

US EPA ARCHIVE DOCUMENT

ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS – FINAL REPORT



**Crisp County Power
Commission
Plant Crisp
Warwick, Georgia**

Prepared for
*U.S. Environmental
Protection Agency
Washington, D.C.*

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CDM Smith Project
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Section 1

Introduction, Summary Conclusions and Recommendations

1.1 Introduction

On December 22, 2008, the dike of a coal combustion waste (CCW) ash pond dredging cell failed at a facility owned by the Tennessee Valley Authority in Kingston, Tennessee. The failure resulted in a spill of over one billion gallons of coal ash slurry, which covered more than 300 acres, damaging infrastructure and homes. In light of the dike failure, the United States Environmental Protection Agency (USEPA) is assessing the stability and functionality of existing CCW impoundments at coal-fired electric utilities to ensure that lives and property are protected from the consequences of a failure.

This assessment of the stability and functionality of the Crisp County Power Commission' Plant Crisp CCW impoundment is based on a review of very limited available documents and a site assessment conducted by CDM Smith on August 30, 2012. In summary, the Plant Crisp ash impoundment embankments are rated as **POOR** for continued safe and reliable operation, because static and seismic engineering studies following the best professional engineering practice to support acceptable safety factors have not been presented. However, a **FAIR** classification and acceptable performance could be expected with minor remedial actions and providing that analyses documenting structural stability under all required loading conditions are conducted.

It is critical to note that the condition of the embankments depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the embankments will continue to represent the condition of the embankments at some point in the future. Only through continued care and inspection can there be a chance that unsafe conditions will be detected.

1.2 Purpose and Scope

CDM Smith was contracted by the USEPA to perform site assessments of selected surface impoundments. As part of this contract, CDM Smith conducted a site assessment of the Plant Crisp Ash Pond. This pond is located to the west of the power generation plant and southwest of the existing hydroelectric dam on Lake Blackshear. The purpose of this report is to provide the results of our assessment and evaluation of the site conditions and potential for waste release from the CCW impoundment.

A site visit was conducted by CDM Smith representatives on August 30, 2012 to collect relevant information and perform a visual assessment of the CCW impoundment..

1.3 Conclusions and Recommendations

1.3.1 Conclusions

The following conclusions are based on our visual observations during the site assessment on August 30, 2012 and a review of the very limited documentation provided by the Crisp County Power Commission.

1.3.1.1 Conclusions Regarding Structural Soundness of the CCW Impoundment.

The CCW impoundment appears to be structurally sound based on our visual observations of the structural components (i.e. inlet structures, earth embankments and outlet structures). No documentation to evaluate and assess structural stability and soundness of the impoundment was provided.

1.3.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of CCW Impoundment.

Supporting technical documentation was not provided. No probable maximum precipitation (PMP) analysis required under Federal Emergency Management Agency (FEMA) standards was provided.

1.3.1.3 Conclusions Regarding Adequacy of Supporting Technical Documentation

Supporting data and documentation have not been provided. Liquefaction potential analyses for embankment foundations have not been performed, and complete original record drawings for the Ash Pond were not provided.

1.3.1.4 Conclusions Regarding Description of the CCW Impoundment.

The description of the CCW impoundment provided by a Crisp County Power Commission representative was generally consistent with the visual observations by CDM Smith during our site assessment. However, only four (4) sheets of miscellaneous drawings and survey data were provided, making it difficult to assess discrepancies compared to the intended design of the CCW impoundment. The drawings that were provided are included in **Appendix A**.

1.3.1.5 Conclusions Regarding Field Observations

During our visual observations and site assessment, signs of areas of erosion, erosion rills, and scarps were observed on the exterior and interior slopes of the embankments. There were no apparent unsafe conditions or conditions in need of immediate remedial repair observed.

1.3.1.6 Conclusions Regarding Adequacy of Maintenance and Methods of Operation

Current maintenance and operating procedures appear to be adequate. There was no evidence of previous spills or release of impounded coal ash slurry outside of the impoundment.

1.3.1.7 Conclusions Regarding Adequacy of Surveillance and Monitoring Program

The impoundment at Plant Crisp was permitted under the National Pollutant Discharge Elimination System (NPDES) Permit No. GA0025399 issued by the State of Georgia Department of Natural Resources, Environmental Protection Division, dated September 23, 2005. The permit authorized discharge into Lake Blackshear (Flint River Basin) in accordance with effluent limitations and monitoring requirements under the conditions set forth in the permit. Data to verify discharge and monitoring were not provided to CDM Smith. The permit expired on August 31, 2010. However, we were informed that the Crisp County Power Commission was in the process of getting it renewed.

1.3.1.8 Conclusions Regarding Suitability for Continued Safe and Reliable Operation

The embankments do not show evidence of unsafe conditions requiring immediate remedial efforts, although maintenance to correct the deficiencies noted above is required.

1.3.2 Recommendations

Based on CDM Smith visual assessment of the Ash Pond and a review of limited documentation provided by Crisp County Power Commission, the following recommendations are provided.

A complete set of record drawings and/or as-built drawings should be developed or made readily available for future reference.

1.3.2.1 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that a qualified professional engineer assist the Crisp County Power Commission to evaluate the hydrologic and hydraulic capacity of the CCW impoundment to withstand design storm events without overtopping.

1.3.2.2 Recommendations Regarding the Technical Documentation for Structural Stability

It is recommended that a qualified professional engineer assist Crisp County Power Commission in the evaluation of the Ash Pond's embankments stability, including liquefaction analyses.

1.3.2.3 Recommendations Regarding Field Observations

Erosion rills and scarps – Erosion rills and scarps were observed on the exterior and interior slopes of the west embankment. Structural fill should be placed and compacted in the rills and scarps and the repaired areas graded to meet the adjacent existing contours. After slope restoration, it is recommended that the exposed surface of the embankment be stabilized with sod or hydroseeded to restore vegetation cover on the slopes.

Animal burrows were not observed on the embankments exterior slopes. Although none were seen, the vegetation cover may have hidden animal burrows. Therefore it is recommended that vegetation be maintained at a height that allows potential animal burrows to be readily observed.

1.3.2.4 Recommendations Regarding Surveillance and Monitoring Program

Monitoring the embankment slopes and crests for erosion, movement, animal burrows, and seepage is recommended. Although no discharge into Lake Blackshear (Flint River Basin) was observed, surveillance and monitoring in accordance with effluent limitations set forth in the NPDES Permit is recommended.

1.3.2.5 Recommendations Regarding Continued Safe and Reliable Operation

Inspections should be made following periods of heavy and/or prolonged rainfall, and the occurrence of these events should be documented. Inspection records should be retained at the facility for a minimum of three years.

Major repairs and slope restoration should be designed by a registered professional engineer experienced with earthen dam design.

None of the conditions observed during our site visit require immediate attention or remediation. However, the recommendations in this report should be implemented in a reasonable time frame to maintain continued safe and reliable operation of the CCW impoundment.

1.4 Participants and Acknowledgment

1.4.1 List of Participants

CDM Smith representatives William Fox, P.E. and Eduardo Gutiérrez-Pacheco, P.E. met with representatives of Crisp County Power Commission before and after our visual assessment. The representatives of the Crisp County Power Commission were Mr. Joe Rogers, Maintenance Supervisor, and Mr. Gene Ford, Manager of Production.

1.4.2 Acknowledgement and Signature

CDM Smith acknowledges that the CCW impoundment referenced herein was assessed by William L. Fox, P.E. and Eduardo Gutiérrez-Pacheco, P.E. Based on the limited documentation provided, the Ash Pond is rated **POOR** because the facility lacks static, hydrologic and seismic engineering studies following best professional engineering practice to support safety factors under normal loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. There are minor deficiencies that require remedial measures.

We certify that the CCW impoundment referenced herein was assessed on August 30, 2012.



Stephen L. Whiteside, P.E.

Vice President

Georgia Registration No. 27339



Section 2

Description of the Coal Combustion Waste Impoundment

2.1 Location and General Description

Plant Crisp is located near the border of Crisp and Worth Counties, Georgia, approximately 12 miles southwest of the City of Cordele. The power plant site is on the south bank of Lake Blackshear (Flint River Basin), and as shown on the USGS Quadrangle Map, **Figure 1**, it is in Worth County (Latitude: 31° 50' 40.81" N, Longitude: 83° 56' 28.74" W). Critical infrastructure located within approximately five miles downgradient of the Plant Crisp is shown on **Figure 2**.

Plant Crisp's coal combustion waste (CCW) impoundment consists of the Ash Pond located to the west of the power generation plant and southwest of the existing hydroelectric power dam.

An aerial view of the Plant Crisp including the Ash Pond, Coal Stockpile, Admin Building, hydroelectric power dam, and power generation plant is shown on **Figure 3**. The total perimeter of the embankments for the Ash Pond is approximately 2,500 feet, and the pond has an approximate surface area of 6.5 acres. **Table 2-1** provides a summary of the approximate size and dimensions of the Ash Pond.

Table 2-1 – Summary of the Ash Pond Approximate Dimensions and Size

	Ash Pond			
	North Embankment	West Embankment	South Embankment	Southeast Embankment
Approximate Maximum Embankment Heights ⁽¹⁾ (ft)	22	16	10	5
Typical Crest Widths ⁽¹⁾ (ft)	15	17	16	16
Approximate Lengths ⁽²⁾ (ft)	850	500	510	640
Estimated Interior Slopes ⁽¹⁾ H:V	2:1	2:1	3:1	5:1
Estimated Exterior Slopes ⁽¹⁾ H:V	2:1	2:1	5:1	4:1

(1) Based on approximate field measurement by CDM Smith.

(2) Approximate lengths were obtained from drawings provided by Crisp County Power Commission.

2.1.1 Horizontal and Vertical Datum

The site survey provided by Crisp County Power Commission to CDM Smith did not include reference to the horizontal and vertical datum used. Horizontal survey data in this report reference the North American Datum (NAD) of 1983, 2007 adjustment. Elevations noted herein are in feet, and are referenced to 1929 National Geodetic Vertical Datum (NGVD 29), unless otherwise noted.

2.1.2 Site Geology

Plant Crisp is located adjacent to the southwest side of Lake Blackshear in Worth County, Georgia. Based on review of the Warwick, GA 7.5-Minute USGS Topographic Quadrangle Map, the natural ground surface elevation in the area of the Ash Pond is approximately El. 250 feet. According to the Geologic Map of Georgia and the Geo-hydrology map of Sumter, Dooly, Pulaski, Lee, Crisp, and Wilcox Counties, Georgia, Plant Crisp is underlain by the Holocene-age Flint River alluvium and the Eocene-age Ocala Limestone. These two groups consist of soils deposited in very recent fluvial depositional environments overlying soils deposited in ancient marine depositional environments. The overlying alluvium is lithologically diverse with a combination of sand, gravel, silt, clay, and organic material that is pale yellowish-gray to dark-gray in color. These deposits are the result of the meandering and dendritic floodplains and terraces of the Flint River before it was dammed. The lithology of the underlying formation consists of a white to cream-colored, relatively pure limestone with the basal beds commonly being a sandy limestone.

