**James M. Landreth**
Vice President
Fossil Hydro Operations

SCE&G®
A SCANA COMPANY

June 1, 2011

Mr. Stephen Hoffman
US Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
5th Floor, N-5237
Arlington, VA 22202-2733

Subject: South Carolina Electric & Gas Company
Urquhart Generating Station
Coal Combustion Residue Impoundment
Round 9 – Dam Assessment Report (April 2011)

Dear Mr. Hoffman:

South Carolina Electric & Gas Company (SCE&G) hereby files electronically our comments regarding the referenced Urquhart Generating Station Coal Combustion Residual Impoundment Round 9 – Dam Assessment Report (April 2011), including a revised water balance diagram (marked up and clean copy). This report was posted on your secured website link on May 5, 2011.

To address the recommendations regarding the maintenance and methods of operation, SCE&G has already implemented an action plan to add the downstream slope into the scope of its regular vegetation control program and to occasionally blade the crest of the embankment as necessary and minimize vehicular traffic on the crest.

If you have any questions about this filing, please contact Mr. William Argentieri at (803) 217-9162 or by email at bargentieri@scana.com.

*Very truly yours,*

James M. Landreth

*Mr. James M. Landreth, Vice President*
*Fossil & Hydro Operations*
*South Carolina Electric & Gas Company*
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WRA/wa

Enclosures

c: M. C. Summer/W. R. Argentieri
T. N. Effinger/ J. C. Younan
D. D. Jerome/ J. K. Todd
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## Coal Combustion Residue Impoundment
## Round 9 - Dam Assessment Report

## *Urquhart Generating Station*
## *Ash Ponds*
## *South Carolina Electric & Gas*
## Beech Island, South Carolina

**Prepared for:**

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

**Prepared by:**

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727
**April 2011**

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## INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response, the U.S. EPA is assessing the stability and functionality of the coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the Urquhart Generating Station is based on a review of available documents and on the site assessment conducted by Dewberry personnel on February 16, 2011. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2.5, there are two recommendations based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the Urquhart Generating Station is **SATISFACTORY** for continued safe and reliable operation, with no recognized existing or potential management unity safety deficiencies.

## PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety)

In early 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

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EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry & Davis LLC about the Urquhart ash ponds that was reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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| Doc 02: | ~~Process~~ Water Balance Diagram |
| Doc 03: | Pond Volumes |
| Doc 04: | EPA Questionnaire |
| Doc 05: | F&ME Structural Stability Report |
| Doc ~~05~~06: | Dike Landfill Pond Inspections 2009 |
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| Doc ~~08~~09: | Dike Landfill Pond Inspections 2006 |
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**APPENDIX B**

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|---|---|
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## 1.0 CONCLUSIONS AND RECOMMENDATIONS

### 1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, February 16, 2011, and review of technical documentation provided by South Carolina Electric & Gas (SCE&G).

#### 1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments and spillway appear to be structurally sound based on a review of the engineering data provided by the owner's technical staff and Dewberry engineers' observations during the site visit.

#### 1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

Adequate capacity & freeboard exists to safely pass the design storm.

#### 1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is adequate. Engineering documentation reviewed is referenced in Appendix A.

#### 1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management unit provided by the owner was an accurate representation of what Dewberry observed in the field.

#### 1.1.5 Conclusions Regarding the Field Observations

The overall assessment of the ash pond embankment system was that it was in satisfactory condition. Surficial sloughing was observed along the Ash Pond's downstream slope. Embankments appear structurally sound.

#### 1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the fly ash management unit. There was no evidence of significant embankment repairs or prior releases observed during the field inspection. Vegetation removal is required on the downstream slope.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

**The facility is SATISFACTORY for continued safe and reliable operation. No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria.**

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Maintenance and Methods of Operation

An action plan should be developed to address removal of woody vegetation along the downstream slope. Specifically, SCE&G needs to:

- Remove brush from the downstream slope
- Address minor rutting along crest and avoid vehicular traffic along crest

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## 1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

### 1.3.1 List of Participants

Tim Miller, South Carolina Electric & Gas (SCE&G)

Dave Jerome, South Carolina Electric & Gas (SCE&G)

Toi Bowie, South Carolina Electric & Gas (SCE&G)

Tom Effinger, SCANA

Jean-Claude Younan, SCANA

Frederic Shmurak, Dewberry & Davis, Inc.

Justin Story, Dewberry & Davis, Inc

### 1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on February 16, 2011.

Frederick Shmurak, P.E.

Justin Story, E.I., LEED AP BD+C

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## 2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

### 2.1 LOCATION AND GENERAL DESCRIPTION

The Urquhart Generating Station and ash pond are located in Beech Island, South Carolina just off the Savannah River. The town of Jackson is approximately 7 miles downstream of the ash ponds. Figure 2.1a depicts a vicinity map around the Urquhart Generating Station while Figure 2.1b depicts an aerial view of the Urquhart Generating Station.

