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COAL COMBUSTION RESIDUAL IMPOUNDMENT INSPECTION – CROSS GENERATING STATION

Pineville, South Carolina

santee cooper®

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**Please note that the terms "embankment", "berm", "dike", and "dam" are used interchangeably within this report, as are the terms "pond", "basin", and "impoundment".*

Executive Summary

This assessment of the stability and functionality of the Cross Generating Station (CGS) coal combustion residual (CCR) management units is based on a review of available documents and an on-site assessment conducted by Santee Cooper engineering staff on November 16, 2015. We found the supporting technical information to be generally adequate. As detailed in Section 5.2, the assessment team had several recommendations based on field observations that may help CGS to continue to maintain the management units in safe condition.

In summary, the CGS CCR management units (Gypsum Filtrate Pond and Bottom Ash Pond) are in generally satisfactory condition for continued safe and reliable operation. No recognized existing or potential management unit safety deficiencies were identified within the parameters of design and operation given the units' low hazard potential classifications.

Summary of Recommendations

Bottom Ash Pond

1. Minor tractor rutting and occasional minor erosion noted at various locations on the downstream slope of the Bottom Ash Pond should be monitored for further displacement of material during weekly inspections.
2. Erosion of the downstream slope of the Bottom Ash Pond perimeter dike noted directly below both pipe bridges for the bottom ash feed lines on the southwestern side of the impoundment should be repaired within ninety (90) days of the date of this report. (NOTE: This repair was completed within two (2) days of the date of inspection).
3. Minor damage to the top of the inside slope and revetment of the perimeter dike noted near the rail car shop should be repaired and the crest road properly graded to direct water away from the area to avoid ponding of storm water during rain events within ninety (90) days of the date of this report.
4. Erosion of the downstream slope of the perimeter dike noted on the northeastern corner of the pond should be repaired and the area should be

stabilized with vegetation within ninety (90) days of the date of this report to avoid further damage during storm events.

Gypsum Filtrate Pond

1. The interior slope of the perimeter dike was found to be steeper than the original design drawings indicate due to mechanical excavation during the removal of gypsum from the pond. The slopes should be closely monitored for signs of erosion, further movement and/or slumping of the interior of the crest into the pond. If further movement or erosion is noted, an engineered repair should be investigated in light of the upcoming closure of the pond.
2. An old surficial slope failure was noted on the southeast corner of the Gypsum Filtrate Pond perimeter dike's downstream slope. This area should be monitored for further movement during CGS' weekly inspections. If further movement is noted, an engineered repair should be investigated in light of the upcoming closure of the pond.

This assessment of dam safety reported herein is based on field observations and review of readily available information provided to the inspection team of the subject coal combustion residual (CCR) management units at Cross Generating Station. Qualified Santee Cooper engineering staff performed the field observations and review of pertinent information and made the assessment in conformance with the requirements of Section 257.83 of the Federal Register and in accordance with reasonable and generally accepted engineering practices.

Coal Combustion Residual Impoundment Inspection – Cross Generating Station

1.0 General Information and Introduction

1.1 Purpose and Scope

The purpose of this report is to fulfill the requirements of Section 257.83(b) of the Federal Register regarding the safety and inspection of CCR surface impoundments. Section 257.83(b) states that "If the existing or new CCR surface impoundment or any lateral expansion of the CCR surface impoundment is subject to the periodic structural stability assessment requirements under Section 257.73(d) or 257.74(d), the CCR unit must additionally be inspected on a periodic basis by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards." The inspection must, at a minimum, include:

i. A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g., CCR unit design and construction information required by Section 257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under Section 257.73(d) and 257.74(d), the results of inspections by a qualified person, and results of previous annual inspections
ii. A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures
iii. A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation

The inspection report must also be written by a qualified professional engineer and must address the following (required information on the CCR impoundments at CGS included in bold below the Federal Register excerpt):

i. Any changes in geometry of the impounding structure since the previous annual inspection
   - **No change noted in the geometry of the Bottom Ash Pond (see Section 5.3)**
   - **Some steepening of the interior slope of the Gypsum Filtrate Pond (see Section 5.3)**

ii. The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection
   - **The Bottom Ash Pond has a staff gage but no formal dam safety instrumentation (see Section 4.4.3)**
   - **The Gypsum Filtrate Pond has no formal dam safety instrumentation due to its small size (see Section 4.4.3)**

iii. The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection
   - **See Table 1.1 below for information on Bottom Ash Pond**
   - **See Table 1.1 below for information on Gypsum Filtrate Pond**

iv. The storage capacity of the impounding structure at the time of inspection
   - **See Table 1.1 below for information on Bottom Ash Pond**
   - **See Table 1.1 below for information on Gypsum Filtrate Pond**

v. The approximate volume of the impounding water and CCR at the time of inspection
   - **See Table 1.1 below for information on Bottom Ash Pond**
   - **See Table 1.1 below for information on Gypsum Filtrate Pond**

Ash Pond Name	Gypsum Filtrate	Bottom Ash Pond
Surface Area (acre)	1.0	79.0
Approx. Current CCR Storage Volume (acre-feet)	2.7	380
Total Storage Capacity (acre-feet)	6	1,158
Total Water Storage (acre-feet)	3.3	778
Crest Elevation (feet)	85.81	91.00
Normal Pond Level/Depth (feet)	83.5/6.0	88.0/12.0
Maximum Pond Level/Depth	84.50/7.0	89.9/13.9
Minimum Pond Level/Depth (feet) for 2015	82.50/5.0	87.6/11.6

Table 1.1 – Impoundment Capacity Information

vi. Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures

- **Some maintenance required on Bottom Ash Pond as discussed in Executive Summary and Sections 4.2 and 5.4.1; however, pond is safe for continued operation**
- **Some maintenance items noted on Gypsum Filtrate Pond as discussed in Executive Summary and Sections 4.2 and 5.4.2; however, pond is safe for continued operation**

vii. Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

- **No other changes noted on the Bottom Ash Pond that impact the stability or operation of the impounding structure**
- **No other changes noted on the Gypsum Filtrate Pond that impact the stability or operation of the impounding structure**

2.0 Description of Coal Combustion Residual Management Units

2.1 Location and General Description

The Cross Generating Station (CGS) is located on the east bank of the Diversion Canal in Berkeley County, South Carolina, approximately 5.2 miles northeast of Cross, South Carolina. CGS is located on Cross Station Road, Pineville, South Carolina, 29468. Lake Marion is northwest of CGS, and Lake Moultrie is southeast of the station.

CGS has two (2) CCR management impoundments: the Bottom Ash Pond and the Gypsum Filtrate Pond. The Bottom Ash Pond is adjacent to the station Wastewater Decant Pond and is connected to the Wastewater Decant Pond via a trapezoidal weir. The Gypsum Filtrate Pond was constructed as a stand-alone pond. Table 2.1 below shows a summary of the size and general dimensions of the CCR management impoundments at CGS:

Table 2.1: Summary of Dam Dimensions and Size

	Gypsum Filtrate Pond	Bottom Ash Pond
Dam Height (ft)[1]	8	14
Crest Width (ft)	15	15 to 24
Length (ft)	1075	6899
Design Side Slopes (upstream) H:V	3:1	3:1
Design Side Slopes (downstream) H:V	3:1	3:1

2.2 Amount and Type of CCRs Currently Stored in Units and Maximum Capacity

The amount of CCRs currently stored in the units and maximum capacities are summarized in Table 2.2 below. The Gypsum Filtrate Pond is designed to contain flue gas emissions control residuals. The Bottom Ash Pond is designed to contain bottom ash and boiler slag. The bottom ash pond also receives economizer ash and water pumped from the Gypsum Filtrate Pond, the coal pile runoff retention basin, and station

drainage sumps. Water from the Bottom Ash Pond is recycled for use as ash seal and ash sluice water after being processed through the Wastewater Decant Pond.

