



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

July 24, 2012

Mr. Michael J. Annacone  
Vice President  
Brunswick Steam Electric Plant  
P.O. Box 10429  
Southport, NC 28461-0429

**SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT – NRC SUPPLEMENTAL  
INSPECTION REPORT 05000325/2012008 AND 05000324/2012008**

Dear Mr. Annacone:

On June 21, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection pursuant to Inspection Procedure 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area", at Brunswick Unit 1 and 2 facilities. The enclosed inspection report documents the inspection results, which were discussed on June 21, 2012, with you and other members of your staff.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed to examine the causes for and actions taken related to a white finding with low to moderate safety significance which was cited in the fourth quarter of 2011. This issue was previously documented and assessed in NRC Inspection Report 05000325/2011014 and NRC Inspection Report 05000324/2011014. The NRC was informed on May 31, 2012 of your staff's readiness for this inspection.

The objectives of this supplemental inspection were to provide assurance that: (1) the root causes and the contributing causes for the risk-significant issues were understood; (2) the extent of condition and extent of cause of the issues were identified; and (3) corrective actions were or will be sufficient to address and preclude repetition of the root and contributing causes. The inspection consisted of examination of activities conducted under your license as they related to safety, compliance with the commission's rules and regulations, and the conditions of your operating license.

The NRC has determined that inspection objectives stated above have been met. Therefore in accordance with IMC 0305, "Operating Reactor Assessment Program," this performance issue shall not be considered in the Action Matrix after the end of the third quarter of 2012.

The NRC determined that the staff at Brunswick performed an acceptable evaluation of the white finding. Your staff's evaluation determined that the root cause of the issue was that the Brunswick organization did not understand the significance of external events to the overall core damage frequency. This lack of understanding, resulted in weak controls for inspection, correction, and evaluation of the plant design features related to all external events, including flooding, seismic and high wind events. The inspector determined that the corrective actions that you've taken have restored the emergency diesel generator fuel oil tank enclosures to full compliance with the licensing basis. In addition, the inspector found that corrective actions

taken or planned appear reasonable and will correct the causes that led to the noncompliance and prevent recurrence.

Based on the results of this inspection, no findings were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Randall A. Musser, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Docket Nos.: 50-325, 50-324  
License Nos: DPR -71, DPR-62

Enclosure: Inspection Report 05000325, 324/2012008  
w/ Attachment: Supplemental Information

cc w/ encl: (See page 3)

taken or planned appear reasonable and will correct the causes that led to the noncompliance and prevent recurrence.

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Sincerely,

/RA/

Randall A. Musser, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

Docket Nos.: 50-325, 50-324  
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Enclosure: Inspection Report 05000325, 324/2012008  
w/ Attachment: Supplemental Information

cc w/ encl: (See page 3)

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(cc w/encl cont'd – See next page)

M. Annacone

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M. Annacone

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Letter to Michael J. Annacone from Randall A. Musser dated July 24, 2012

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT – NRC SUPPLEMENTAL  
INSPECTION REPORT 05000325/2012008 AND 05000324/2012008

Distribution w/encl:

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L. Douglas, RII

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RidsNrrPMBrunswick Resource

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No.: 50-325, 50-324

License No.: DPR-71, DPR-62

Report No.: 05000325/2012008, 05000324/2012008

Licensee: Carolina Power and Light (CP&L)

Facility: Brunswick Steam Electric Plant, Units 1 & 2

Location: Southport, NC

Dates: June 18, 2012 through June 21, 2012

Inspector: C. Scott, Resident Inspector, H.B. Robinson

Approved by: Randall Musser, Chief  
Reactor Projects Branch 4  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

Inspection Report (IR) 05000325/2012008, 05000324/2012008; June 18, 2012, - June 21, 2012; Brunswick Steam Electric Plant, Unit 1 and Unit 2; Supplemental Inspection Procedure (IP) 95001 in response to a failure to identify and correct degradation of the emergency diesel generator fuel oil tank room entrance enclosures.

This inspection was conducted by a resident inspector. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### Cornerstone: Mitigating Systems

The NRC staff performed this supplemental inspection in accordance with IP 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation of the White inspection finding associated with the degradation of the external flood barrier for the emergency diesel generator fuel oil tank rooms. The NRC staff previously characterized this issue as having low to moderate safety significance (white), as documented in NRC IR 05000325/2011014 and 05000324/2011014.

