev. 0-A], Section 3. These credited feature types are grouped as follows:

1. **Dams (and Berms)** – Minimum top dam and berm elevations prevent Monticello Reservoir or the Service Water Pond from flooding the site during probable maximum precipitation (PMP) and probable maximum flood (PMF) events.
2. **Grade** – Site grade was designed such that rainfall runoff during PMP event flows overland to prevent flooding of buildings, exterior equipment, and systems.
3. **Exterior Building Walls** – Walls protect buildings from infiltration of flood waters during PMP/PMF; penetrations (for pipes/conduits/doors) are included in their respective wall. Below-grade penetrations are sealed and thick concrete walls are protected on their outside surfaces by a continuous waterproofing membrane. Waterstops are provided at joints.
4. **Floor Slabs** – Slabs protect buildings from infiltration of flood waters during PMP/PMF.
5. **Roofs** – Protect buildings from infiltration of flood waters from local intense precipitation PMP

No flood mitigation features are credited in the CLB.

There are no plant procedures requiring actions in the VCSNS CLB that provide for flood protection or mitigation.

No flooding occurs on site during current licensing basis PMP or PMF events. Therefore, flood duration is not a concern.

### **4.3 Flood Warning Systems**

4.3.1 As the VCSNS site is the equivalent of a dry site relative to flood protection, no formal flood warning system is in place to warn of potential flooding. Procedures and systems do exist to warn of extreme weather events. They are as follows:

1. EPP-015, "Emergency Plan Procedure, Natural Emergency"

This procedure addresses seismic events, tornados, hurricanes, winter storms, and Fairfield Hydro dam failure.

2. OAP-109.1, "Operations Administrative Procedure, Guidelines for Severe Weather"

This procedure addresses cold and hot weather, hurricanes, high winds, and heavy rain.

### **4.4 Effectiveness of Flood Protection Systems & Exterior, Incorporated, and Temporary Barriers**

All of the credited flood protection features are "Incorporated or Exterior Passive" features. There are no "Incorporated or Exterior Active" features and there are no "Temporary" features.

Flood protection features whose conditions prevent the flood protection feature from performing its credited function during a design basis external flooding event are reported as deficiencies and entered into the licensee's Corrective Action Program (CAP). A detailed discussion of these deficiencies and how they have been entered into the CAP are included in Section 4.6 and Section 4.8, respectively.

### **4.5 Walkdown Process and Team**

#### 4.5.1 Walkdown Guidance

The NEI 12-07 [Rev. 0-A] guidelines were followed for walkdown procedures. No active features requiring simulation were identified.

#### 4.5.2 Walkdown Team

The following WorleyParsons personnel received training in the NANTEL training course "Flood Protection Verification (Generic Verification Walkdown of Plant Protection Features)":

Ronald J. Cox, mechanical/piping designer, 39 years of experience, 14 years of VCSNS plant experience

Jon A. Winterhalter, PE, civil engineer, 38 years of experience, VCSNS plant experience beginning 1974

Lawrence Grybosky, PE, civil/geotechnical engineer, 13 years of experience

Benjamin E. Culbert, structural designer with 12 years of experience, 3 years of VCSNS plant experience

Pradeep Velugubantla, civil engineering, 8 years of experience

The Curriculum Status report documenting successful training completion is included in Attachment A.

The site walkdown team consisted of four or five of the trained WorleyParsons personnel and one or more of SCE&G engineering, plant, or security personnel. Each WorleyParsons walkdown team member was fully indoctrinated and trained relative to the NEI 12-07 [Rev. 0-A] guidelines, current licensing basis credited flood prevention or mitigation features, and other related directives, information, and recommendations. In addition, two (2) of the WorleyParsons walkdown team members completed confined space entry training and fall protection training.

While onsite, the walkdown team was supported by WorleyParsons home office senior mechanical and electrical discipline staff and project management. Additionally, site-located client engineering and plant staff assisted the project walkdown team in collection of supplemental documents, procedures, plant history, and in location/positive identification of features during the walkdowns. The NRC resident inspector was invited to accompany the licensee during the walkdowns, and participated in two walkdowns.

#### **4.6 Walkdown Results: Key Findings, Degraded, Non-Conforming, or Unanalyzed Conditions**

A list with a total of 62 credited flood protection features was developed from the CLB documents that were reviewed (refer to Section 4.1). All 62 credited flood protection features were walked down and observations were recorded on Walkdown Record Forms. In accordance with NEI 12-07 [Rev. 0-A], only the key findings are summarized herein. The Walkdown Record Forms are included in Report TR02060-002 and are available at the plant site for review.