Table 2.2: Amount of CCRs and Maximum Capacity of Units

Ash Pond Name	Gypsum Filtrate	Bottom Ash Pond
Surface Area (acre)[1]	1.0	79.0
Approx. Current CCR Storage Volume (cubic yards)	4000	615,000
Approx. Current CCR Storage Volume (acre-feet)	2.7	380
Total Storage Capacity (cubic yards)	9,680	1,868,240
Total Storage Capacity (acre-feet)	6	1,158
Total Water Storage (acre-feet)	3.3	778
Crest Elevation (feet)	85.81	91.00
Normal Pond Level/Depth[2] (feet)	83.5/6.0	88.0/12.0
Maximum Pond Level/Depth[2] (feet) for 2015	84.50/7.0	89.9/13.9
Minimum Pond Level/Depth[2] (feet) for 2015	82.50/5.0	87.6/11.6

1From Santee Cooper response to EPA's RFI dated March 17, 2009.

2Maximum and Minimum Pond Levels/Depths for Gypsum Filtrate Pond are estimates only – due to the small size of the pond, no staff gage is maintained in the basin. Pond Levels for Bottom Ash Pond are taken from a shared staff gage in the Wastewater Decant Pond

2.3 Principal Project Structures

2.3.1 Earth Embankments

The Bottom Ash Pond consists of a perimeter dike embankment that has geometric

features and crest elevations as shown above in Tables 2.1 and 2.2. The dimensions and elevations are from construction drawings for the pond. The wider crests occur on the embankments along the southwest side of the Bottom Ash Pond (24 feet wide) to accommodate the layout of several pipelines from the power block. As discussed in Section 2.1, the Bottom Ash Pond is connected to the Wastewater Decant Pond via a trapezoidal weir, which is lined with silt curtain to further prevent material transport between ponds. No CCRs are stored in the Wastewater Decant Pond. The Bottom Ash Pond is lined with Bentomat, which is a thin geocomposite of bentonite sandwiched between and contained by fabric layers. The inside slopes are also armored with Fabriform revetment (grout-filled cellular fabric form) to protect the liner and slope from wave erosion and exposure. No internal drainage blankets or toe drains for seepage control were included in the design of the dikes, but such seepage control features would not be warranted or expected for low perimeter dikes impounding a lined pond.

The Gypsum Filtrate Pond has a diked perimeter embankment that has geometric features and crest elevations as shown in Tables 2.1 and 2.2. The dimensions and elevations are from construction drawings for the pond. The material used in the construction of the dike is unknown, but believed to be similar to that used in construction of the Bottom Ash Pond dikes. The floor of the pond is lined with a 6-inch thick soil bentonite layer. No internal drainage blankets or toe drains for seepage control were included in the design of the low perimeter dike.

2.3.2 Outlet Structures

The Bottom Ash Pond discharges into the Wastewater Decant Pond through a 10-foot bottom width trapezoidal weir with 3:1 (horizontal to vertical) side slopes which is located between the ponds. The weir is armored with Fabriform revetment. The crest elevation of this structure is 95.0 feet (the elevation of the shared divider dike between the Wastewater Decant Pond and the Bottom Ash Pond) and its invert is at 85.0 feet. Water from the Bottom Ash Pond flows through the weir into the Wastewater Decant Pond, where it is pumped back to the CGS power block through the ash sluice system and the ash seal system. The Wastewater Decant Pond also contains the emergency outlet for both ponds. This outlet consists of a reinforced concrete box structure with a four (4) foot overflow section set at 89.0 feet. Emergency overflow discharges from the

bottom of the overflow structure through an 18-inch diameter steel pipe. The invert of this pipe is at 78.0 feet.

The Gypsum Filtrate Pond has a pump structure located on the northeast end of the pond. Water is pumped from the Pond to the Bottom Ash Pond. An emergency overflow structure is located at the southwest end of the pond. The overflow structure consists of a reinforced concrete box structure with a four (4) foot overflow section set at 84.6 feet. According to construction drawings, this box discharges from the bottom of the structure through an 18-inch diameter prestressed concrete pipe.