During this supplemental inspection, the inspectors determined that the licensee performed an adequate evaluation of the NRC identified White finding for failure to identify and correct a condition adverse to quality involving the external flood barriers for the EDG fuel oil tank rooms. Specifically, the entrance enclosures which house the EDG fuel oil tanks had several openings, unsealed pin holes, and a narrow gap along the perimeter of the base walls, which would have allowed water intrusion in the EDG fuel tank rooms during a design bases external event. (Hurricane) The licensee concluded that the root cause of the issue was that the Brunswick organization did not understand the significance of external events to overall core damage frequency. This resulted in weak controls for inspection, correction and evaluation of the plant design features related to external events.

The inspectors determined that the licensee's problem identification, root cause, extent of condition evaluation and extent of cause evaluation for the White finding were generally adequate. Additionally, the inspector determined that the corrective actions taken and planned appear reasonable and will correct the causes that led to the non-compliance and prevent recurrence. Given the licensee's acceptable performance in addressing the degraded external flood barriers, the White finding associated with this issue will only be considered in assessing plant performance for a total of four quarters in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program". Inspectors will review the licensee's implementation of corrective actions during a future inspection.

#### A. NRC-Identified and Self-Revealing Findings

No findings were identified

#### B. Licensee-Identified Violations

No findings were identified

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## REPORT DETAILS

### 4. OTHER ACTIVITIES

#### 4OA4 Supplemental Inspection (95001)

##### .01 Inspection Scope

The NRC staff performed this supplemental inspection in accordance with IP 95001 to assess the licensee's evaluation of a White finding, which affected the mitigating systems cornerstone in the reactor safety strategic performance area. The White finding involved an NRC inspector identified finding for the failure to identify and correct a condition adverse to quality associated with the entrance enclosures for the Emergency Diesel Generator (EDG) fuel oil tank rooms. Specifically, the enclosures contained openings which would adversely impact their ability to mitigate external flooding of the EDG fuel oil tank rooms in the event of an external event (hurricane). The finding was characterized as having low to moderate safety significance (White) based on the results of a Phase 3 risk analysis performed by a region-based senior reactor analyst (SRA), as discussed in NRC Inspection Report (IR) 05000325/2011012; 05000324/2011012. The licensee entered the Regulatory Response Column of the NRC's Action Matrix in the fourth quarter of 2011 as a result of this inspection finding.

Following the identification of this condition, new sealant material was installed to close the openings of the entrance enclosures for the EDG fuel oil tank rooms, and jersey barriers were installed to limit wave run-up on the enclosures. In preparation for the inspection, the licensee performed a root cause evaluation (RCE), RCE-490292, Revision 6.2, to identify weaknesses that existed in various organizations, which allowed for a risk-significant finding and to determine the organizational attributes that resulted in the white finding. The licensee staff informed the NRC staff on May 31, 2012 that it had completed its root cause evaluation of the circumstances surrounding the risk-significant performance issue and were ready for the NRC to assess the their evaluation and subsequent corrective actions.

The inspection objectives were to:

- Provide assurance that the root and contributing causes were understood;
- Provide assurance that the extent of condition and extent of cause of risk-significant issues were identified; and
- Provide assurance that the licensee's corrective actions were or will be sufficient to address the root and contributing causes and to preclude repetition.

The inspectors reviewed the licensee's RCE in addition to other evaluations conducted in support and as a result of the RCE. The inspectors reviewed corrective actions that were taken or planned to address the identified causes. The inspectors also held discussions with licensee personnel to ensure that the root and contributing causes and

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the contribution of safety culture components were understood and corrective actions taken or planned were appropriate to address the causes and preclude repetition. Additionally, the inspector accompanied site engineering on a plant walkdown to inspect and review the temporary and permanent modifications installed in response to the White Finding.

## .02 Evaluation of the Inspection Requirements

### 02.01 Problem Identification

- a. IP 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents who identified the issue (i.e., licensee-identified, self-revealing, or NRC-identified) and the conditions under which the issue was identified.

The inspectors determined that the licensee's evaluation of this risk significant issue appropriately determined who and under what conditions the issue was identified. Specifically, licensee's event chronology review documented that the openings in the access enclosures were identified by NRC inspectors.

- b. IP 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents how long the issue existed and prior opportunities for identification.

The licensee's evaluation determined that the existence of holes and gaps in the fuel oil tank access enclosures was first identified on April 20, 2011. However the licensee was unable to reasonably determine how long the condition existed. In their evaluation, the licensee concluded that the degradation to the fuel oil tank chamber (FOTC) access structure was a result of long-term aging degradation of the rubber seals between panels, fastener washers and holes around conduit penetrations.