Subsurface information for Plant Crisp and within the Ash Pond embankments was not provided. The drawings and expired NPDES permit that were provided by Crisp County Power Commission are included in Appendix A.

2.2 Coal Combustion Waste Handling

Plant Crisp disposes the CCW in the Ash Pond. Overflow from the pond discharges through an 18-inch-diameter corrugated metal riser pipe located near the north embankment and discharges into Flint River Basin. The Ash Pond receives any residual sluiced fly ash and bottom ash, waste water from the plant process, and coal pile runoff. Plant Crisp does not generate flue gas desulphurization gypsum. According to the Crisp County Power Commission boiler slag is generated at Plant Crisp, but disposed of elsewhere.

2.3 Size and Hazard Classification

According to the United States Army Corps of Engineers (USACE) Guidelines for Safety Inspection of Dams (1979), the impoundments may be placed in the size classification per **Table 2-2**.

Table 2-2 – USACE ER 1110-2-106 Size Classification

Category	Impoundment	
	Storage (acre -feet)	Height (feet)
Small	50 to < 1000	25 to < 40
Intermediate	1000 to < 50,000	40 to < 100
Large	> 50,000	> 100

Based on storage capacity and embankments height, the Plant Crisp impoundment is considered a SMALL impoundment.

It is not known if the Plant Crisp impoundment currently has a Hazard Potential Classification. Based on the USEPA classification system as presented on Page 2 of the USEPA checklist (**Appendix B**) and our review of the site and downstream areas, a recommended hazard rating has been assigned to the impoundment as summarized in **Table 2-3**:

Table 2-3 – Recommended Impoundment Hazard Classification Rating

Impoundment	Recommended Hazard Rating	Basis
Ash Pond	Low Hazard	<ul style="list-style-type: none"> ▪ Failure or miss-operation would result in low economic loss and environmental damage to adjacent waterways and downstream areas. ▪ Losses would be limited to Owner's property. ▪ Loss of human life as a result of failure is not anticipated.

2.4 Amount and Type of Residuals Currently Contained in the Unit and Maximum Capacity

At the time of the assessment, CDM Smith did not have information on the amounts of residuals currently stored in the unit. The surface area of the Ash Pond is approximately 6.5 acres. The Ash Pond receives process water from plant operations, including plant drains, industrial process water, and sluiced bottom and fly ash.

2.5 Principal Project Structures

The primary components of the Ash Pond include the following:

- An 8-inch diameter PVC inlet pipe located at the southeast embankment,
- A 7-inch-diameter ductile iron inlet pipe,
- Earth perimeter embankments
- An 18-inch-diameter corrugated metal pipe outlet structure with a 30-inch-diameter trash rack on the north embankment.

2.6 Critical Infrastructure within Five Miles Downgradient

Based on available topographic maps, surface drainage in the vicinity of Plant Crisp appears to be towards the north and northwest through a wooded area in the direction of the Flint River. Critical infrastructure that was identified within five miles of Plant Crisp includes the 17.2 MW Lake Blackshear hydroelectric project, Lake Blackshear, the Flint River Basin, and GA Route 300. This 4-lane divided highway extends from I-75, immediately south of Cordele to Albany, GA, and it is less than two miles from the plant generally to the east and south.

The town of Warwick, Georgia is located approximately 1.5 miles southeast from Plant Crisp.

A breach of the impoundment embankments would most likely impact low-lying lands surrounding the Ash Pond and is not expected to result in loss of human life.

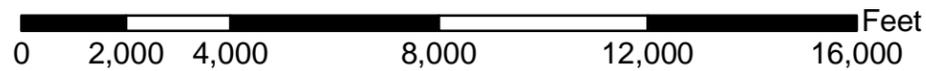
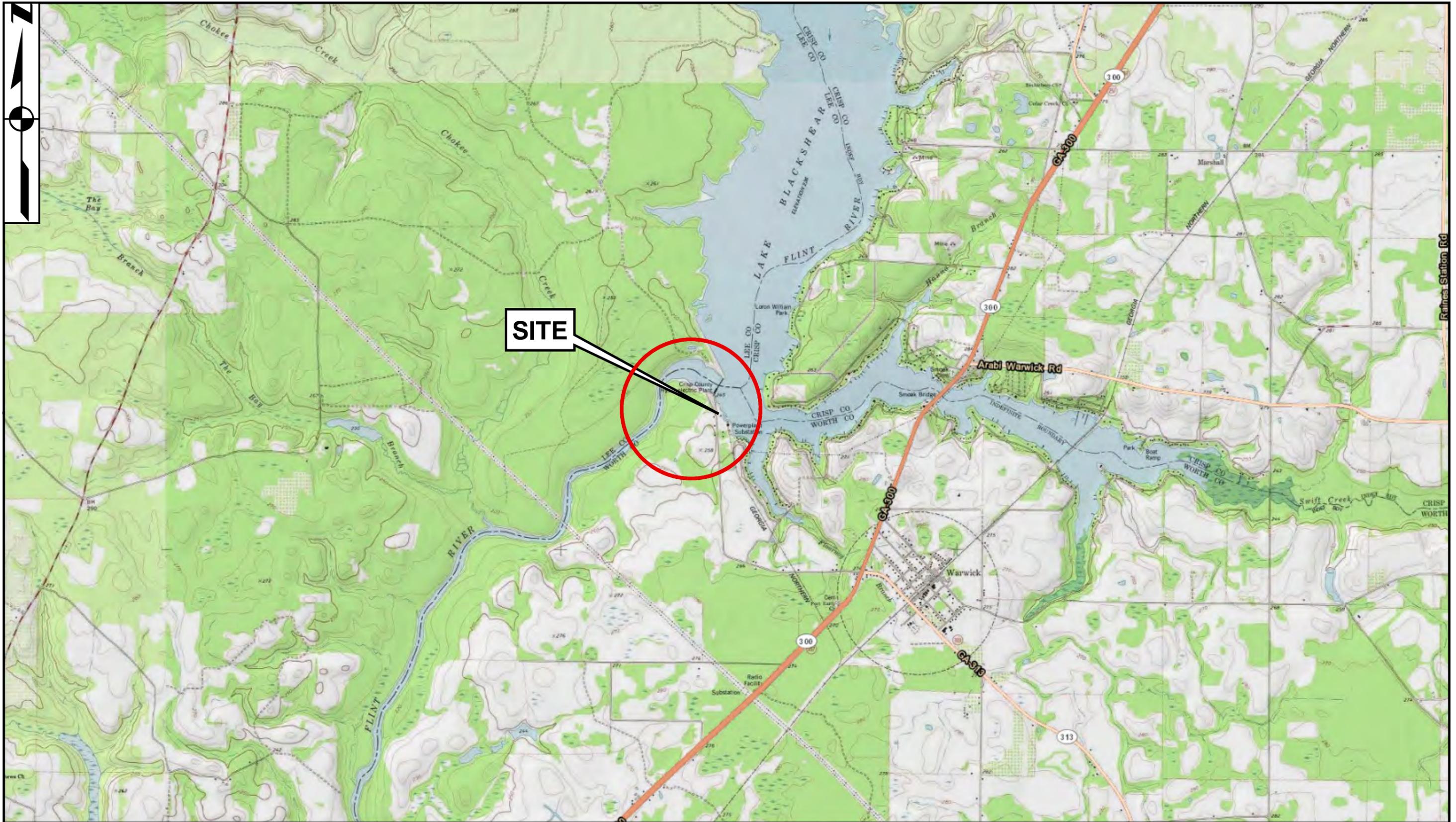


FIGURE-1
LOCUS PLAN
CRISP COUNTY POWER COMMISSION - PLANT CRISP
WARWICK, GEORGIA



LEGEND

 5 Miles Radius for Ash Impoundment

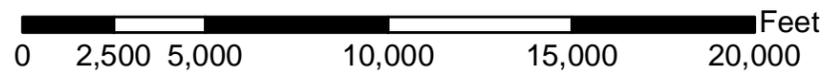


FIGURE-2
CRITICAL INFRASTRUCTURE PLAN
CRISP COUNTY POWER COMMISSION - PLANT CRISP
WARWICK, GEORGIA



ASH POND

HYDROELECTRIC
POWER DAM

POWER PLANT

COAL STOCKPILE

ADMIN
BUILDING

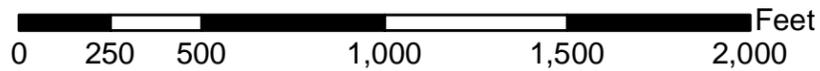


FIGURE-3
AERIAL PLAN
CRISP COUNTY POWER COMMISSION - PLANT CRISP
WARWICK, GEORGIA

Section 3

Summary of Relevant Reports, Permits and Incidents

3.1 Summary of Reports on the Safety of the CCW impoundment

At the time of CDM Smith's on-site assessment, no safety reports on the CCW impoundment were available. According to plant representatives, there have been no known structural or operational problems associated with the impoundment. However no supporting documentation was available.

3.2 Summary of Local, State, and Federal Environmental Permits

Currently, the coal combustion waste (CCW) impoundment is regulated by the State of Georgia, Department of Natural Resources, Environmental Protection Division (GAEPD).

Plant Crisp was issued a permit under the National Pollutant Discharge Elimination System (NPDES) authorizing discharge to the Lake Blackshear (Flint River Basin) in accordance with effluent limitations, monitoring requirements, and other conditions set forth in the permit. The permit was issued on September 23, 2005, by the State of Georgia, permit number is GA0025399. The permit expired on August 31, 2010. We were informed that the Crisp County Power Commission was in the process of renewing the permit.

3.3 Summary of Spill/Release Incidents

According to plant representatives, there have been no known spills or releases related to the impoundment. No documentation was available to confirm or disprove this statement.

Section 4

Summary of History of Construction and Operation

4.1 Summary of Construction History

4.1.1 Impoundment Construction and Historical Information

Plant Crisp began operation in 1930, producing power at the Blackshear hydroelectric facility. Over time, the demand for power exceeded the capacity of the hydroelectric facility and in 1957 the Commission constructed a combined cycle facility consisting of a 12.5 megawatt (MW) coal generator and a 5 MW natural gas combustion turbine.