3.0 Summary of Relevant Reports and Incidents

3.1 Summary of Reports on the Safety of CCR Units

Furnished reports of weekly inspections, conducted by CGS personnel for the period October 2015 to November 2015 indicated no major structural or operational problems. No significant deterioration was indicated in the documentation reviewed. In addition, the periodic inspection report completed by Civil Projects in 2013 was reviewed. Several minor potential maintenance items were noted in the report and were carefully observed during the field inspection.

As indicated in Section 5.4.1, careful inspection of the pipe bridge(s) and the slopes immediately downstream should be included in the weekly inspections moving forward, particularly following significant rainfall events.

4.0 Field Observations

4.1 Project Overview and Significant Findings

Santee Cooper qualified engineer Michael Melchers, P.E. performed a site visit to CGS on November 16, 2015. The site visit began mid-morning. Weather conditions during the visit were approximately 45 to 65 degrees Fahrenheit, sunny, and dry, although approximately five (5) inches of rain had been received over the previous ten (10) days.

The overall condition of the CCR impoundment dikes was satisfactory with no significant findings noted.

All findings were discussed with station personnel following completion of the field inspection to facilitate monitoring and repair of any deficiencies noted.

Please note that field observations as outlined in Sections 4.2 and 4.3 below are indicative of conditions on-site as of November 16, 2015. Several of the observations noted have now been corrected as outlined in the Executive Summary and Section 5.3 of this report.

4.2 Bottom Ash Pond

4.2.1 Crest

The crest of the Bottom Ash Pond perimeter dike was generally found to be in satisfactory condition. The limestone-surfaced crest road did have several isolated potholes from traffic. No major sags, depressions, or other signs of significant settlement were observed in the crest. No tension cracks or other signs of insipient mass soil movement were observed in the crest or along the edge of the crest.

4.2.2 Upstream/Inside Slope

The upstream/inside slope of the Bottom Ash Pond perimeter dike was generally found to be in satisfactory condition. The Fabriform revetment on the upstream inside slopes was in serviceable condition in most areas with one (1) isolated area adjacent to the CGS

rail car shop showing damage, likely from heavy equipment. Small patches of vegetation were noted on the upstream slopes, generally along and just above the waterline or ash sediment line. No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water surface or ash surface.

4.2.3 Downstream/Outside Slope and Toe

The downstream slope and toe of the Bottom Ash Pond was found to be in generally satisfactory condition. Grass on the outside slope was typically observed to be maintained in good condition with isolated rutting and minor surface erosion in areas with poorly established cover, especially near the toe where the perimeter drainage ditch keeps soils somewhat moister than in other locations. One isolated area with more widespread erosion was noted during the field inspection (repair recommendations are contained in Section 5.4.1). No obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed on the outside slope.

The area beyond the outside toe of the dike on the southeast side was observed to be covered in woody vegetation. There were no indications of seepage.

4.2.4 Abutments and Groin Areas

There are no abutments or groins in the dike embankment. No erosion or displacements were observed where the Bottom Ash Pond meets the Wastewater Decant Pond dike.

4.2.5 Overflow Structure/Outlet

Water flows from the Bottom Ash Pond to the Wastewater Decant Pond through a trapezoidal weir. The Fabriform-armored notch appeared to be in satisfactory condition with no major depressions, displacements, or deterioration. A silt curtain system keeps the structure clear of any deposited materials, allowing free flow of clarified water between the Bottom Ash Pond and the Wastewater Decant Pond.

4.2.6 Outlet Conduit

There is no outlet conduit from or through the Bottom Ash Pond perimeter dike.

4.2.7 Emergency Spillway

There is no emergency spillway within the Bottom Ash Pond; however, the capacity of the trapezoidal weir between the Bottom Ash Pond and the Wastewater Decant Pond allows water to be transferred from the Bottom Ash Pond to the Wastewater Decant Pond and then out through the Wastewater Decant Pond's emergency overflow structure during large storm events (if necessary).