The licensee noted that there were multiple opportunities to identify and correct the degraded conditions before they were identified by the NRC. Several of the missed opportunities included: 1) Brunswick's 1995 response to Generic Letter 88-20, Individual Plant Examination Of External Events (IPEEE), failed to properly identify the risks associated with the FOTC and the fuel oil transfer pumps, 2) Brunswick's response to multiple flooding related industry events failed to result in any corrective actions to improve plant design or procedures, 3) Brunswick's response to the April 2011 industry sponsored, Fukushima Daiichi Nuclear Station Fuel Damage Caused by Earthquake and Tsunami Event Report, which required walk-downs to review flood mitigating equipment including passive structural items such as walls and structures for non-safety and safety related equipment, failed to identify the degraded condition of the enclosures for the EDG FOTC.

The inspectors determined that the licensee's evaluation of the issue had identified, as appropriate and when able, how long the above discussed conditions existed and any prior opportunities for identification.

- c. IP 95001 requires that the inspection staff determine that the licensee's evaluation documents the plant specific risk consequences, as applicable, and compliance concerns associated with the issues.

The NRC determined this issue was a White finding, as documented in NRC IR 05000325/2011014, 05000324/2011014. While the RCE did not specifically address the compliance concerns, the licensee did provide a response to the NRC Follow-Up Inspection Report, which informed the licensee of the preliminary White finding. In the licensee's letter, dated May 17, 2012, they indicated that full compliance with current design bases was achieved on July 29, 2011 when the holes and gaps in the enclosures were sealed. The licensee did not request a Pre-decisional Enforcement Conference (PEC) nor did they contest the characterization of the finding and violation.

The licensee's RCE concluded that, the fuel oil supply, a key station safety feature of the plant, was at increased vulnerability to flooding during a period of high hurricane probability and that an external flooding event could have challenged flood protection features. Subsequent analysis, by the licensee, found that the fuel oil system would not have been compromised by design basis flooding, but limited margin existed to the water level that would have likely caused failure. The licensee calculated that the core damage Frequency (CDF) for the design basis flooding event was approximately 1.0E-06.

The inspectors determined that the licensee's RCE documented the plant specific risk consequences and that the licensee response letter, dated May 17, 2012, appropriately addressed the associated compliance concerns.

- d. Findings

No findings were identified.

#### 02.02 Root Cause, Extent of Condition, and Extent of Cause Evaluation

- a. IP 95001 requires that the inspection staff determine that the licensee evaluated the issue using a systematic methodology to identify the root and contributing causes.

The licensee used the following systematic methods to complete RCE-490292:

- Operational experience review;
- timeline construction;
- data gathering through interviews and documents review
- events and causal factor charting; and
- barrier analysis;

The licensee used events and causal factor charting to evaluate weaknesses in safety culture. The inspectors determined that the licensee used systematic methods which were adequate to identify the root and contributing causes.

- b. IP 95001 requires that the inspection staff determine that the licensee's RCE was conducted to a level of detail commensurate with the significance of the issue.

The inspectors reviewed the licensee's RCE and found that it included an extensive timeline of events and an event and causal factor chart as discussed in the previous section. Using a multidisciplinary team, the licensee identified that the root cause for this risk significant issue was that the Brunswick organization not understanding the significance of external events to overall core damage frequency. This led to weak controls for inspection, correction, and evaluation of the plant design features related to the external events. The RCE also identified that the primary contributing was the design basis documents related to external flooding were unclear to station personnel. Additionally the licensee determined that the contributing causes included: (1) the monitoring process defined by procedure EGR-NGGC-0351, Condition Monitoring of Structures, was not effective in identifying the FOTC access structure degraded condition, (2) the Progress OE process did not select relevant condition reports from Crystal River Unit 3 for fleet review as internal OE, (3) management oversight did not ensure adequate work prioritization for flood protection related activities and (4) industry sponsored post-Fukushima Daiichi event report required inspections did not identify the degraded condition of the FOTC access structure.

The inspectors concluded that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

- c. IP 95001 requires that the inspection staff determine that the licensee's RCE included a consideration of prior occurrences of the issue and knowledge of OE.

The licensee's RCE included a thorough evaluation of internal and external OE events related to external events. The search of internal OE focused on external flooding concerns at Progress Energy sites (Brunswick, Crystal River 3 and Robinson) while the external search focused on a review of industry event database and the NRC website. The licensee identified similar events that could have been used to prevent this problem had they been appropriately classified, investigated, and had appropriate action been put in place. The licensee noted several instances of external event concerns not being selected for internal or external review because the external event concern was thought to be site specific. As a result of this, the licensee initiated several corrective actions to improve the evaluation and selection of operating experience.