Degraded, non-Conforming, or unanalyzed conditions are described below, and include references to the Condition Report (CR) that enter the conditions into the licensee's correction action program (CAP). Available physical margin (APM) describes the flood margin available for applicable flood protection features at a site, and is the difference between licensing basis flood height and the flood height at which water could affect a structure, system, or component (SSC) important to safety.

4.6.1 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-12-04133:

4.6.1.1 North Berm (Credited Feature ID DE-1): Top of berm elevation is below CLB elevation 438.0 feet (low point elevation is 437.7 feet). The CLB APM of 1.40 feet is reduced to 1.10 feet. The berm being at a lower elevation than in the CLB reduces its flood protection margin. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.1.2 North Dam (Credited Feature ID DE-2): Top of berm elevation is below CLB elevation 438.0 feet (low point elevation is 437.1 feet). The CLB APM of 4.40 feet (internal, the side of the Service Water Pond) is reduced to 3.50 feet and the CLB APM of 1.40 feet (external, the side of Monticello Reservoir) is reduced to 0.50 feet. The berm being at a lower elevation than in the CLB reduces its flood protection margin. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.1.3 East Dam (Credited Feature ID DE-3): Top of berm elevation is below CLB elevation 438.0 feet (low point elevation is 437.5 feet). The CLB APM of 4.40 feet (internal) is reduced to 3.90 feet and the CLB APM of 1.40 feet (external) is reduced to 0.90 feet. The berm being at a lower elevation than in the CLB reduces its flood protection margin. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-12-03267:

4.6.2.1 Auxiliary Building, North Wall (Credited Feature ID EBW-2): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 435.9867 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.2 Fuel Handling Building, East Wall (Credited Feature ID EBW-5): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 435.77 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.3 Fuel Handling Building, South Wall (Credited Feature ID EBW-6): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 436.1415 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.4 Diesel Generator Building, North Wall (Credited Feature ID EBW-9): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 435.986 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.5 Diesel Generator Building, South Wall (Credited Feature ID EBW-11): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 436.0138 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.6 Intermediate Building, South Wall 1 (Credited Feature ID EBW-13): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 436.0012 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.7 Intermediate Building, South Wall 2 (Credited Feature ID EBW-15): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 435.9852 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.8 Intermediate Building / Penetration Access Area (Credited Feature ID EBW-17): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 435.9319 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.9 Control Building, South Wall (Credited Feature ID EBW-18): Door thresholds were below the CLB flood elevation of 436.15 feet, thus eliminating APM for this credited feature. The lowest door threshold was at elevation 436.0037 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.10 Site Grading (Credited Feature ID GR-1): There are locations where the centerline of the road in the vicinity of the plant is above elevation 436.0 feet. This feature was evaluated and recommended as "OPERABLE but DEGRADED, see CER for Corrective Action(s)" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.2.11 Grading at Refueling Water Storage Tank (Credited Feature ID YD-1): The site topography is such that overland flow resulting from local intense precipitation will overtop the RWST pit. This may result in an elevated pool elevation within the RWST pit. This feature was evaluated and recommended as "OPERABLE" in CR-12-03267. A detailed discussion on the CR is included in Section 4.8.

4.6.3 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-12-04135:

4.6.3.1 Reactor Building / Tendon Gallery, NE Wall (Credited Feature ID EBW-8): Inspection found groundwater inleakage/seepage and wet areas on walls. There are also open penetrations on the exterior slab above the tendon gallery. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.4 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-12-04137:

4.6.4.1 Diesel Generator Building, North Wall (Credited Feature ID EBW-9): Inspection found groundwater inleakage/seepage and wet areas on walls. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.4.2 Diesel Generator Building, West Wall (Credited Feature ID EBW-11A): Inspection found groundwater inleakage/seepage through wall penetrations and found unsealed penetrations. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.5 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-11-00563:

4.6.5.1 Service Water Pumpouse, East Wall (Credited Feature ID EBW-25): Inspection found groundwater inleakage/seepage through wall penetrations. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8. This item had been previously identified by plant personnel prior to the flooding walkdowns and was entered into the CAP at that time as CR 11-00563.

4.6.6 The following deficiencies were observed during the flooding walkdowns and entered into the CAP as CR-12-03527:

4.6.6.1 Service Water Pumpouse, South Wall (Credited Feature ID EBW-28): Inspection found groundwater inleakage/seepage around embedded conduits. This feature was evaluated and recommended as "OPERABLE" in the CR. A detailed discussion on the CR is included in Section 4.8.