Based on our understanding and the limited available data, it appears that the Ash Pond was constructed in the 1970's as a side-hill impoundment. Only the northern, southern, and western embankments of the impoundment have an exposed exterior slope. The eastern slope of the impoundment is cut into the existing ground surface. The crest elevation of the Ash Pond is estimated to be about El. 250.

Based on the limited drawings that were provided, the exterior and interior slopes of the impoundment embankments were to be constructed at 3H:1V, as shown on U.S. Department of Agriculture, Soil Conservation Service Drawing SP 1104, Sheet 1 of 2, March, 1973. A complete set of drawings was not available for CDM Smith's review. Based on information provided by Crisp County Power Commission, and CDM Smith's visual observations, the Ash Pond perimeter embankments have a crest width that generally varies from about 15 to 20 feet.

Information regarding the soils that were used for the embankment construction was not available. An 8-foot-wide by 4-foot-deep cutoff trench is shown for a portion of the north and west embankments in the drawings provided. Details regarding the detailed design, materials used, and methods of constructing the embankments were not provided.

Drawings provided by Crisp County Power Commission showing a typical cross section of the embankments are presented in **Appendix A**.

4.1.2 Significant Changes/Modifications in Design since Original Construction

According to Crisp County Power Commission representatives, there have not been significant changes or modifications in the design. There was no documentation provided that indicates any changes or modifications to the original design. However, based on visual observations, the estimated exterior and interior slopes and the crest width seem to be inconsistent with the cross section provided in the drawings.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

Information regarding major repairs or rehabilitation to the embankments of the Ash Pond was not provided. No evidence of prior releases, failures, or remedial work was observed on the embankments during the CDM Smith visual assessment. There was no documentation provided that indicates any repairs or rehabilitation has occurred since the original construction.

4.2 Summary of Operational Procedures

4.2.1 Original Operating Procedures

The Ash Pond at Plant Crisp has historically been used as a settling pond for CCW and other plant wastes such as:

- Residual sluiced fly ash and bottom ash
- Waste water from the plant process and
- Coal pile runoff

4.2.2 Significant Changes in Operational Procedures since Original Startup

No significant changes in the operational procedures appear to have been made to the Ash Pond. There was no documentation provided that indicates there have been any changes in operation procedures since start-up.

4.2.3 Current CCW Impoundment Configuration

The approximate crest elevation of the embankments is El. 250 and the pond area is 6.5 acres. It is our understanding that the normal pool elevation was intended to be 2 feet below the crest.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to CDM Smith regarding other notable events that have impacted operations and /or regular maintenance and inspection of the Ash Pond.

Section 5

Field Observations

5.1 Project Overview and Significant Findings (Visual Observations)

CDM Smith has performed a visual assessment of the CCW impoundment at the Crisp County Power Commission – Plant Crisp. The CCW impoundment assessed is known as the Ash Pond. The perimeter embankments of the CCW impoundment are approximately 2,500 feet in length and vary from approximately 5 to 23 feet in height. The assessment was completed following the general procedures and considerations contained in the Federal Emergency Management Agency (FEMA) Federal Guidelines for Dam Safety (April 2004). These guidelines require that observations of embankment settlement, movement, erosion, seepage, leakage, cracking, and deterioration be performed. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, developed by the USEPA, were completed for the impoundment. Copies of the completed forms are included in **Appendix B**. The locations of photographs that were taken during our field assessment are shown on **Figure 4**, and these photographs are included in **Appendix C**. The locations of the photographs were logged using a handheld GPS device, and the coordinates are also listed in Appendix C.

CDM Smith visited the plant on August 30, 2012 to conduct a visual assessment of the impoundment. The weather was generally cloudy with daytime high temperatures up to 80 degrees Fahrenheit. The daily precipitation for the week before and total precipitation for one month immediately prior to our site visit are shown in **Table 5-1**. These data were recorded at the National Oceanic and Atmospheric Administration (NOAA) Station 092266, in Cordele, Georgia, which is approximately 12 miles northeast of Plant Crisp.

Table 5-1 – Approximate Precipitation Prior to Site Visit

Date of Site Visit – August 30, 2012		
Day	Date	Precipitation (inches)
Wednesday	August 29	0.00
Tuesday	August 28	0.50
Monday	August 27	0.00
Sunday	August 26	0.00
Saturday	August 25	0.00
Friday	August 24	0.00
Thursday	August 23	0.02
Total	Month Prior to Site Visit (July 31 to August 29, 2012)	0.98

Note: Precipitation data from www.nws.noaa.gov. Station Location ID: 092266 at Cordele, Georgia. Lat. 31.983333; Lon.-83.766666; EL. 308 feet



5.2 Ash Pond

At the time of the assessment, the Ash Pond contained residual ash and a limited amount of ponded water near the northwest corner of the impoundment (Photograph 68). The volume of ponded water did not adversely impact storage capacity of the Ash Pond. The bottom of the pond was covered with well-maintained vegetative cover. It was indicated by the Crisp County Power Commission staff that the Ash Pond has never been dredged to remove accumulated ash. Approximately 8 feet of freeboard was available near the northwest corner of the pond, where the ponded water was observed. The Ash Pond is of a side-hill configuration, with the north and west embankments constructed to a height of about 23 feet.

5.2.1 Crest

The crest of the perimeter embankment appeared to be in **SATISFACTORY** condition (Photographs 1, 34, 37, 40, 41, 46, 48 and 58). The crest width varies from about 15 and 20 feet. The crest of the embankments has a grass cover that was about 4 to 6 inches high. Reportedly, the crest is exposed to very limited vehicle traffic, only during maintenance operations. No signs of cracks, erosion, scarps, depressions, or settlement were observed on the crest of any of the embankments.

5.2.2 Interior Slopes

The interior slopes of the Ash Pond embankments appear to be in **FAIR** condition. The interior slopes are about 2H:1V at the north and west embankments, 3H:1V at the south embankment, and 5H:1V at the southeast embankment. Slopes shown on the drawings provided are 3H:1V. Interior slopes have a grass cover approximately 4 inches high (Photographs 4, 9, 10, 42, 43, 57, 60, 67, 71 and 72). Scarps and erosion rills (Photographs 50, 59, 61, 62, 66, 70 and 75) were observed along the interior slopes of the north, west, and south embankments. Several boulders (rocks with size greater than 12 inches) protruding from the face of the slope (Photographs 65 and 73) were observed on the north and south embankments. Near the southeast embankment, accumulated ash and debris were clearly visible (Photograph 53).

The Ash Pond has two inlet pipes located on the southeast embankment (Photographs 4, 51, and 55); one 8-inch-diameter polyvinyl chloride (PVC) pipe and one 7-inch-diameter ductile iron pipe (DIP). During the visual assessment, water from the plant was discharging through the PVC pipe (Photograph 63).

5.2.3 Exterior Slopes

The exterior slopes appear to be in **FAIR** condition. The exterior slopes of the embankments are about 2H:1V at the north and west embankments, 5H:1V at the south embankment, and 4H:1V at the southeast embankment. The east portion of the north embankment has an approximate slope of 3H:1V with a slope break near the outlet structure to 2H:1V (Photograph 6). Slopes shown on the drawings provided are 3H:1V. The exterior slopes are covered with grass that was approximately 4 to 6 inches high at the time of the visual assessment (Photographs 14 to 17, 31, 32, 38, 39, 44 and 45). Surficial erosion rills and scarps were observed at the north embankment (Photographs 5, 7 and 8). An apparent 16-foot-long semicircular surficial slough (Photographs 21 to 23) and several minor sloughs and scarps near the crest (Photograph 18, 19, 20, and 24 to 27) were observed on the west embankment.

A runoff swale was cut into the toe of the slope of the west embankment (Photographs 29 to 31). It was reported by the Crisp County Power Commission representatives that the toe of slope of the west embankment extends beyond the plant property line.

Animal burrows were not observed on the embankments during the visual assessment.

5.2.4 Outlet Structures

The outlet structure consists of an 18-inch-diameter corrugated metal riser pipe (CMP), with an approximate 2-foot-high by 36-inch-wide CMP trash-rack at the neck of the outlet pipe. This outlet is located near the central portion of the north embankment (Photographs 11, 12 and 64). Based on the drawings provided by the Crisp County Power Commission (Appendix A), we understand that this riser pipe connects into a 12-inch-diameter CMP and discharges near the toe of slope of the north embankment. CDM Smith was not able to locate the exit pipe due to the high vegetation at the apparent outfall/discharge location.

Section 6

Hydrologic/Hydraulic Safety

6.1 Impoundment Hydraulic Analysis

Georgia Department of Natural Resources Environmental Protection Division Chapter 391-3-8 Rules for Dam Safety Georgia DNR EPD regulation 391-3-8-.09 (3.f) indicates that all dams in the State of Georgia shall be capable of safely passing a design storm based upon a fraction of the flood developed from the probable maximum precipitation (PMP) hydrograph depending on the sub-classification of the dam as provided in **Table 6-1**.

Table 6-1– PMP Design Criteria by Sub-classification (Applicable for all Dams in GA.)

Dam Size	Size Definition	Design Flood
Small Dam	Storage capacity not exceeding 500 acre-feet and a height not exceeding 25 feet	25% of the PMP
Medium Dam	Storage capacity exceeding 500 acre-feet but not exceeding 1000 acre-feet or height exceeding 25 feet but not exceeding 35 feet	33.3% of the PMP
Large Dam	Storage capacity exceeding 1000 acre-feet, but not exceeding 50,000 acre-ft or height between exceeding 35 feet but not exceeding 100 feet	50% of the PMP
Very Large Dam	Storage capacity exceeding 50,000 acre-feet or height exceeding 100 feet	100% of the PMP

Georgia DNR assigns a “Category I” classification where improper operation or dam failure would result in probable loss of human life. Situations constituting “probable loss of life” are those situations involving frequently occupied structures or facilities, including, but not limited to, residences, commercial and manufacturing facilities, schools and churches. Georgia DNR assigns a “Category II” classification where improper operation or dam failure would not expect to result in probable loss of human life. Georgia defines the PMP as “the greatest amount of rainfall of a six-hour duration which would be expected for a given drainage basin as determined by Hydrometeorological Report No. 52 published the U. S. Weather Bureau.”

Georgia DNR EPD regulation 391-3-8-.09 (3.f) states that the design storm may be reduced on existing dams if the Owner’s engineer can successfully demonstrate to the Director, by engineering analysis, that the dam is sufficient to protect against probable loss of human life downstream at a lesser design storm. The Ash Pond embankment is classified as a “Small Dam” by Georgia DNR EPD regulations and as per Georgia regulations shall be capable of safely passing a design storm equal to 25% of the PMP. Loss of human life is not anticipated as a result of failure or miss-operation of the Ash Pond impoundment. It may be reasonably assumed that the Crisp County Power Commission’s engineer can successfully demonstrate to the Director, by engineering analysis, that the dam is sufficient to protect against probable loss of human life downstream at a lesser design storm.