The inspectors determined that the root cause evaluation, for degraded EDG fuel oil tank room enclosures, had adequately considered prior internal and external occurrences of the problem and had knowledge of internal and external operating experience.

- d. IP 95001 requires that the inspection staff determine that the licensee's RCE addresses the extent of condition and extent of cause of the issue(s).

The licensee's evaluation considered the extent of condition associated with the degraded EDG fuel oil enclosures. The extent of condition was evaluated for both the material condition of the enclosures and the slow organizational response to address the problem once it was identified. Additionally, to address the extent of condition the

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licensee initiated actions to perform engineering walk-downs of all similar structures containing safety related equipment to identify if there were any other potential adverse conditions. To address the slow organizational response to the adverse condition, the licensee initiated actions to ensure that those personnel involved in the problem reporting or screening processes, and the work oversight committee, have the appropriate sensitivity and sufficient guidance to prioritize degraded conditions associated with equipment designed to protect against external events.

The root cause team also evaluated the extent of cause for both the root and primary contributing causes. The original scope of the extent of cause was limited to flooding events and their design basis. However, the evaluation prompted the licensee to expand the scope of the root cause investigation and address external events, including seismic events and high wind events such as tornados. The team also expanded the scope of the primary contributing cause to include the design bases for all external events.

The inspectors determined that the extent of condition and extent of cause evaluations for the degraded EDG fuel oil tank enclosures were adequately addressed in the licensee's RCE. The inspectors also noted that the licensee implemented corrective actions to address issues identified by the extent of condition and extent of cause evaluations.

- e. IP 95001 requires that the inspection staff determine that the licensee's root cause, extent of condition, and extent of cause evaluations appropriately considered the safety culture components as described in IMC 0305.

The licensee's root cause team performed a nuclear safety culture evaluation to determine whether a weakness in any safety culture component was a root cause or a significant contributing cause. The results of the evaluation were compared to the Safety Culture Components as defined in NRC Regulatory Issue Summary 2006-13 and NRC Inspection Manual, Chapter 0310, Components Within The Cross-Cutting Areas. The licensee's evaluation did not identify any additional causes.

The inspectors reviewed the safety culture evaluation, the extent of condition and extent of cause evaluations and determined that the safety culture components of the White finding were appropriately considered and reviewed for this issue.

- f. Findings

No findings were identified.

#### 02.03 Corrective Actions

- a. IP 95001 requires that the inspection staff determine that: (1) the licensee specified appropriate corrective actions for each root and/or contributing cause, or (2) an evaluation that states no actions are necessary is adequate.

Following the NRC identification of the degraded fuel oil enclosures on April 20, 2011, the licensee initiated actions to seal and repair the hole/ gaps in the two enclosures. The licensee completed these actions on July 29 2011. As a result of the RCE the licensee has initiated additional actions to address all the root and contributing causes. The licensee's root cause evaluation concluded that one root cause, one primary contributing cause and four contributing causes applied to the degraded EDG fuel oil tank enclosures. The corrective action to address the root cause and prevent reoccurrence is the development of an engineering program that will ensure performance of necessary operation, maintenance, testing and inspection activities to maintain the design features used to mitigate consequences of the external events (flooding, high winds and seismic. The licensee's corrective action to address the primary contributing cause is to revise design bases documents and applicable sections of the final safety analysis report to clarify the design features of safety related buildings.

The inspectors reviewed the licensee's corrective actions for each root cause, primary contributing cause and contributing cause and determined that adequate corrective actions have been or will be taken to address the cause of the risk significant issue.

- b. IP 95001 requires that the inspection staff determine that the licensee prioritized corrective actions with consideration of risk significance and regulatory compliance.

During the review of the RCE, the inspectors determined that the licensee's corrective actions to address the performance deficiency were appropriately prioritized relative to their risk significance and regulatory compliance. Additionally the inspectors determined that the corrective actions were prioritized in accordance with the licensee's CAP.

- c. IP 95001 requires that the inspection staff determine that the licensee established a schedule for implementing and completing the corrective actions.

The inspectors reviewed the licensee's RCE and determined that the corrective actions to address the performance deficiency have been completed or reasonably scheduled. The remaining corrective actions are scheduled to be completed by December 2012.

- d. IP 95001 requires that the inspection staff determine that the licensee developed quantitative and/or qualitative measures of success for determining the effectiveness of the corrective actions to preclude repetition.

The inspectors determined that the effectiveness review plan, documented in the RCE, had quantitative and qualitative criteria established to measure success.

- e. IP 95001 requires that the inspection staff determine that the licensee's planned or taken corrective actions adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection, if applicable.