4.6.7 The following unanalyzed conditions were observed during the flooding walkdowns:

4.6.7.1 Control Building, Electric Manhole 1 (Credited Feature ID EBW-21): A portion of Electric Manhole 1 (EMH-1) could not be inspected due to a support from existing scaffolding being erected ovetop of the access panel to EMH-1. WO#1211535 has been written to document future inspection of EMH-1. The current plan is to perform the inspection in the 1<sup>st</sup> quarter of 2013. EMH-1 is inspected every 28 days for any water, in accordance with site PM Task CMP0700.013-EMH0001. This task records the depth of water found, if any, and stores the information in the CMMS program. The manhole is located below the groundwater table. No water has been found in EMH-1 in the past quarter; this is justification for moving back this inspection.

#### **4.7 Cliff-Edge Effects**

No cliff-edge effects were identified during the flooding walkdowns. The APM for credited features (where applicable) were documented in the Walkdown Record Forms. Walkdown Record Forms are included in Report TR02060-002. Any credited feature where the APM was reduced or eliminated has been entered into the CAP as a CR (refer to Section 4.6 and Section 4.8).

## 4.8 Planned or New Flood Protection or Mitigation Measures

### 4.8.1 CR-12-04133

**Brief Description:** During review of site flood protection design in accordance with NEI 12-07 [Rev. 0-A], in response to Fukushima NTF Recommendation 2.3-Flooding, the Flooding Walkdown Team identified deficiencies related to site dams and embankments. The following deficiencies were identified during study of site topographical surveys performed as part of Fukushima Recommendation 2.1/2.3 response (Performed per PO# NU-02NN747697). (The surveys were submitted with accuracy of 0.1 feet at the dam/berm profiles.)

- The North Berm (DE-1) was identified as having local low points in crest at elevation 437.7'.
- The SWP North Dam (DE-2) was identified as having low points in crest elevation of 437.1'.
- The SWP East Dam (DE-3) was identified as having low points in crest elevation of 437.5'.

The North Berm, SWP North Dam and SWP East Dam have a design elevation of 438.0' (FSAR, Section 2.10).

**Conclusion (Excerpt):** "Although the Dam/Berm crest elevations are below 438.0' there is still available physical margin between the current Dam/Berm crest elevation and the maximum wave run-up elevation. It is also noted that the SW Pond North and East dam require protection against wind-wave activity generated in the SW Pond."

**Operability Recommendation:** "OPERABLE"

### 4.8.2 CR-12-03267

**Brief Description:** During review of site flood protection design in accordance with NEI 12-07a, in support of Fukushima NTF Recommendation 2.3 – Flooding, a discrepancy was noted between the FSAR stated site maximum ponding level and the Nuclear Safety Related building flood protection features.



Conclusion (Excerpt): Design Engineering to resolve discrepancies noted within FSAR Section 2.4.3.1.3 regarding site protection against the local intense precipitation flood event. ES-120 Operability Recommendation has been completed. Interim actions include a general visual inspection to be performed on each catch basin shown on drawing 743-001 for catch basin manhole inlet blockage as well as for potentially transportable materials in the immediate vicinity that could result in manhole blockage. Sandbags will be procured, staged, and used as determined by the Shift Supervisor in the best interests of plant safety. The direction for staging of the sandbags, as well as locations of where the sandbags are needed, will be included in EPP-015 or other applicable operating guidance.

Operability Recommendation: OPERABLE but DEGRADED, see CER for Corrective Action(s).

During the flooding walkdowns, an Unidentified Plant Flood Pathway (UPFP) was observed at the RWST pit where the RWST pit could fill up with rainwater directly falling into the pit from the PMP. This condition was entered into the CAP as CR-12-04504. A detailed discussion on CR-12-04504 is included in Report TR02060-002.

#### 4.8.3 CR-12-04135

Brief Description: During review of site flood protection design in accordance with NEI 12-07 [Rev. 0-A], in response to Fukushima NTTF Recommendation 2.3-Flooding, the Flooding Walkdown Team identified the following deficiencies in the Reactor Building Tendon Gallery:

- Active Groundwater in-leakage/seepage was noted above the 408' elevation of the Tendon Access Gallery.
- There are 8 small conduit penetrations ((6) - 1.5" and (2) - 1") located on the removable slab sections of the Tendon Gallery on the East side of the Reactor Building. Slab sections are shown on drawing E-411-060. The low point of the top of conduits is at elevation 436.19', which is above the maximum site ponding elevation of 436.15'.