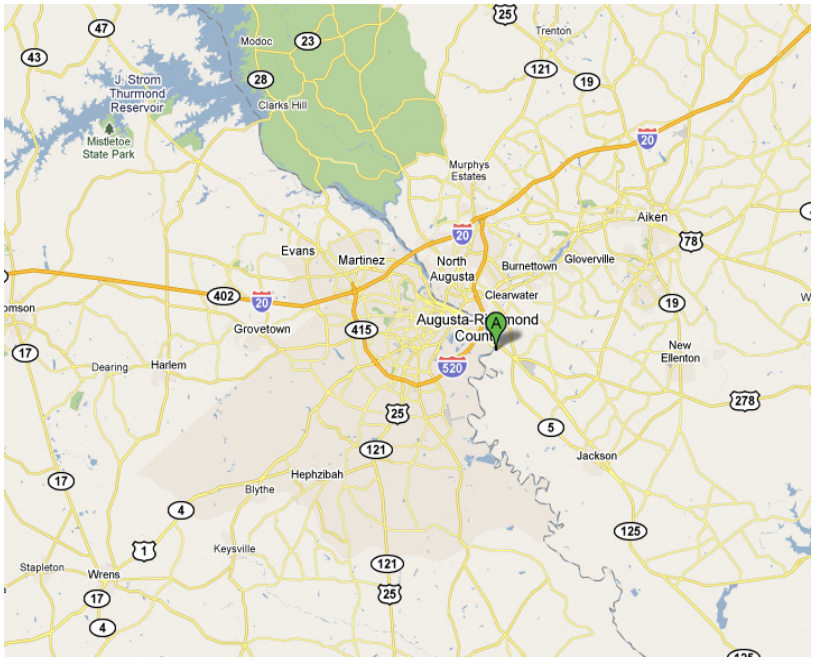


Figure 2.1a: Urquhart Generating Station Vicinity Map

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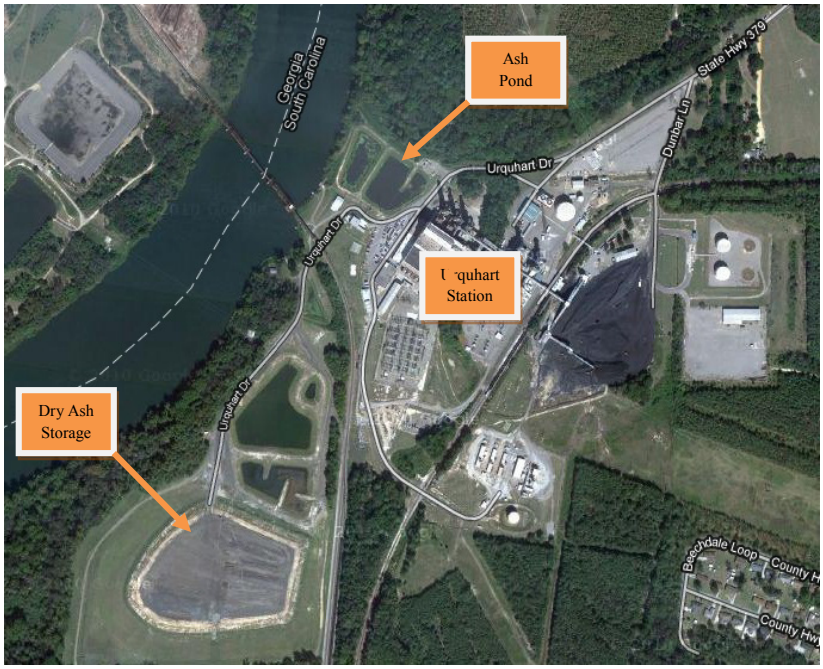


Figure 2.1b: Urquhart Generating Station Aerial View

**Comment [wra1]:** Note – Arrows were pointing to the wrong places. Descriptions and arrows of ash pond, dry ash storage and Urquhart Station are moved to point at the correct item.

**Table 2.1: Summary of Dam Dimensions and Size**

| | **Urquhart Ash Pond** |
|---|---|
| **Dam Height (ft)** | Upper Pool 8'; Lower Pool 14' |
| **Crest Width (ft)** | 12 |
| **Length (ft)** | 1,450 |
| **Side Slopes (upstream) H:V** | 2:1 |
| **Side Slopes (downstream) H:V** | 2:1 |

Appendix A: Doc 01 – Site Plan

## 2.2 COAL COMBUSTION RESIDUE HANDLING

### 2.2.1 Fly Ash

Fly ash is collected at the base of the stack by an electrostatic precipitator. The collected ash is stored in hoppers and conveyed pneumatically to a silo (see photo below). From the silo it is mostly sold for beneficial use. What is not sold is hauled via truck to a permitted dumping site. ~~It can also be conveyed hydraulically in a pipe to the ash pond.~~ The plant ~~currently~~ does not discharge into the ash pond. ~~A flowchart for handling the fly ash is shown in Appendix A (Doc 02 – Water Flow Diagram).~~

Comment [wra2]: Photo below shows a bottom ash dewatering bin, not a fly ash silo

Comment [wra3]: The flow chart is a water balance diagram that does not pertain to the fly ash system since the fly ash system was modified in November 2010.