FEMA standards, as specified in “Federal Guidelines for Dam Safety” dated April 2004, require hydrologic design of impoundments to consider discharge and storage capacities, reservoir regulation plans, land requirements, and wind/wave effects. FEMA standards require impoundments to have the

capacity to store some percentage of the Probable Maximum Precipitation (PMP) for a 6-hour storm event over a 10 square-mile area in the vicinity of the site. Significant hazard and high hazard structures are required to store 50 percent of the PMP and 100 percent of the PMP, respectively. For low hazard structures, impoundments are required to have capacity for at least 100-year, 24-hour return frequency storm event. The drainage area contributing to the Ash Pond appears to be limited to the storage area within the impoundment and the plant coal pile, an additional area of approximately 0.5 acre.

6.2 Adequacy of Supporting Technical Documentation

Hydrologic and hydraulic documentation and/or PMP analyses were not provided by Crisp County Power Commission for CDM Smith to review.

6.3 Assessment of Hydrologic/Hydraulic Safety

Hydrologic and hydraulic safety of the Ash Pond appears to be **POOR** based on the following:

- No documentation was provided on the ability of the impoundments to store the design storms documented; and
- No documentation or analyses for the Inflow Design Flood (IDF) was provided.

An assessment of hydrologic/hydraulic safety of the Ash Pond is not possible at this time due to the lack of supporting documentation. According to the plant representatives, there has not been an overtopping of the Ash Pond since original operations started. No evidence of overtopping and no sign of plugged, collapsed, or blocked pipes, or other detrimental conditions was observed during the site visit.

Section 7

Structural Stability

7.1 Supporting Technical Documentation

The Crisp County Power Commission did not provide CDM Smith with slope stability analyses or technical documentation to support the embankments structural stability.

7.1.1 Stability Analyses and Load Cases Analyzed

The GAEPD programs and regulations that relate to coal ash impoundments include Georgia's Subtitle D program, the Georgia Safe Dams program and the Georgia NPDES permitting process. The Rules of Georgia, Department of Natural Resources, Environmental Protection Division, Chapter 391-3-4, Solid Waste Management also contain sections that relate to the disposal of coal ash. In addition, procedures have been established by the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Natural Resources Conservation Service as accepted engineering practice in regard to dams and impoundments. The minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005) are provided in **Table 7-1**.

Table 7-1 - Minimum Safety Factors

Load Case	Minimum Required Factor of Safety
Steady-State Condition at Normal Pool or Maximum Storage Pool Elevation	1.5
Rapid Drawdown Condition from Normal Pool Elevation	1.3
Maximum Surcharge Pool (Flood) Condition	1.4
Pseudo-Static, Storage Pond at Maximum Storage Pool	1.0
Liquefaction	1.3

Notes: Above safety factors are based on requirements established by the USACE and FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams, May 2005. It is our belief that required safety factors have not been established by the State of Georgia for coal ash impoundments.

7.1.2 Design Parameters and Dam Materials

General soil properties and soil parameters that may have been used for the slope stability or design of the embankments were not provided to CDM Smith for review.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Since no stability analyses were provided, uplift and/or phreatic surface assumptions were not available.

7.1.4 Factors of Safety and Base Stresses

Factors of safety and base stresses were not available for review.

7.1.5 Liquefaction Potential

Documentation provided by the Crisp County Power Commission did not include an evaluation of liquefaction potential.

7.1.6 Critical Geological Conditions

Based on the review of U. S. Geological Survey Maps and readily available information, critical geological conditions for Plant Crisp were not identified. Based on the 2008 USGS National Seismic Hazard Map, a Peak Ground Acceleration (PGA) of 2% probability of exceedance in 50 years indicates that Georgia is in the low hazard potential area for seismic activity.

7.2 Adequacy of Supporting Technical Documentation

Structural stability and liquefaction potential documentation were not provided.

7.3 Assessment of Structural Stability

Because of the lack of documentation and analyses, the assessed rating for the structural stability of the Ash Pond is **POOR**. A poor rating is assigned when a dam safety deficiency is recognized for loading conditions that may realistically occur and remedial action is necessary. Also, if a facility has not conducted static and seismic engineering studies following the best professional engineering practice to support Factors of Safety, the facility must be rated as **POOR**. If the required analyses are performed, the rating could potentially be changed to **FAIR** or higher. During CDM Smith's visual observations and site assessment, shallow scarps and minor erosion areas were observed on the exterior slope of the west embankment and the interior slope of the north embankment. In addition, no indications of seepage on the exterior slopes or along the toe of slopes of the embankments were observed.

- It is not known if critical studies or investigations have been performed to confirm that potential safety deficiencies do not exist.

Section 8

Adequacy of Maintenance and Methods of Operation

8.1 Operating Procedures

As described in Section 2, the Ash Pond receives any residual sluiced fly ash and bottom ash, waste water from the plant process, and coal pile runoff. Overflow from the pond discharges through an 18-inch-diameter corrugated metal riser pipe located near the north embankment and discharges into the Flint River Basin floodplain.

8.2 Maintenance of the Dam and Project Facilities

According to the Crisp County Power Commission, they perform inspections and maintenance of the embankments. These inspections were reported to occur on a weekly basis and any other day during a plant operation walk-around. Records of these inspections were not provided.

8.3 Assessment of Maintenance and Methods of Operations

8.3.1 Adequacy of Operating Procedures

Based on CDM Smith's visual observations and the verbal information provided by Crisp County Power Commission, the operating procedures are considered to be **INADEQUATE**. Written documentation was not provided, and unaddressed maintenance issues (i.e. erosion rills and scarps) were observed.

8.3.2 Adequacy of Maintenance

No major maintenance issues that would appear to compromise the structural stability and operation of the Ash Pond were identified. The embankments appear to be performing in a **FAIR** condition. However, based on the lack of documentation provided and minor deficiencies previously described herein, the maintenance procedures must be rated as **INADEQUATE**.

Section 9

Adequacy of Surveillance and Monitoring Program

9.1 Surveillance Procedures

The Crisp County Power Commission indicated that they inspect the embankments on a weekly basis and on other days when a non-scheduled operations walk-around occurs. However, CDM Smith was not provided with inspection logs or inspection reports that support this statement.

9.2 Instrumentation Monitoring

Based on CDM Smith's visual assessment and verbal information provided by Crisp County Power Commission, we understand that there is no instrumentation monitoring for the Ash Pond. No written documentation or monitoring records were provided to CDM Smith.

9.3 Assessment of Surveillance and Monitoring Program

9.3.1 Adequacy of Inspection Programs

Based on verbal information provided by the Crisp County Power Commission during the site assessment, the inspection program appears to be adequate. No condition that needs immediate remedial action was observed. As previously noted, however, there is a lack of written documentation on regular maintenance issues and surveillance of the Ash Pond.

9.3.2 Adequacy of Instrumentation Monitoring Program

As mentioned, there is no instrumentation on the embankments. The instrumentation monitoring program for the Ash Pond is inadequate. Detrimental conditions or indications of potential failure of the embankments were not observed during CDM Smith's visual assessment.

Section 10

Reports and References

The following is a list of documents and drawings that were provided by the Crisp County Power Commission that were used during the preparation of this report and the development of the conclusions and recommendations presented herein. These documents are included in Appendix A.

1. Authorization to Discharge under the National Pollutant Discharge Elimination System, Permit No. GA0025399, State of Georgia, Department of Natural Resources, Environmental Protection Division, dated September 23, 2005.
2. Ash Pond, Typical View of Dam Base Area, taken from Centerline of Dam Survey, Crisp County Power Commission Engineering Department, dated September 28, 1973.
3. Crisp County Power Commission, Debris Basin, US Department of Agriculture Soil Conservation Service, Drawing (Plan, Cross Section, Profile Centerline of Embankment), dated March, 1973; revised on January 7, 1974 by the Crisp Power Engineering Department.
4. Crisp County Power Commission, Engineering Department, Location Map, 15 MW Steam – Gas Turbine, Generating Station, Warwick, Georgia, dated November 8, 1956 (Revised August 24, 1972).
5. Survey Plat for Crisp County Power Commission, Worth County, Georgia, dated July 19, 1978.

Appendix A

**Data Provided by Crisp
County Power Commission**

PERMIT NO. GA0025399

STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Georgia Water Quality Control Act (Georgia Laws 1964, p. 416, as amended), hereinafter called the "State Act;" the Federal Water Pollution Control Act, as amended (33 U.S. C. 1251 et seq.), hereinafter called the "Federal Act;" and the Rules and Regulations promulgated pursuant to each of these Acts,

Crisp County Power Commission
202 South 7th Street
Cordele, Georgia 31015

is authorized to discharge from a facility located at

Crisp County Power Commission - Plant Crisp (SIC Code 4911)
961 Power Dam Road
Warwick, Worth County, Georgia 31796

to receiving waters

Lake Blackshear
(Flint River Basin)

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II and III hereof.

This permit shall become effective on September 23, 2005.