Conclusion (Excerpt): "The groundwater in-leakage is considered to be very minimal and to have no impact on plant equipment. The Tendon Gallery Sump pumps located below elevation 388' provide sufficient capability to pump down the minor groundwater ingress.

WO# 1210857 has been written for maintenance to rework the seal per the standard details of drawing E-400-250 "Overall Plant – Joint Sealer Study", Section 4-4.

It is desired to provide a removable cap over the 8 small conduit penetrations. The purpose of the cap will be to preclude the very small amount of rain water which falls directly into the conduits from entering into the tendon gallery. The current amount of water that enters the conduits during rainstorms will not result in any flooding concerns; however as a good practice it is desired to provide the removable cap.

WO#1210858 has been written for electrical maintenance to install removable conduit cap on the 8 small conduits located on removable slab sections of the Tendon Gallery on the East Side of the Reactor Building (75 degrees Azimuth).

Operability Recommendation: "OPERABLE"

#### 4.8.4 CR-12-04137

**Brief Description:** During review of site flood protection design in accordance with NEI 12-07 [Rev. 0-A], in response to Fukushima NTF Recommendation 2.3-Flooding, the Flooding Walkdown Team identified the following deficiencies in the Diesel Generator Building basement (400' elevation):

- On both the West and North wall of the Diesel Generator Building minor in-leakage was noted. The in-leakage was noted leaking around the SW Piping Penetrations (DG Room 00-01) on East Wall at approximate elevation 415' as well as in-leakage at the seismic rattle space between the DGB north wall and the IB East Wall above elevation 400' (DG Room 00-02).

**Conclusion (Excerpt):** Due to the low leakage rate and sump pump capability; there is no adverse consequence to essential equipment due to the maintenance type groundwater in-leakage.

WO# 1210860 has been written for Civil Maintenance to seal the rattle space with Colma Joint Similar or equal as shown on drawing E-400-250.

WO# 1210861 has been written for Civil Maintenance to investigate the cause of and repair leakage thru the Link Seals for the 24" Service Water Piping at the 400' elevation of the Diesel Generator Building (CMP-550.001 "Diesel Building Link Seal Installation and Removal").

Operability Recommendation: "OPERABLE"

#### 4.8.5 CR-11-00563

*This item had been previously identified by plant personnel prior to the flooding walkdowns and was entered into the CAP at that time as CR 11-00563.*

**Brief Description:** During field walkdown of Service Water Pumphouse to support CDBI inspection, ground water infiltration was noted through penetrations P-SW-1-002 in Room 25-01 and P-SW-01-001 in Room 25-03. The leak is occurring due to a degraded seal in annulus between the piping penetration and the 30" SW Pump discharge piping on the SE wall of the SWPH.

**Conclusion (Excerpt):** The amount of water infiltration is minimal and will have no adverse effect on design flood levels in Rooms 25-01, 25-02 and 25-03. The seal is not a fire rated seal and is not listed in STP-728-031.

**Operability Recommendation:** "OPERABLE"

#### 4.8.6 CR-12-03527

**Brief Description:** Water was observed dripping in room 25-08 of the SWPH (Room adjacent to sump pumps and 'C' switchgear). The water appeared to be coming from the packing material around the duct bank (not the conduit) and falling into the sump pump trench. The sumps were not running.

**Conclusion (Excerpt):** The amount of water infiltration is minimal. WO#1209247 written to inspect and repair gasket/filler material.

**Operability Recommendation:** "OPERABLE"

## 5. Figures

- A. "Site Improvements Plot Plan," Drawing Number E-744-052, FSAR Figure 2.4-6, Revision Date, 11/1/11

## 6. Attachments

- A. Training Qualification Reports For Walkdown Team Members – "Flood Protection Verification (Generic Verification Walkdown of Plant Flood Protection)," Assignment Date July 12, 2012, for Ronald J. Cox, Jon A. Winterhalter, Lawrence Grybosky, Benjamin E. Culbert and Pradeep Velugubantla; "Confined Space (Confined Space Entry Qualification)," Assignment Date October 1, 2012, for Lawrence Grybosky and Benjamin E. Culbert; "Fall Protection (Fall Protection Training Qualification)," Assignment Date October 15, 2012, for Lawrence Grybosky and Benjamin E. Culbert

## 7. Revision Summary

Revision 0 is original issue.