Hopper discharge where trucks can load ash material

### 2.2.2 Bottom Ash

Bottom ash is collected from the furnace and is conveyed hydraulically through ~~the same~~a pipe ~~as the fly ash into the ash pond~~to a dewatering bin. From the dewatering bin it is trucked to a permitted landfill. The transport water overflows from the dewatering bin to the ash pond. A small amount of bottom ash fines may carry over into the ash pond, but this has not been confirmed or quantified.

2.2.3 Boiler Slag

Boiler slag is collected from the boiler and is sluiced into the same pipe that conveys ~~fly and~~ bottom ash into the ~~ash pond~~dewatering bin.

2.2.4 Flue Gas Desulfurization Sludge

No Scrubbers are used in this plant so there is no flue gas desulfurization (FGD) process or related waste products to be discharged.

## 2.3 SIZE AND HAZARD CLASSIFICATION

The ash pond is partly impounded by an earthen embankment system consisting of a dike configuration and partly incised into natural grade. There is one ash pond for the plant separated into two pools (upper and lower) by an internal dike. Reference Table 2.1 for dam height, crest width, length and side slopes. The current storage volume at the normal pool elevation is 30,810 CY for the ash pond based on a SCE&G Pond Volume map provided (Appendix A: Doc 03 – Pond Volumes).

**Table 2.3a: USACE ER 1110-2-106**
**Size Classification**

| Category | Impoundment | |
|---|---|---|
| | **Storage (Ac-ft)** | **Height (ft)** |
| Small | 50 and < 1,000 | 25 and < 40 |
| Intermediate | 1,000 and < 50,000 | 40 and < 100 |
| Large | > 50,000 | > 100 |

A Hazard Classification has not been assigned by a regulatory agency, but based on observations, a classification of **Low** appears to be appropriate. Per the Federal Guidelines for Dam Safety dated April 2004, a Low Hazard Potential classification applies to those dams where failure or misoperation results in no probable loss of human life and/or environmental losses. Losses are principally limited to the owner's property.

**Table 2.3b: FEMA Federal Guidelines for Dam Safety**
**Hazard Classification**

| | **Loss of Human Life** | **Economic, Environmental, Lifeline Losses** |
|---|---|---|
| Low | None Expected | Low and generally limited to owner |
| Significant | None Expected | Yes |
| High | Probable. One or more expected | Yes (but not necessary for classification) |

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## 2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The ash pond contains fly ash, bottom ash, pyrites and boiler slag. The drainage area is essentially the surface area of the ponds.

| **Table 2.4: Maximum Capacity of Unit** | |
|---|---|
| **Urquhart Ash Pond** | |
| **Surface Area (acre)** | 2.2 |
| **Current Storage Capacity (cubic yards)** | 29,500-30,810 |
| **Current Storage Capacity (acre-feet)** | 18 - 19 |
| **Total Storage Capacity (cubic yards)** | Not Provided |
| **Total Storage Capacity (acre-feet)** | Not Provided |
| **Crest Elevation (feet)** | 142.8 |
| **Normal Pond Level (feet)** | Upper Pool 135.8/Lower Pool 134.6 |

Appendix A: Doc 04 – EPA Questionnaire

## 2.5 PRINCIPAL PROJECT STRUCTURES

### 2.5.1 Earth Embankment

The ash pond system is located in the flood plain. It contains the following from top to bottom:

- Fill placed circa 1977 for the ponds;
- Fill Placed in the Flood Plain during the original plant construction Circa 1953;
- Naturally occurring Flood Plain Sediment.

It was determined by F&ME Consultants that all fill material used is naturally occurring river and Coastal Plain Sediments from the immediate plant site and there was no evidence of ash material used in the construction of the ponds. (Appendix A: Doc 05 – Subsurface Investigation and Structural Stability Report).

### 2.5.2 Outlet Structures

The pond has a riser with 18" reinforced concrete pipe (RCP) that discharges into the Savannah River.

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## 2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

All critical structures were attempted to be located by using aerial photography which might not accurately represent what currently exists down-gradient of the site. No critical infrastructure was found to be downstream of the site.