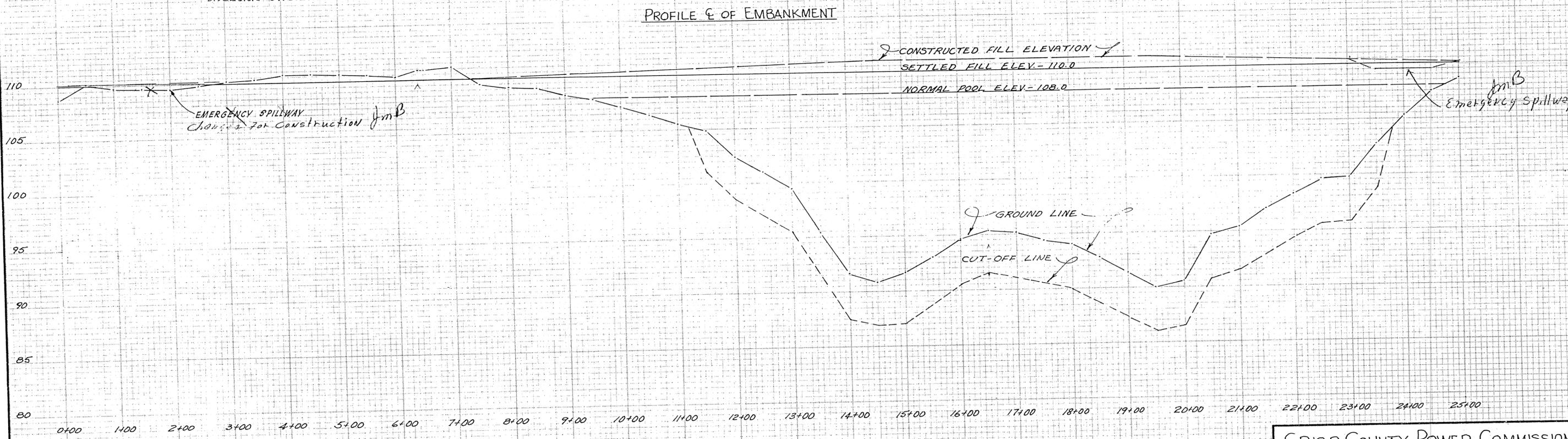
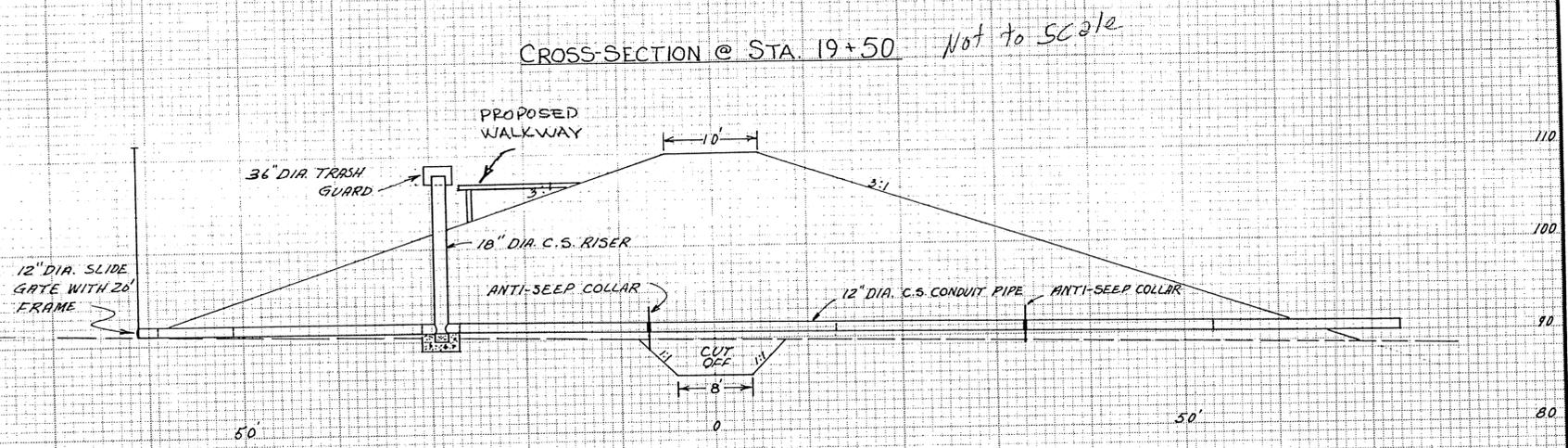
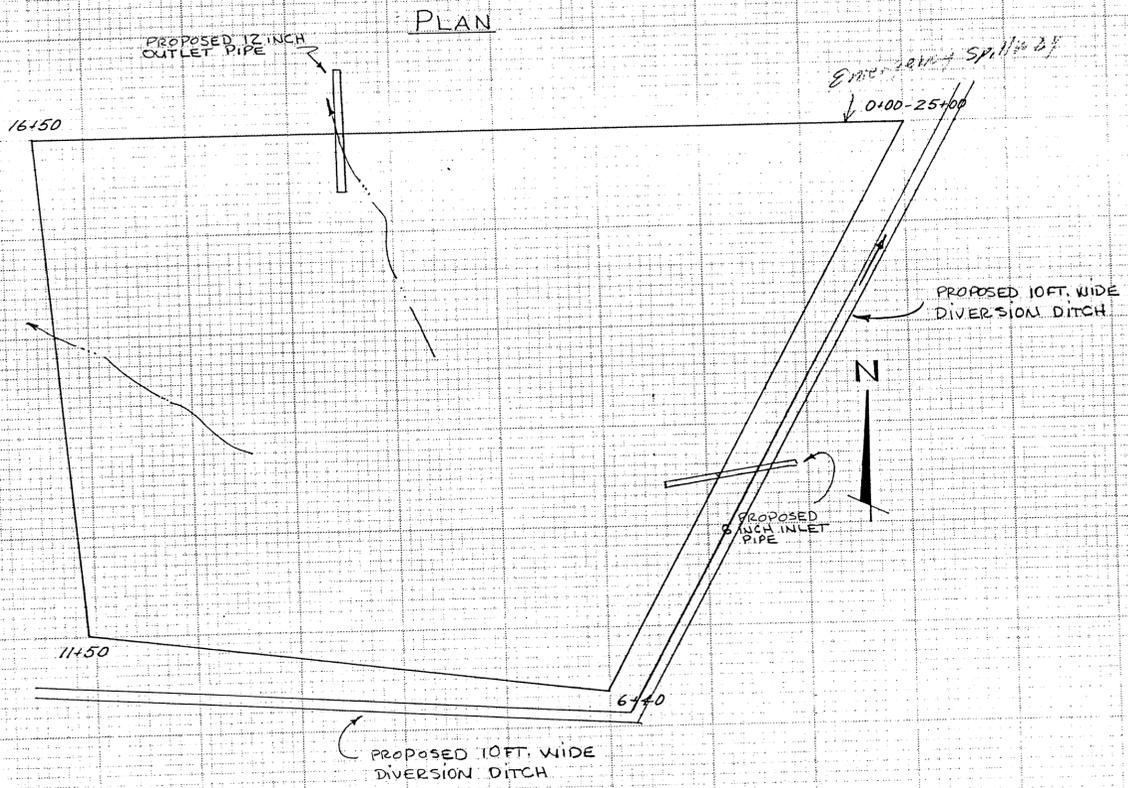
This permit and the authorization to discharge shall expire at midnight, August 31, 2010.

Signed this 23rd day of September, 2005.





Director,
Environmental Protection Division



BILL OF MATERIALS

- CONCRETE 1 CU. YD.
 - CONDUIT PIPE 12" DIA. CORR. STEEL 100 LIN. FT.
 - RISER TEE 12"x12"x18" C.S. (17" WATER) 1 EACH
 - ANTI-SEEP COLLARS 2 EACH
 - TRASH GUARD 36" DIA. C.S. 1 EACH
 - SLIDE GATE 12" DIA, 20' FRAME 1 EACH
- ALL PIPE SHALL BE CORRUGATED STEEL, FULLY ASPHALT COATED .05" AND ASBESTOS TREATED.

EARTH QUANTITIES

EMBANKMENT	39,600	CU. YDS.
EXCAVATION CUT-OFF TRENCH	1,800	CU. YDS.
TOTAL	41,400	CU. YDS.

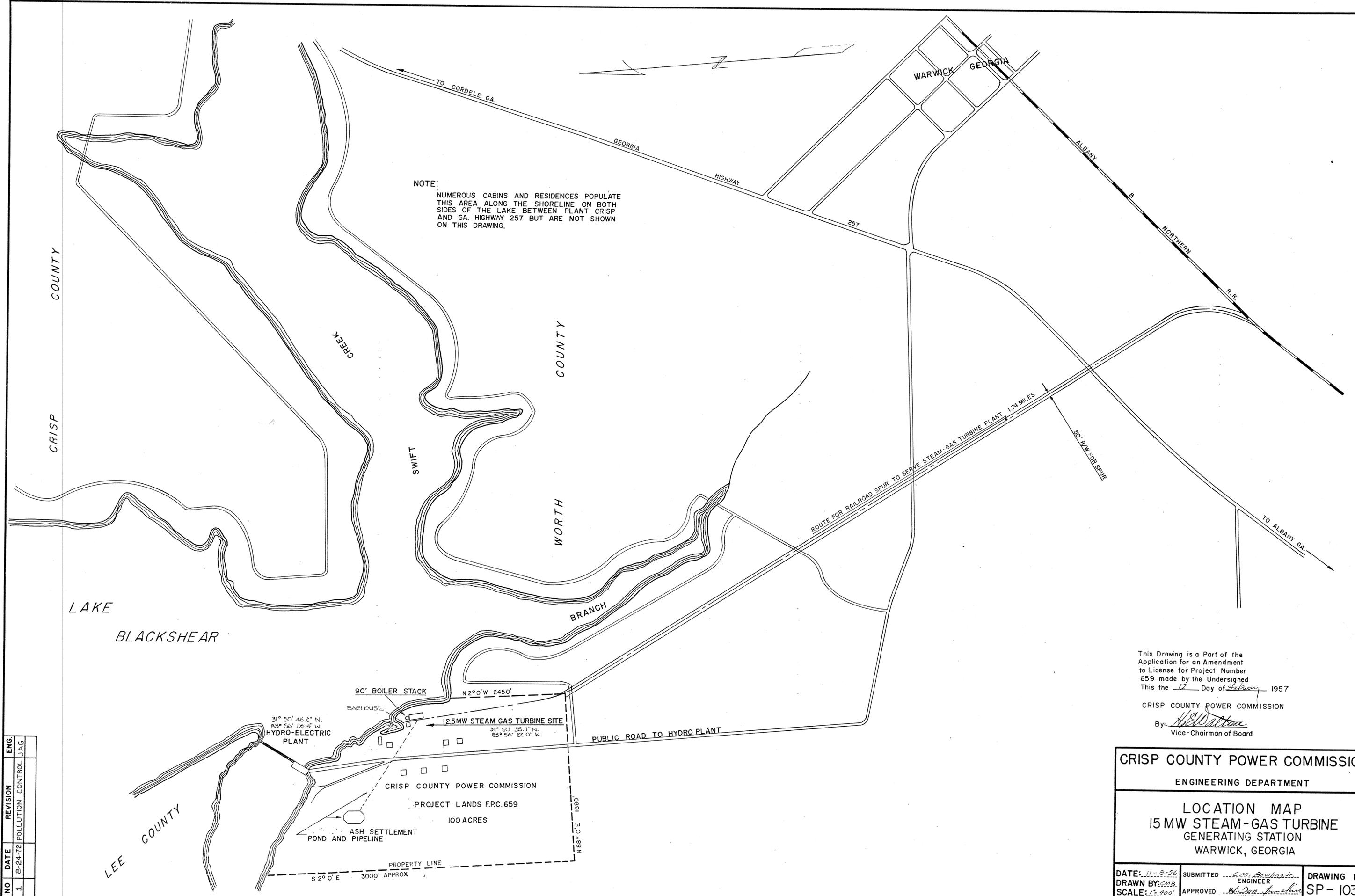
CRISP COUNTY POWER COMMISSION
DEBRIS BASIN

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

REVISED JAN. 7, 1974
CRISP POWER
ENG. DEPT JAG

Designed	BRUNSON & ROBERTS	Date	3-73	Approved by	<i>Perry J. Dornier</i>
Drawn	P.F. DOMINY	Title	3-73	Title	AREA ENGINEER
Traced		Sheet		Drawing No.	
Checked		No.	1	of	2
					SP1104

NOTE:
 NUMEROUS CABINS AND RESIDENCES POPULATE THIS AREA ALONG THE SHORELINE ON BOTH SIDES OF THE LAKE BETWEEN PLANT CRISP AND GA. HIGHWAY 257 BUT ARE NOT SHOWN ON THIS DRAWING.