## **Attachment A**

### **Training Qualification Reports for Walkdown Team Members**

#### **"Flood Protection Verification (Generic Verification Walkdown of Plant Flood Protection)"**

**Assignment Date July 12, 2012**

**For**  
Ronald J. Cox  
Jon A. Winterhalter  
Lawrence Grybosky  
Benjamin E. Culbert  
Pradeep Velugubantla

#### **"Confined Space (Confined Space Entry Qualification)"**

**Assignment Date October 1, 2012**

**For**  
Lawrence Grybosky  
Benjamin E. Culbert

#### **"Fall Protection (Fall Protection Training Qualification)"**

**Assignment Date October 15, 2012**

**For**  
Lawrence Grybosky  
Benjamin E. Culbert

**(4 Pages)**

## Curriculum Status

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**User**

User: \*\*\*\*\*

User Name: CULBERT, BENJAMIN E

**Qualification**

Qualification	Completed	Assignment Date	Days Remaining
FLOOD PROTECTION VERIFICATION (GENERIC VERIFICATION WALKDOWN OF PLANT FLOOD PROT)	Yes	7/12/2012	

**User**

User: \*\*\*\*\*

User Name: WINTERHALTER, JON

**Qualification**

Qualification	Completed	Assignment Date	Days Remaining
FLOOD PROTECTION VERIFICATION (GENERIC VERIFICATION WALKDOWN OF PLANT FLOOD PROT)	Yes	7/12/2012	

**User**

User: \*\*\*\*\*

User Name: GRYBOSKY, LAWRENCE

**Qualification**

Qualification	Completed	Assignment Date	Days Remaining
FLOOD PROTECTION VERIFICATION (GENERIC VERIFICATION WALKDOWN OF PLANT FLOOD PROT)	Yes	7/12/2012	

**User**

User: \*\*\*\*\*

User Name: VELUGUBANTLA, PRADEEP

**Qualification**

Qualification	Completed	Assignment Date	Days Remaining
FLOOD PROTECTION VERIFICATION (GENERIC VERIFICATION WALKDOWN OF PLANT FLOOD PROT)	Yes	7/12/2012	

Page 1 of 4

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**User**

User: \*\*\*\*\*

User Name: COX, RONALD J

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**Qualification**

Qualification	Completed	Assignment Date	Days Remaining
FLOOD PROTECTION VERIFICATION (GENERIC VERIFICATION WALKDOWN OF PLANT FLOOD PROT)	Yes	7/12/2012	

7/30/2012 01:29 PM EST

## Curriculum Item Status

## User

User: \*\*\*\*\*

User Name: CULBERT, BENJAMIN E

## Qualification

Qualification	Completed	Assignment Date	Days Remaining
Q-CONFINED SPACE (CONFINED SPACE ENTRY QUALIFICATION)	Yes	10/1/2012	544

## Items

Item ID	Title	Completion Date	Completion Status	Required Date
COURSE CS-PRACTICAL (Rev 4/5/2012 09:08 AM EST)	CONFINED SPACE PRACTICAL	10/1/2012	C-COMPLETE (Course Complete)	4/12/2014
NANTEL 1235 (Rev 3/6/2011 06:44 AM EST)	NANTEL GENERIC CONFINED SPACE ENTRY TRAINING	10/1/2012	NAN-ATTEND (CLASSROOM NANTEL COURSE (C-CODE))	4/12/2014
NANTEL 1675 (Rev 3/6/2011 06:46 AM EST)	SCE&G - CONFINED SPACE ENTRY TRAINING	10/1/2012	NAN-ATTEND (CLASSROOM NANTEL COURSE (C-CODE))	4/12/2014

## Qualification

Qualification	Completed	Assignment Date	Days Remaining
Q-FALL PROTECTION (FALL PROTECTION TRAINING QUALIFICATION)	Yes	10/15/2012	574

## Items

Item ID	Title	Completion Date	Completion Status	Required Date
COURSE C-FALL PROTECTION PRACTICAL (Rev 5/1/2012 01:58 PM EST)	FALL PROTECTION PRACTICAL	10/1/2012	C-COMPLETE (Course Complete)	5/12/2014
NANTEL 1236 (Rev 3/6/2011 06:51 AM EST)	NANTEL GENERIC FALL PROTECTION TRAINING	10/1/2012	NAN-ATTEND (CLASSROOM NANTEL COURSE (C-CODE))	5/12/2014
NANTEL 1674 (Rev 3/6/2011 06:53 AM EST)	SCE&G - FALL PROTECTION TRAINING	10/1/2012	NAN-ATTEND (CLASSROOM NANTEL COURSE (C-CODE))	5/12/2014