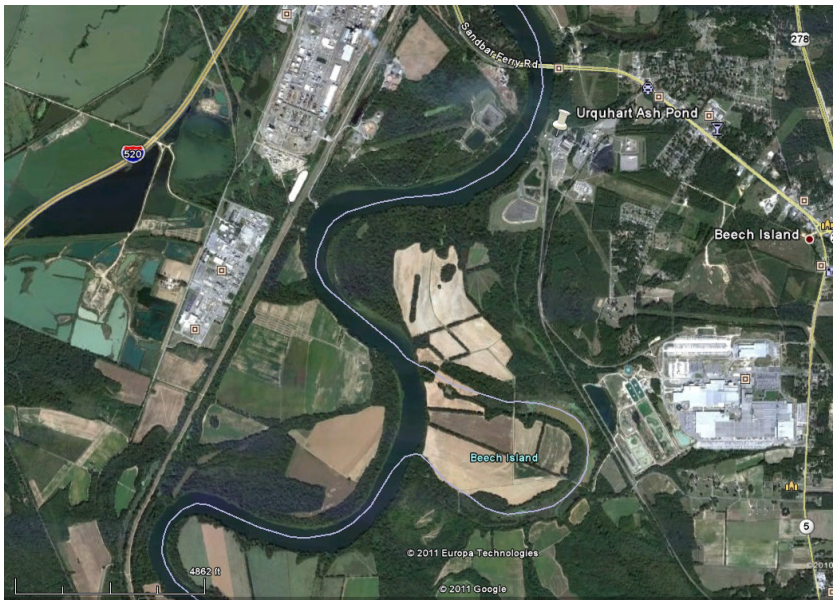


Figure 2.6: Critical Infrastructure Map

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## 3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

Summary of Reports on the Safety of the Management Unit

2010 Annual Ash Pond Dike Inspection, Urquhart Station. (Appendix A: Doc 06 – 2010 Urquhart Annual Inspection). Comments from the 2010 report include:

- Minor surface erosion is present on some areas along the berm and needs to have 4 inches of top soil placed and be re-seeded;
- Any new woody vegetation along upstream face of ash pond should be removed;
- Routine maintenance such as grass mowing, fertilizing, applying herbicide to rip rap armored banks and regularly scheduled quarterly visual inspections and an annual inspection should continue;
- Develop an Emergency Action Plan (EAP) for the ash pond.

2009 Ash Pond Dike Inspections, Urquhart Station. (Appendix A: Doc 07 – Dike Landfill Pond Inspections 2009). Comments from the 2009 reports include:

- The January 8, 2009 inspection concluded that no problems were encountered during the inspection and that erosion areas are currently being worked on;
- The April 4, 2009 inspection concluded that erosion areas need to be corrected due to recent rain events;
- The remaining inspections dated July 6, 2009, October 6, 2009, and September 29, 2009 had no comments.

Additional inspection reports can be found in Appendix A: Doc 08-11.

### 3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

Discharge from the impoundment is regulated by the South Carolina Department of Health and Environmental Control (SCDHEC) and the impoundment has been issued a National Pollutant Discharge Elimination System Permit (Permit No. SC0000574 was issued ~~September 30, 2008~~October 22, 2003).

### 3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

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## 4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

### 4.1 SUMMARY OF CONSTRUCTION HISTORY

#### 4.1.1 Original Construction

The plant began operation in 1953 and, based on documentation from the slope stability analysis report, portions of the embankments were constructed around that time frame. In 1977 additional fill was placed for construction of the ponds. (Appendix A: Doc 05 – Subsurface Investigation and Structural Stability Report). Very limited information was provided for the original construction of the ash pond.

#### 4.1.2 Significant Changes/Modifications in Design since Original Construction

In 1977 additional fill was placed for construction of the ash ponds. No additional information was provided.

#### 4.1.3 Significant Repairs/Rehabilitation since Original Construction

No documentation of significant repairs/rehabilitation since the original construction was provided.

### 4.2 SUMMARY OF OPERATIONAL PROCEDURES

#### 4.2.1 Original Operational Procedures

The ash pond was designed and operated for reservoir sedimentation and sediment storage of ash. Coal combustion residue and stormwater runoff from around the ash pond facility are discharged into the reservoir. Inflow water is treated through gravity settling and deposition, and the treated process water and stormwater runoff are discharged through an unregulated type overflow outlet structure. The ponds are not used for permanent storage and are periodically dredged to remove ash material.

#### 4.2.2 Significant Changes in Operational Procedures and Original Startup

No documentation was provided describing any significant changes in Operating Procedures.

4.2.3 Current Operational Procedures

To the best of our knowledge, original operational procedures for bottom ash handling are in effect. ~~There has been an initiative to send the coal combustion residuals to a permitted dry dumping facility, but the ponds continue to receive ash material.~~ The fly ash system was modified in 2010 to eliminate carryover of fly ash into the ash pond from the transport system. Bottom ash and fly ash are now being disposed in an offsite permitted commercial landfill.

4.2.4 Other Notable Events since Original Startup

No additional information as provided.

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## 5.0 FIELD OBSERVATIONS

### 5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Frederic Shmurak, P.E. and Justin Story, E.I., LEED AP BD+C performed a site visit on Wednesday, February 16, 2011 in company with the participants.

The site visit began at 10:00 AM. The weather was cloudy and cool. Photographs were taken of conditions observed. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit. The Dam Inspection Checklist in Appendix B has additional site data.

The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

### 5.2 URQUHART ASH POND

#### 5.2.1 Crest

The crest had no signs of depressions, tension cracking, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Minor rutting was observed along portions of the crest (See Photo 5-1.).