This Drawing is a Part of the Application for an Amendment to License for Project Number 659 made by the Undersigned This the 12 Day of February 1957

CRISP COUNTY POWER COMMISSION
 By: *[Signature]*
 Vice-Chairman of Board

CRISP COUNTY POWER COMMISSION
 ENGINEERING DEPARTMENT
LOCATION MAP
15 MW STEAM-GAS TURBINE
GENERATING STATION
WARWICK, GEORGIA

DATE: 11-8-56	SUBMITTED: <i>[Signature]</i> ENGINEER	DRAWING NO. SP-1034
DRAWN BY: <i>[Signature]</i>	APPROVED: <i>[Signature]</i> CHIEF ENGINEER	SHEET
SCALE: 1" = 400'	FILE:	

NO.	DATE	REVISION	ENG.
1.	8-24-72	POLLUTION CONTROL JAG	JAG

N00°46'30"E 121092

N00°46'30"E 17891

N 86°18'W 1122.23

N 89°18'36"W 1680.10

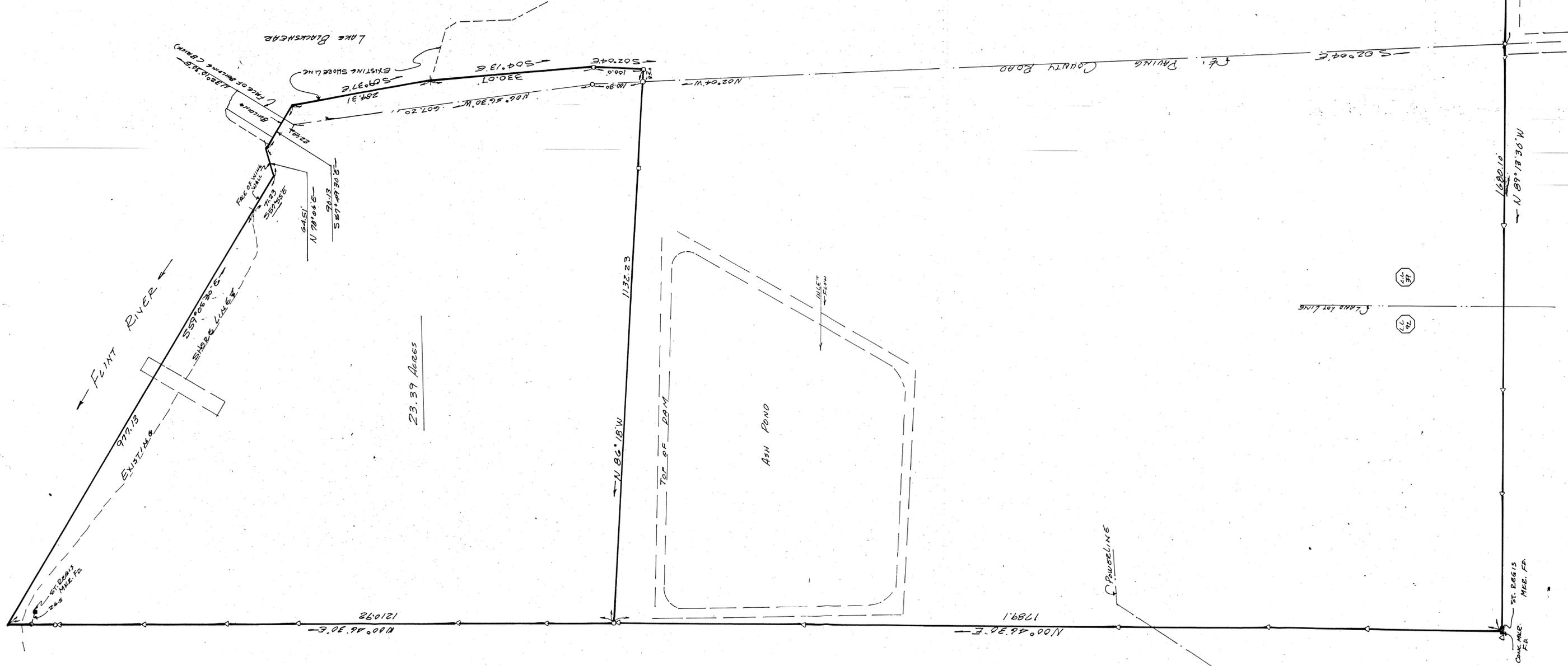
S 02°04'E

PAVING COUNTY ROAD

S 00°06'E 927.8 FENCE

SCENIC DRIVE 498.3

ST. REGIS CONC. PIPE MKE. FD.



23.39 Acres

I certify that this map or plat is a correct representation of the land, and has been prepared in conformity with the standards and regulations of the State of Georgia.
Earl D. Raines
Earl D. Raines
Georgia Registered Surveyor No. 1512



9,000

- NOTE:
1. - 1/2" IRON PIN SET
 2. - 1/2" IRON PIPE FOUND
 3. - CONCRETE MARKER SET
 4. - CONCRETE MARKER FOUND
 5. - GAL. DOME PIN SET

SURVEY PLAT FOR
CRISP COUNTY POWER COMMISSION
 IN LAND LOTS 39 & 42, 15TH LAND DISTRICT
 NORTH COUNTY, GEORGIA
 SCALE 1"=100' 19 JULY 1978
 78-1876-4

78-1876-4

Appendix B
USEPA Checklists



Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # GA0025399 INSPECTOR William Fox and Eduardo Gutierrez
Date August 30, 2012

Impoundment Name Ash Pond
Impoundment Company Crisp County Power Commision
EPA Region 4
State Agency (Field Office) Address 61 Forsyth Street, SW Atlanta, Ga 30303-8960

Name of Impoundment Ash Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New [X] Update

Is impoundment currently under construction? Yes No [X]
Is water or ccw currently being pumped into the impoundment? [X]

IMPOUNDMENT FUNCTION: Settling of CCW (bottom ash, fly ash, and runoff from plant) and some stormwater runoff

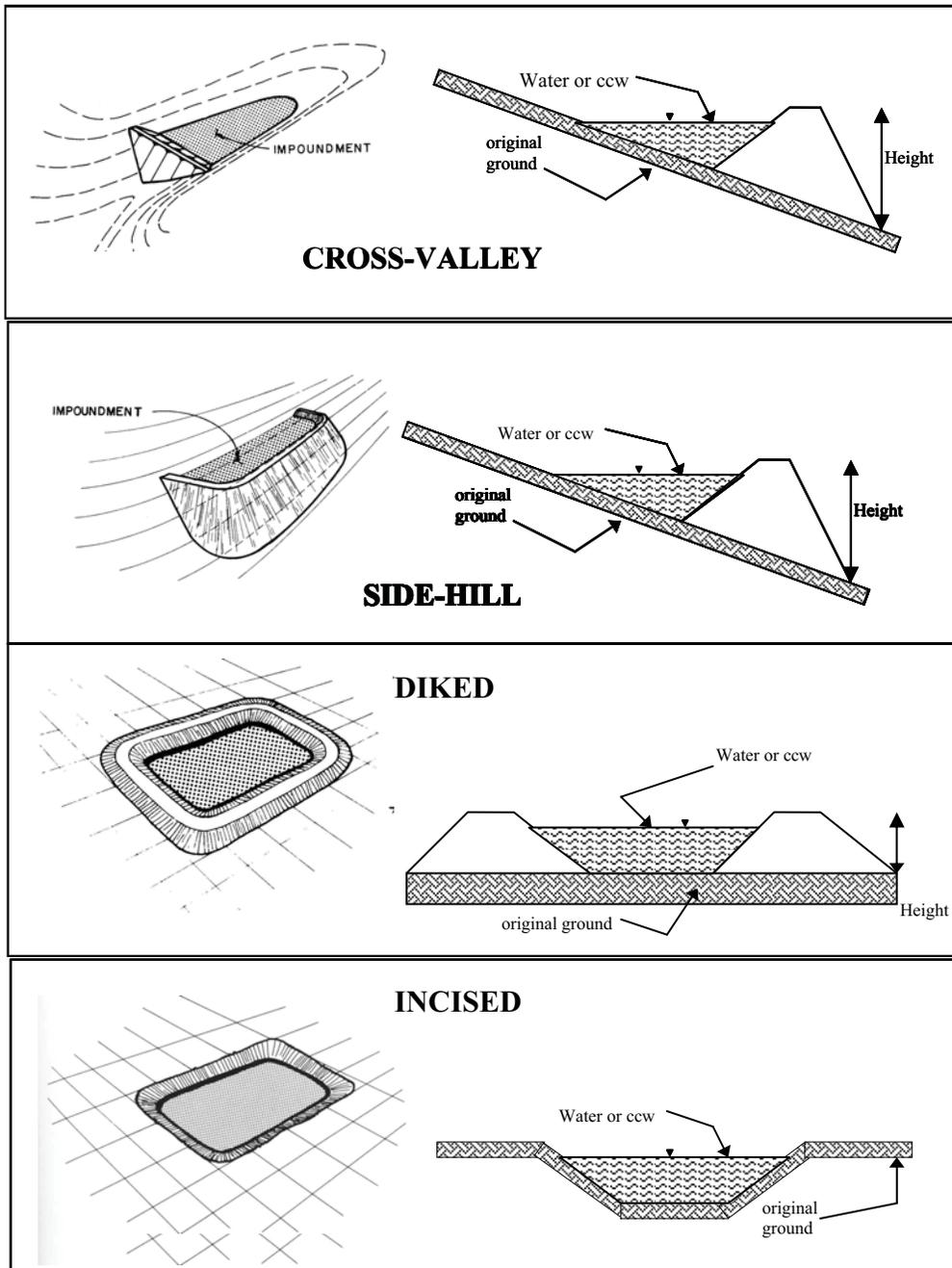
Nearest Downstream Town : Name Warwick, Georgia
Distance from the impoundment 1.5 miles
Impoundment Location: Longitude 83 Degrees 56 Minutes 39.60W Seconds
Latitude 31 Degrees 50 Minutes 41.02N Seconds
State Georgia County Crisp County