The NRC issued the NOV to the licensee on December 27, 2011. The licensee provided the NRC a written response to the NOV on May 17, 2012. The licensee's response described: (1) corrective steps which have been taken and the results achieved;

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(2) corrective steps which will be taken; (3) the date when full compliance will be achieved; and (4) the reasons for the violation.

During this inspection, the inspectors confirmed that the corrective actions taken and planned, to address the NOV, were adequate and appropriately prioritized. The licensee restored full compliance on July 29, 2011, by sealing the holes and gaps in the enclosure.

f. Findings

No findings were identified.

4OA6 Exit Meeting

On June 21, 2012, the inspector presented the inspection results to Mr. Annacone and other members of his staff. The inspectors asked the licensee if any of the material examined during the inspection should be considered proprietary. The licensee did not identify any proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee personnel:

M. Annacone, Site Vice President  
P. Brown, Support Technical Training  
J. Burke, Engineering Director  
C. George, Technical Services Manager  
L. Grzeck, Licensing Supervisor  
J. Krakuszeski, Outage and Scheduling Manager  
J. Johnson, Environmental and Radiological Controls Manager  
J. Kalamaja, Operations Manager  
A. Pope, Support Services Manager  
T. Sherrill, Technical Support  
E. Willis, Director Site Operations

#### NRC personnel:

R. Musser, Chief, Reactor Projects Branch 4, Division of Reactor Projects Region II  
P. O'Bryan, Senior Resident Inspector  
M. Schwieg, Resident Inspector

### **LIST OF DOCUMENTS REVIEWED**

#### Procedures

CAP-NGGC-0200, Condition identification and Screening, Rev. 33  
CAP-NGGC-0205, Condition Evaluation and Correction Action Process, Rev. 15  
OAI-68, Brunswick Nuclear Plant Response to Severe Weather Warnings, Rev. 41  
TRN-NGGC-0100, Analysis Phase, Rev. 10  
EGR-NGGC-0351, Condition Monitoring of Structures, Rev.17

#### Work Orders

1938085, 2-DG-BLG-EL002-1 Seal Openings in FM, 2-DGB-DR-EL023-124, Install Interim Barrier Stair No.7  
1938085-01, Seal Openings in FOTC Metal Enclosure  
1988336-01, Upgrade North FOTC Enclosures per EC 82928  
1988336-02, Upgrade South FOTC Enclosures per EC 82928  
2002822, 2-OGB-DR-EL021-106 Repair Flood Door

#### AR's

169029, Longstanding Water in EDG-1A Fuel oil Storage Tank  
516032, Conduct Quick Hit Self Assessment of BNP Preparedness for NRC 95001  
492979-5, Capture Document for external Flooding Protection Vulnerabilities  
RCE- 490292, 4 Day Fuel Oil Tank Enclosure Degradation, Rev 6.2



Miscellaneous

Flood Protection Vulnerability Walkdown Inspection Checklist: Unit 2 Reactor Building  
 Flood Protection Vulnerability Walkdown Inspection Checklist: AOG Building  
 490292-27, Interim Training Material for PIOC Members on Operating Experience  
 Interim Training for Work Oversight Committee on Flooding Barriers  
 Brunswick Non-Licensed Operator Continuing Training Program, 2 Year Backbone Curriculum  
 Outline, 2013 and 2013, Rev. 1  
 Brunswick Licensed Operator Continuing Training Program, 2 Year Backbone Curriculum  
 Outline, 2013 and 2013, Rev. 00  
 BNP Flooding Response Action Plan  
 Flood Protection Vulnerability Walkdown Inspection Checklist: Four Day Tank Vaults #1  
 Flood Protection Vulnerability Walkdown Inspection Checklist: Diesel generator Building  
 Basement  
 Flood Protection Vulnerability Walkdown Inspection Checklist: SW Building  
 Flood Protection Vulnerability Walkdown Inspection Checklist: Four Day Tank Vaults #2  
 Flood Protection Vulnerability Walkdown Inspection Checklist: Radwaste Building  
 Flood Protection Vulnerability Walkdown Inspection Checklist: SWB, FOTC, RB2  
 SD-58, Structures and Crane, Rev.9  
 DBD-106, Hazard Analysis, Rev.1  
 DBD-58, Structures System, Rev.14  
 EC 8288R10, Diesel FOTC Exterior Steel Providing Flood Protection  
 Brunswick Computer Based Training on External Flooding

Action Requests generated as a result of this inspection

545067, 82928 DG Enclosure Drawing Improvement  
 545570, Errors Noted in Effectiveness Review Plan