Photo 5-1. Rutting along crest

5.2.2 Upstream/Inside Slope

The upstream slopes are mostly vegetated with tall grasses and other wetland vegetation. No scarps, sloughs, depressions, bulging or other indications of slope instability or signs of erosion were observed (See Photo 5-2.).


Photo 5-2. Overall view of interior of ash pond

5.2.3 Downstream/Outside Slope and Toe

No scarps, sloughs, depressions, bulging or other indications of slope instability or signs of erosion were observed. Brush was observed along the southeastern section of the downstream slope (See Photo 5-3.).


Photo 5-3. Brush along southeastern downstream slope

5.2.4 Abutments and Groin Areas

The ash pond embankment consists of a dike system completely surrounding the pond; therefore the earthen embankment does not abut existing hillsides, rock outcrops or other raised topographic features.

## 5.3 OUTLET STRUCTURES

5.3.1 Overflow Structure

The outlet structures for the ash pond were properly discharging flow from the pond and visually appeared to be in good condition.

5.3.2 Outlet Conduit

The visual portion of the outlet conduit was functioning properly with no apparent deterioration.

5.3.3 Emergency Spillway

No emergency spillway is present.

5.3.4 Low Level Outlet

No low level outlet is present.

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## 6.0 HYDROLOGIC/HYDRAULIC SAFETY

### 6.1 SUPPORTING TECHNICAL DOCUMENTATION

#### 6.1.1 Flood of Record

No documentation has been provided about the flood of record.

#### 6.1.2 Inflow Design Flood

According to FEMA Federal Guidelines for Dam Safety, the current practice in the design of dams is to use the Inflow Design Flood (IDF) that is deemed appropriate for the hazard potential of the dam and reservoir, and to design spillways and outlet works that are capable of safely accommodating the floodflow without risking the loss of the dam or endangering areas downstream from the dam to flows greater than the inflow. The recommended IDF or spillway design flood for a low hazard, small-sized structure (See section 2.2), in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria, is the 50-year to 100-year flood (See Table 6.1.2).

**Table 6.1.2: USACE Hydrologic Evaluation Guidelines Recommended Spillway Design floods**

| Hazard | Size | Spillway Design Flood |
|---|---|---|
| Low | Small | 50 to 100-yr frequency |
| | Intermediate | 100-yr to ½ PMF |
| | Large | ½ PMF to PMF |
| Significant | Small | 100-yr to ½ PMF |
| | Intermediate | ½ PMF to PMF |
| | Large | PMF |
| High | Small | ½ PMF to PMF |
| | Intermediate | PMF |
| | Large | PMF |

The Probable Maximum Precipitation (PMP) is defined by American Meteorological Society as the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. The National Weather Service (NWS) further states that in consideration of our limited knowledge of the complicated processes and interrelationships in storms, PMP values are identified as estimates. The NWS has published application procedures that can be used with PMP estimates to develop spatial and temporal characteristics of a Probable Maximum Storm (PMS). A PMS thus

developed can be used with a precipitation-runoff simulation model to calculate a probable maximum flood (PMF) hydrograph.

The 24-hour, 10-square mile PMP depth is 43 inches. Since the facility has a contributing drainage area equal to the surface area of the impoundment, it is anticipated adequate freeboard exists so the facility would not experience significant flood states. The freeboard of the Active Ash Pond is 98 inches, so adequate freeboard exists to safely pass the design storm.

6.1.3 Spillway Rating

No spillway rating was provided. The ash pond is a diked embankment facility having a contributing drainage area equal to the surface area of the impoundment; therefore the impounded pool would not be anticipated to experience significant changes in elevation. The outlet structure type is unregulated and, given little change in the normal pool elevation, the resulting discharge rate is expected to be relatively constant.

6.1.4 Downstream Flood Analysis

No downstream flood analysis was provided.

## 6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Supporting documentation reviewed by Dewberry is adequate.

## 6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Adequate capacity and freeboard exists to safely pass the design storm.

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## 7.0 STRUCTURAL STABILITY

### 7.1 SUPPORTING TECHNICAL DOCUMENTATION

#### 7.1.1 Stability Analyses and Load Cases Analyzed

A stability analysis report for the ash pond dated March 16, 2011, by F&ME Consultants provides information on the stability analysis results and is presented in Section 7.1.4 Factors of Safety and Base Stresses. Steady state (normal) and seismic loading conditions were analyzed. See Appendix A - Doc 05: Subsurface Investigation and Structural Stability Report, for the complete report.

#### 7.1.2 Design Parameters and Dam Materials

A report for the ash pond was prepared by F&ME Consultants, Inc. in 2011. The report includes documentation of the shear strength design properties for the ash pond embankments. Five (5) sections of the embankments were analyzed and only one of the most critical sections, which is adjacent to the Savannah River, is shown in this report (See Figure 7.1.2). For the complete documentation see Appendix A - Doc 05: Subsurface Investigation and Structural Stability Report.