Does a state agency regulate this impoundment? YES [X] NO

If So Which State Agency? Georgia Environmental Protection Division

US EPA ARCHIVE DOCUMENT

CONFIGURATION:



Cross-Valley
 Side-Hill
 Diked
 Incised (form completion optional)
 Combination Incised/Diked

Embankment Height 23 feet Embankment Material Earthen
 Pool Area 6.5 acres Liner No Liner
 Current Freeboard 8 feet Liner Permeability Not Applicable
 (Limited water standing at bottom of pond)



ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information was provided relative to the embankment foundation. It is not possible to make a judgement regarding suitability of underlying materials.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The assessor did not meet with, or have documentation from the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Appendix C

Photographs

Appendix C
Photographs GPS Locations

Site: Crisp County Power Commission - Plant Crisp
Datum: NAD83
Coordinate Units: Decimal Degrees

Photograph No.	Latitude	Longitude
1	31.845344	-83.943060
2	31.845307	-83.943079
3	31.845323	-83.943009
4	31.845336	-83.943154
5	31.845473	-83.943320
6	31.845455	-83.943362
7	31.845500	-83.944360
8	31.845502	-83.944403
9	31.845347	-83.944541
10	31.845355	-83.944585
11	31.845323	-83.944616
12	31.845333	-83.944675
13	31.845284	-83.944643
14	31.845490	-83.944547
15	31.845490	-83.944596
16	31.845493	-83.945288
17	31.845422	-83.945388
18	31.845276	-83.945386
19	31.845317	-83.945384
20	31.845360	-83.945353
21	31.845165	-83.945391
22	31.845100	-83.945389
23	31.845128	-83.945438
24	31.845024	-83.945340
25	31.844853	-83.945410
26	31.844859	-83.945310
27	31.844888	-83.945371
28	31.844819	-83.945373
29	31.844309	-83.945442
30	31.844405	-83.945446
31	31.844353	-83.945462
32	31.844227	-83.945420
33	31.844144	-83.945356
34	31.844199	-83.945288
35	31.844148	-83.945281
36	31.844098	-83.945248
37	31.844049	-83.945211
38	31.844001	-83.945224
39	31.843972	-83.945176
40	31.843988	-83.944666
41	31.843988	-83.944606
42	31.844049	-83.944611
43	31.844047	-83.944663
44	31.843926	-83.944613
45	31.843933	-83.944669
46	31.844037	-83.943746
47	31.844002	-83.943713
48	31.844090	-83.943643
49	31.844069	-83.943692

Appendix C
Photographs GPS Locations

Site: Crisp County Power Commission - Plant Crisp

Datum: NAD83

Coordinate Units: Decimal Degrees

Photograph No.	Latitude	Longitude
50	31.844124	-83.943675
51	31.844397	-83.943443
52	31.844563	-83.943288
53	31.844715	-83.943233
54	31.844759	-83.943196
55	31.844941	-83.943107
56	31.844674	-83.942673
57	31.845245	-83.942940
58	31.845225	-83.942883
59	31.845283	-83.943287
60	31.845299	-83.943383
61	31.845275	-83.943532
62	31.845328	-83.943501
63	31.845150	-83.943181
64	31.845293	-83.944223
65	31.845295	-83.944190
66	31.845320	-83.944409
67	31.845339	-83.945115
68	31.845314	-83.945154
69	31.845226	-83.945224
70	31.844948	-83.945210
71	31.844203	-83.945168
72	31.844155	-83.945113
73	31.844086	-83.944488
74	31.844177	-83.944440
75	31.844065	-83.944256

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 1: Ash Pond – Crest of north embankment, looking west.



Photo 2: Ash Pond – North embankment interior slope, looking west.



Photo 3: Ash Pond – North embankment interior slope, general view of pond surface area looking southwest.

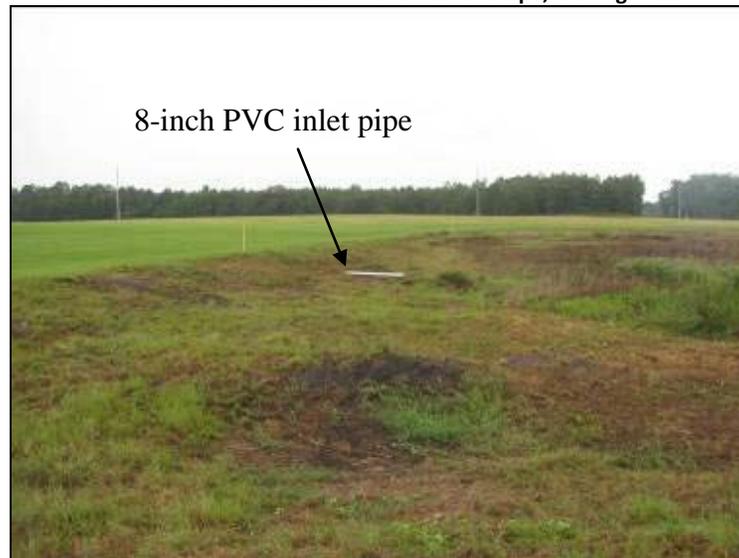


Photo 4: Ash Pond – Southeast embankment interior slope and pond surface area, looking south.

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 5: Ash Pond – North embankment exterior slope, minor surficial erosion looking south.



Photo 6: Ash Pond – North embankment exterior slope, change in slope grade from approximately 2.8 H:1V to 2H:1V, looking west.



Photo 7: Ash Pond – North embankment exterior slope, surficial erosion rill running from crest to toe of slope looking south.



Photo 8: Ash Pond – North embankment exterior slope, erosion rill near crest, looking south.

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 9: Ash Pond – North embankment interior slope, looking east.



Photo 10: Ash Pond – North embankment interior slope, looking west.



Photo 11: Ash Pond – North embankment interior slope, 18-inch outlet riser pipe, looking east.



Photo 12: Ash Pond – North embankment interior slope, boardwalk and 18-inch outlet riser pipe looking east.

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 13: Ash Pond – General view of pond bottom surface, looking south.



Photo 14: Ash Pond – North embankment exterior slope, looking east.



Photo 15: Ash Pond – North embankment exterior slope, looking west.



Photo 16: Ash Pond – North embankment exterior slope near northwest corner, looking east.

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 17: Ash Pond – West embankment exterior slope near northwest corner, looking west.



Photo 18: Ash Pond – West embankment exterior slope sloughing, looking South.

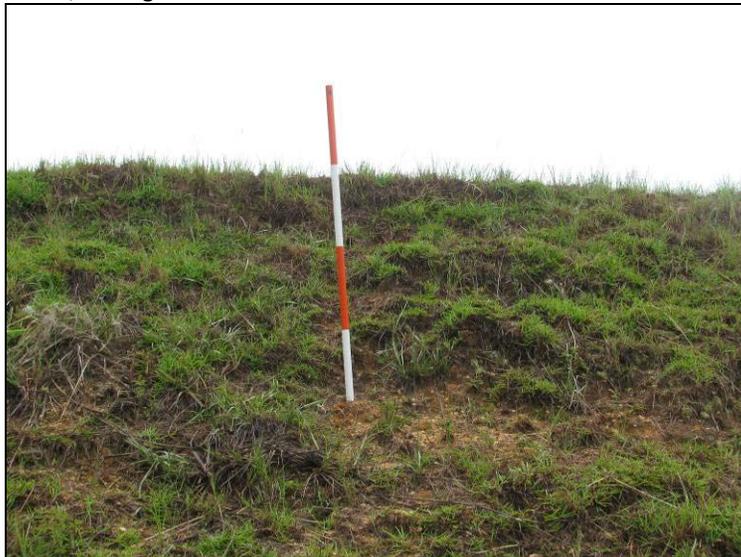


Photo 19: Ash Pond – West embankment exterior slope sloughing, looking east.



Photo 20: Ash Pond – West embankment exterior slope sloughing, looking southeast.

EPA Assessment Crisp County Power Plant Photos August 30, 2012



Photo 21: Ash Pond – West embankment exterior slope, apparent 16-foot long semi-circular sloughing, looking southeast.



Photo 22: Ash Pond – West embankment exterior slope, apparent 16-foot long semi-circular sloughing, looking north.



Photo 23: Ash Pond – West embankment exterior slope, apparent 16-foot long semi-circular sloughing, looking east.



Photo 24: Ash Pond – West embankment exterior slope, scarp near crest of embankment, looking southeast.

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Photo 25: Ash Pond – West embankment exterior slope, sloughing near crest of embankment, looking east.



Photo 26: Ash Pond – West embankment exterior slope, sloughing near crest, looking west.



Photo 27: Ash Pond – West embankment exterior slope, looking north.



Photo 28: Ash Pond – West embankment exterior slope, looking south.
Note: steepness of slope (2H:1V).

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Photo 29: Ash Pond – West embankment exterior slope, swale cut at toe of slope, looking east.



Photo 30: Ash Pond – West embankment exterior slope, swale cut at toe of slope, looking east.



Photo 31: Ash Pond – West embankment exterior slope, toe of slope and road looking north.



Photo 32: Ash Pond – West embankment exterior slope near southwest corner, looking north.

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Photo 33: Ash Pond – West embankment exterior slope near southwest corner, looking north.



Photo 34: Ash Pond – Crest of west embankment looking north.



Photo 35: Ash Pond – General view of pond surface area looking northeast.



Photo 36: Ash Pond – General view of pond surface area looking northeast.

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Photo 37: Ash Pond – Crest of South embankment looking east.



Photo 38: Ash Pond – South embankment exterior slope, looking east.



Photo 39: Ash Pond – South embankment exterior slope, looking east.



Photo 40: Ash Pond – Crest of south embankment looking west.

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Photo 41: Ash Pond – Crest South Embankment looking east.



Photo 42: Ash Pond – South embankment interior slope, looking east.



Photo 43: Ash Pond – South embankment interior slope, looking west.



Photo 44: Ash Pond – South embankment exterior slope, looking east.

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Photo 45: Ash Pond – South embankment exterior slope, looking west.



Photo 46: Ash Pond –Crest of South embankment near southeast corner looking west.



Photo 47: Ash Pond – General view of floodplain area south of Ash Pond, looking southeast.



Photo 48: Ash Pond – Crest of southeast embankment near southeast corner, looking northeast.

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Photo 49: Ash Pond – General view of pond surface area near southeast corner, looking northwest.