## User

Curriculum Item Status

User: \*\*\*\*\*

User Name: GRYBOSKY, LAWRENCE

Qualification

Qualification	Completed	Assignment Date	Days Remaining
Q-CONFINED SPACE (CONFINED SPACE ENTRY QUALIFICATION)	Yes	10/1/2012	544

Items

Item ID	Title	Completion Date	Completion Status	Required Date
COURSE CS-PRACTICAL (Rev 4/5/2012 09:08 AM EST)	CONFINED SPACE PRACTICAL	10/1/2012	C-COMPLETE (Course Complete)	4/12/2014
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Qualification

Qualification	Completed	Assignment Date	Days Remaining
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NANTEL 1674 (Rev 3/6/2011 06:53 AM EST)	SCE&G - FALL PROTECTION TRAINING	10/1/2012	NAN-ATTEND (CLASSROOM NANTEL COURSE (C-CODE))	5/12/2014

10/15/2012 11:20 AM EST

Recommendation 2.3 - Flooding Walkdown Report Attachment A

TR02060-001 Revision 0



**REVIEW CONSIDERATIONS: OWNER'S ACCEPTANCE REVIEW**

D

ECR/Document Number: TR02060-001

Project Title: Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flooding Aspects of Recommendation 2.3 of the Near-Term Task Force Review of Insights From the Fukushima Accident- Verification Walkdown Report for VCSNS Plant Flood Protection Features

The following questions should be considered, as a minimum, during the performance of an Owner's Acceptance Review of vendor developed engineering documents.

- | Yes                                 | N/A                                 |   |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Is the technical information/design complete, consistent, and correct for the activity under review?  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Were inputs, including codes, standards, and regulatory requirements correctly selected and applied?  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Are assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent re-verification when the detailed design activities are completed? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Is the document/package developed in a clear and understandable manner?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Is the plant design basis/criteria maintained?  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Are references properly identified and complete?  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were design considerations from EC-01, Attachment I and II adequately addressed/incorporated?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were technical, design, program or procedure requirements adequately addressed/incorporated?  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Have applicable construction and operating experiences been considered?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were designs developed in accordance with good engineering practices and established ES guidance documents?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Have impacted documents, databases (EC-02) and equipment changes been identified?   |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Is the document/package developed in accordance with applicable station procedures (e.g., SAP-133, ES-453, ES-455)?   |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Is the document/package developed in a clear and understandable manner as to not require recourse to the Originator?  |

- Yes    N/A
- Does the design meet interfacing organizations operational/maintenance requirements?
- Is technical information adequate to perform the task?
- Is the acceptance criteria adequate for the activity under review?
- Is the post modification testing adequate to confirm the design?
- Has the 10CFR50.59 Review Process been completed, if required?

For work performed in accordance with VC Summer Nuclear Station Procedures, the procedure forms must be signed by the originator and if not qualified must be co-signed by a qualified person. Check the qualifications of the contractor personnel signing the procedure forms.

- Yes    No
- Are contractor personnel signing the VCSNS procedure forms qualified under a vendor qualification program or the VCSNS Nuclear Training Manual for those procedures?
- If not have the VCSNS forms been co-signed by a person qualified to the applicable procedure?

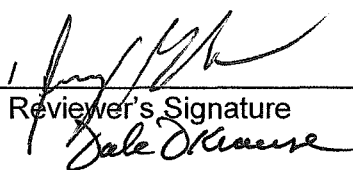
Technical Reviews

- Are all technical reviews complete and all comments resolved to the satisfaction of the commenter?

TECHNICAL REVIEW: Check all blocks that apply

<input type="checkbox"/> Principal Piping Engineer	<input type="checkbox"/> Principal Engr Analysis Engineer	<input type="checkbox"/> Principal I&C Engineer
<input type="checkbox"/> Principal Mechanical Engineer	<input checked="" type="checkbox"/> Principal Civil Engineer	<input type="checkbox"/> Principal PSA Engineer
<input type="checkbox"/> Principal Nuclear Fuels Engineer	<input type="checkbox"/> Principal Digital Engineer	<input type="checkbox"/> Principal Electrical Engineer
<input type="checkbox"/> Principal EQ Engineer	<input type="checkbox"/> Principal Fire Protection Engineer	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____	<input type="checkbox"/> _____

Jeremy Graham  
 Reviewer's Printed Name

  
 Reviewer's Signature

11/20/12  
 Date

11-21-12

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