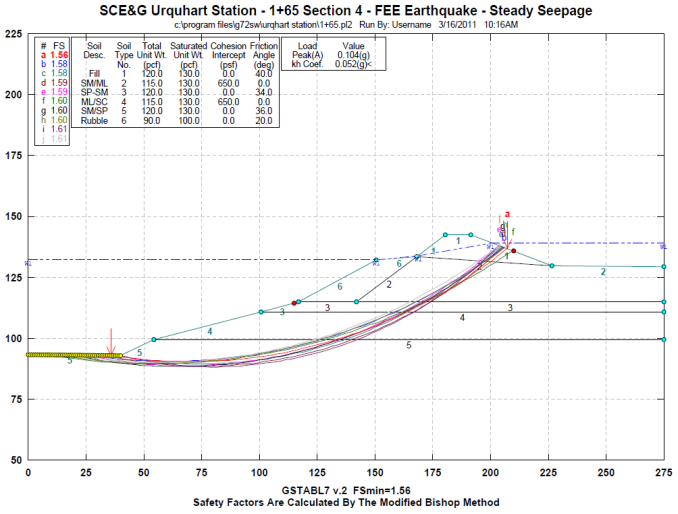


Figure 7.1.2

7.1.3 Uplift and/or Phreatic Surface Assumptions

Monitoring instrumentation devices have not been installed to verify water levels within the embankment. The assumed phreatic surfaces are shown on the figures in section 7.1.2 above and the depiction seems appropriate for these types of structures. No additional information was provided. The water level of the upstream interior pond was stated to be 135.8' and downstream interior pond to be 134.6'. These elevations were not verified.

7.1.4 Factors of Safety and Base Stresses

Table 7.1.4 Factors of Safety for the Five Analyzed Sections of the Ash Pond (Appendix A: Doc 05 – Subsurface Investigation and Structural Stability Report)

| Loading Condition | Location | Performance Criteria | Factor of Safety |
|---|---|---|---|
| **Max. Storage Pool-Steady Seepage** | Per Stability Report – Section 4 Adjacent to Savannah River | 1.5 | 1.99 |
| **Liquefaction-Steady Seepage** | | >1.0 | 1.26 |
| **FEE Earthquake-Steady Seepage** | | >1.0 | 1.56 |
| **SEE Earthquake-Steady Seepage** | | >1.0 | 1.14 |

7.1.5 Liquefaction Potential

In the report by F&ME Consultants it was determined that during a seismic event, liquefaction of the foundation soils could occur. The maximum liquefaction induced settlement was estimated to be about five inches. The settlement would be expected over a broad area of the ash pond perimeter and would not be anticipated to create instability of the perimeter containment system. (Appendix A: Doc 05 - Subsurface Investigation and Structural Stability Report)

7.1.6 Critical Geological Conditions

The project site is located on the East side of the Savannah River in Beech Island, Aiken County, South Carolina and is situated within the Upper Coastal Plain of the Physiographic Province near the Fall Line (which lies to the North of the site).

Based on USGS Seismic-Hazard Maps for the Conterminous United States, the facility is located in an area anticipated to experience a 0.12 g acceleration with a 2-percent probability of exceedance in 50 years.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall the structural stability of the dam appears to be satisfactory.

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## 8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

### 8.1 OPERATING PROCEDURES

The ash pond was designed and operated for reservoir sedimentation and sediment storage of ash. However, since the fly ash system was modified in 2010, only minor amounts of ~~C~~coal combustion residual and minimal stormwater runoff around the ash pond facility are discharged into the reservoir. Inflow water is treated through gravity settling and deposition, and the treated process water and stormwater runoff are discharged through an unregulated type overflow outlet structure. The ponds are not used for permanent storage and are periodically dredged to remove ash material.

### 8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

The maintenance of the dam and project facilities is adequate, although the following items need to be addressed:

- Address minor rutting along crest
- Remove brush along downstream slope of southeastern embankment

### 8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

#### 8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

#### 8.3.2 Adequacy of Maintenance

Based on the assessments of this report, maintenance procedures appear to be adequate.

# DRAFT

## 9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

### 9.1 SURVEILLANCE PROCEDURES

Quarterly/Annual Inspections:

Quarterly/Annual inspections were provided by SCE&G/SCANA and can be found in Appendix A: Doc 07 - 11.

### 9.2 INSTRUMENTATION MONITORING

The Urquhart Plan impoundment dikes do not have an instrumentation monitoring system.