Photo 51: Ash Pond – Southeast embankment interior slope, 7-inch I.D. Ductile iron pipe looking northwest.

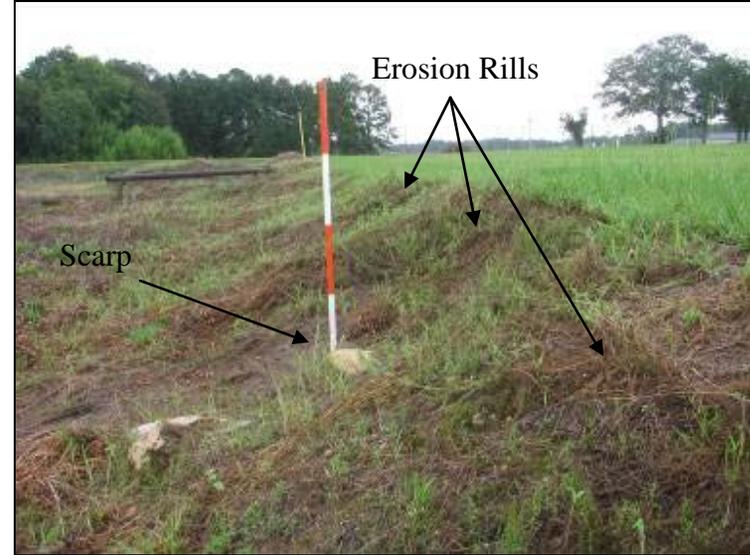


Photo 50: Ash Pond – Southeast embankment interior slope, looking northeast. Note: erosion rills and surficial scarps.



Photo 52: Ash Pond – Permit sign on southeast embankment, looking west.

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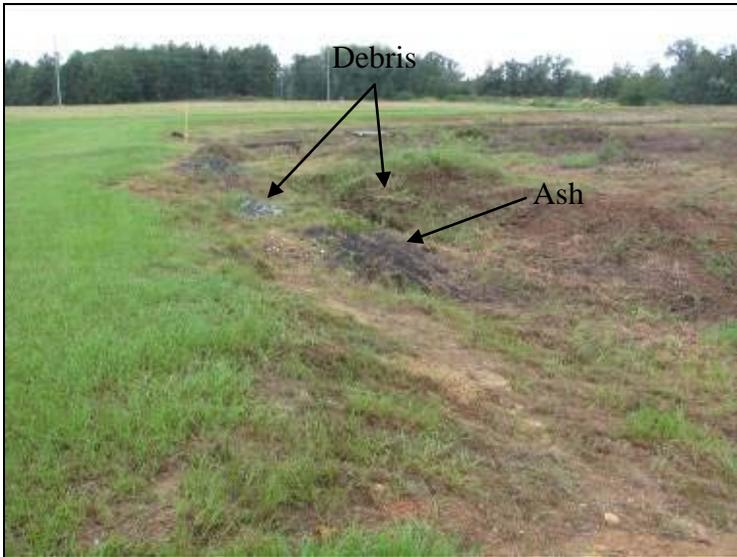


Photo 53: Ash Pond – Crest and interior slope southeast embankment, looking southwest. Note: Ash and debris at pond surface.



Photo 54: Ash Pond – General view of pond surface, looking west.



Photo 55: Ash Pond – Southeast embankment interior slope, 8-inch PVC inlet pipe, looking northwest.



Photo 56: Ash Pond – General view of Ash pond, looking west.

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Photo 57: Ash Pond –North embankment interior slope near northeast corner, looking west.



Photo 58: Ash Pond – Crest of southeast embankment near northeast corner, looking southwest.

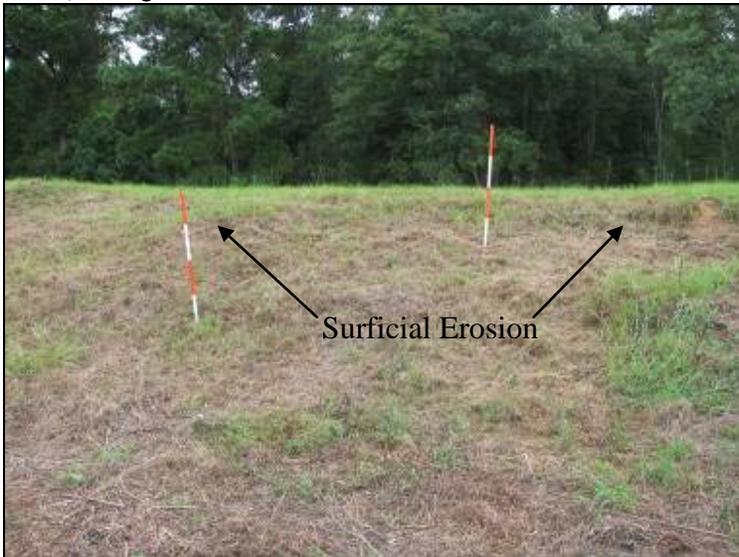


Photo 59: Ash Pond – North embankment interior slope, surficial erosion (30-foot long) looking northwest.



Photo 60: Ash Pond – North embankment interior slope, looking west.

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Photo 61: Ash Pond – North embankment interior slope surficial erosion, looking north.



Photo 62: Ash Pond – North embankment interior slope surficial erosion, looking west.



Photo 63: Ash Pond – 8-inch PVC inlet pipe on southeast embankment, looking south. Note: water flowing.



Photo 64: Ash Pond – North embankment interior slope, boardwalk and outlet 18-inch CMP riser pipe looking west.

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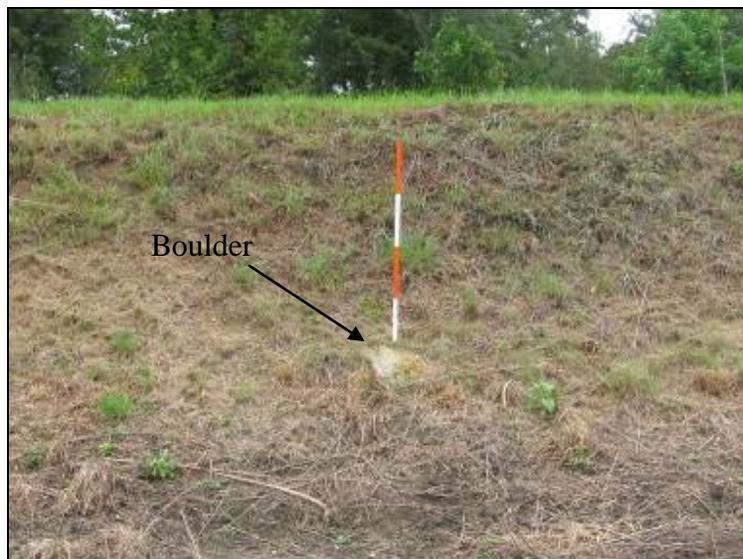


Photo 65: Ash Pond – North embankment interior slope, looking north.
 Note: boulder (12"-24") and steepness of slope (2H:1V).



Photo 66: Ash Pond – North Embankment interior slope, erosion rills near outlet structure looking north.



Photo 67: Ash Pond – North embankment interior slope, looking east.



Photo 68: Ash Pond – West embankment interior slope, looking south.
 Note: ponded water near northwest corner of pond.

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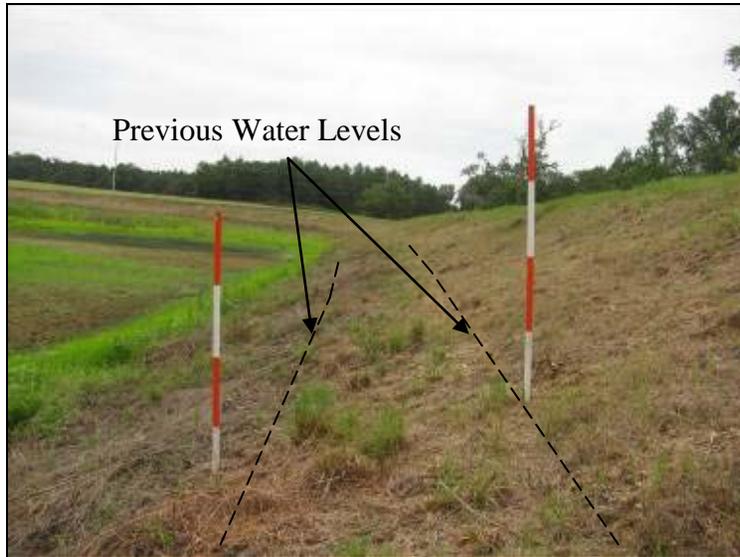


Photo 69: Ash Pond – West embankment interior slope, looking south. Note apparent previous water level marks.



Photo 70: Ash Pond – West embankment interior slope surficial erosion/scarp, looking west.



Photo 71: Ash Pond – West embankment interior slope, looking north.



Photo 72: Ash Pond – South embankment interior slope, looking east.

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Photo 73: Ash Pond – South embankment interior slope, looking south. Note protruding rock at slope face.



Photo 74: Ash Pond – Incised channel in the Ash deposited at bottom of pond, looking east.



Photo 75: Ash Pond – South embankment interior slope, surficial erosion looking southeast.

Appendix 8

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Memorandum

To: Jana Englander

From: William J. Friers

Date: December 31, 2013

Subject: Round 12, Final Report - Plant Crisp

Attached please find a file copy of the CCW Impoundment Final Report for Plant Crisp (Round 12, CLIN 003). This Final Report has been revised to address all comments received from the EPA, Plant Owners, and State Regulatory Agencies.

CDM Smith received comments from EPA and Crisp County Power regarding the **Plant Crisp Draft Report**, dated November 2012. The State of Georgia, Safe Dams Program did not have comments on the Draft Report. All EPA comments have been addressed in the Final Report. Crisp County Power comments have been addressed in the Final Report, as noted below.

Crisp County Power Comment No. 1 - States the CCW Impoundment does not receive liquids from cooling tower blowdown.

CDM Smith Action - Deleted reference to cooling tower blowdown in Section 2.4.

Crisp County Power Comment No. 2 - Request to eliminate CDM Smith recommendation to prepare drawings and perform hydraulic and seismic studies considering the low level of ash in the pond and the minimal amounts being added.

CDM Smith Action - Recommendation to prepare drawings and perform analyses was not changed. Crisp County Power has not conducted static and seismic engineering studies following the best professional engineering practice to support the CCW Impoundment's embankments' structural stability. Additionally, no documentation was provided by Crisp County Power for analyses of the Inflow Design Flood (IDF) or evaluation of the ability of the impoundment to store inflow associated with the design storm.

Please call or email with any questions.

Sincerely,

Bill

William J. Friers, P.E.
Senior Civil Engineer
CDM Smith