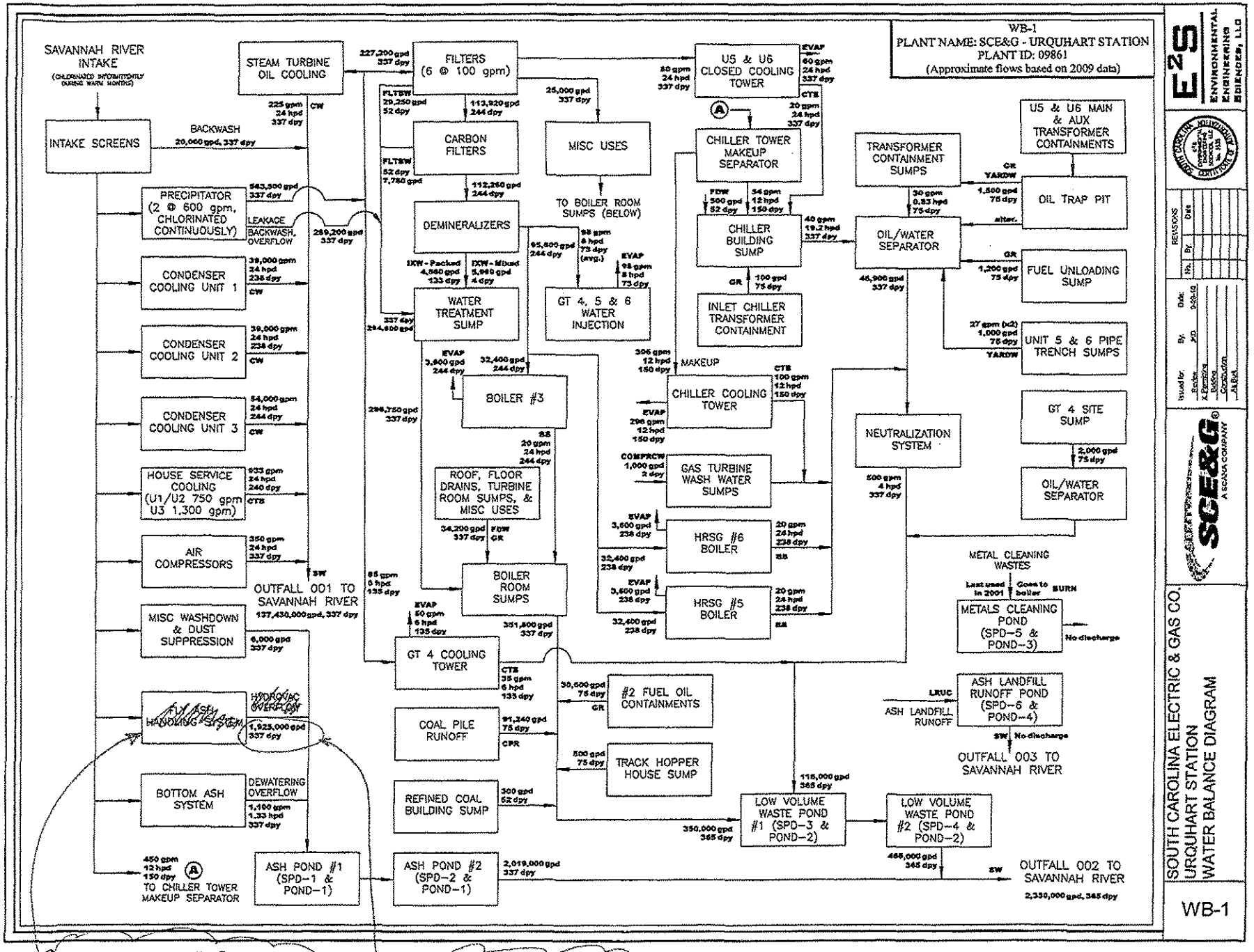
### 9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

#### 9.3.1 Adequacy of Inspection Program

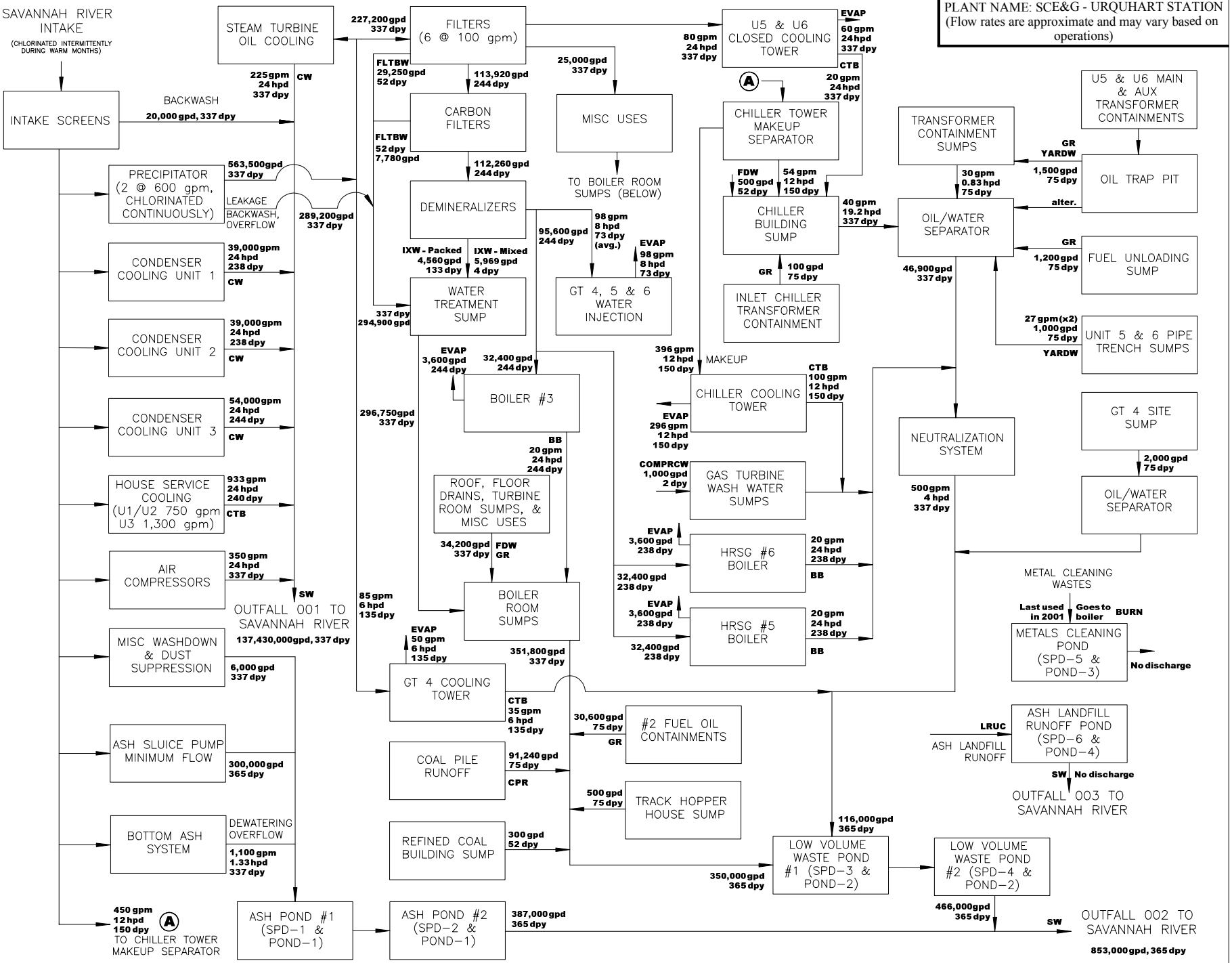
Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

#### 9.3.2 Adequacy of Instrumentation Monitoring Program

No instrumentation is needed for the Urquhart ash pond.



WB-1
PLANT NAME: SCE&G - URQUHART STATION
(Flow rates are approximate and may vary based on operations)




E2S ENVIRONMENTAL ENGINEERING SCIENCES, LLC

REVISIONS

| No. | By: | Date: |
|---|---|---|

Issued for: Review; X Permitting; Bidding; Construction; As Built
By: JKD
Date: 5-20-11

SCE&G® A SCANA COMPANY

SOUTH CAROLINA ELECTRIC & GAS CO.
URQUHART STATION
WATER BALANCE DIAGRAM

WB-1

NOTE

Subject: EPA Comments on South Carolina Electric & Gas Co, Urquhart Generating Station, Beech Island, SC
Round 9 Draft Assessment Report

To: File

Date: October 18, 2011

1. On p. ii, **PURPOSE AND SCOPE**, change language to:

The U.S. Environmental Protection Agency (EPA) is ~~embarking on an initiative to~~ investigating the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry.

2. On p. ii, INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS, second paragraph, replace "Section 1.2.5" with "Section 1.2.1."

3. On p. ii, INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS, third paragraph, each individual unit must receive a condition rating, please refrain from rating the facility as a whole. Please correct this in section 1.1.8 on p. 1-2 also.

4. On p. 2-3, section 2.2.1, the report states that "the plant currently does not discharge into the ash pond." This statement appears to be contradicted in sections 2.2.2, 2.2.3 and 4.2.3.

5. A "satisfactory" condition rating is provided yet there is a potential for liquefaction to occur based on the statements in section 7.1.5. This fact may warrant a condition rating of less than satisfactory. The Recommendations section (section 1.2) should address this issue.

   **7.1.5 Liquefaction Potential**
   "In the report by F&ME Consultants it was determined that during a seismic event, **liquefaction of the foundation soils could occur.** The maximum liquefaction induced settlement was estimated to be about five inches. The settlement would be expected over a broad area of the ash pond perimeter and would not be anticipated to create instability of the perimeter containment system."

6. On p. 7-3, section 7.3 ASSESSMENT OF STRUCTURAL STABILITY, the report states: "Overall the structural stability of the dam appears to be satisfactory." With a potential for liquefaction to occur (section 7.1.5), there should not be a statement indicating that the dam appears to be satisfactory.

7. Appendix A, please identify each document prior to the document inclusion in Appendix A.

8. The following was not addressed in the report for either pond: “Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?” Please address for each Pond.