4.2.8 Other Conduits

The Bentomat liner in the Bottom Ash Pond was installed during initial construction of the pond. Due to high groundwater in the vicinity of CGS, an underdrain system consisting of slotted 12" HDPE pipe installed in sand-lined trenches was used to dewater the area, allowing the liner to be safely installed without uplift concerns during construction. Upon filling of the pond, the underdrain system was abandoned in-place and the outfall (consisting of a sump area and pump) was closed using grout. Because the underdrain system utilized small pipes installed in controlled backfill, and because the invert of the outfall is over ten (10) feet below grade, this system presents minimal risk to the integrity of the Bottom Ash Pond. Closure of the sump area further minimizes the risk of any sediment transport. This structure is completely below grade, preventing visual inspection of the structure itself; however, the vicinity of the outfall is in satisfactory condition.

Process water pipes, including bottom ash feed lines, pumped storm water discharge lines, and other station process water lines enter the Bottom Ash Pond in four (4) locations. The majority of the lines enter the pond through two (2) concrete "bridge" structures at the top of the perimeter dike. These structures were found to be in satisfactory condition; however, both showed signs of erosion directly below the concrete structure, likely driven by the large volume of rainfall received on-site in the weeks leading up to the inspection. The erosion is not currently a threat to safe operation of the pond; however, as outlined in section 5.2.1, repair is recommended.

Two (2) other small HDPE lines penetrate the top of the perimeter dike near the southwestern corner of the pond. The two (2) individual pipe crossings are fairly recent installations and were placed at the top of the perimeter dike and backfilled using

flowable fill to ensure proper material compaction around the conduit. These crossings were found to be in satisfactory condition.

4.3 Gypsum Filtrate Pond

4.3.1 Crest

The crest of the Gypsum Filtrate Pond perimeter dike was generally found to be in satisfactory condition. The limestone-surfaced crest road did have several isolated potholes from traffic. No major sags, depressions, or other signs of significant settlement were observed in the crest. No tension cracks or other signs of insipient mass soil movement were observed in the crest or along the edge of the crest.

4.3.2 Upstream/Inside Slope

The upstream/inside slope of the Gypsum Filtrate Pond perimeter dike was found to be in fair condition. The slope appears to have been damaged by excavation during removal of products from the pond by excavators and other earth-moving equipment. The inside slope appeared to be steeper than the 3:1 (horizontal to vertical) slope shown in design drawings at the time of inspection. Some slumps and slides were noted during the field inspection as a result of the steep slope and excavation activities; however, operating levels in this pond are maintained at a low level, minimizing the risk of further slope failure under normal operating conditions. Station personnel also noted during the pre-inspection meeting that the pond is scheduled for closure in early 2016, further minimizing the long-term risk from the condition of the inside slope.

4.3.3 Downstream/Outside Slope and Toe

The downstream/outside slope and toe of the Gypsum Filtrate Pond was found to be in generally satisfactory condition. The grass on the outside slope is being maintained in good condition with no significant areas of erosion observed. One minor surficial slope failure was noted near the southeast corner of the pond; however, the slide appeared to be old and was stable at the time of inspection.

A drainage ditch along the outside toe of the pond conveys runoff to a ditch downstream of the emergency outfall. There were no obvious signs of seepage at the

toe of the dike.

4.3.4 Abutments and Groin Areas

There are no abutments or groins in the dike embankment of the Gypsum Filtrate Pond.

4.3.5 Overflow Structure/Outlet

The Gypsum Filtrate Pond has a single reinforced concrete outfall structure for emergency discharges only. This structure (described in detail in Section 2.3.2) was found to be in satisfactory condition with no major cracks, spalls, or other deterioration. The emergency overflow structure discharges into an 18-inch diameter, prestressed concrete outlet pipe. The visible portion of the outlet pipe appeared to be in satisfactory condition, although some surficial corrosion was apparent on the steel portion of the pipe.

4.3.6 Pump Structure

The main outlet for the Gypsum Filtrate Pond is a pump structure that conveys water to the Bottom Ash Pond. The pump is triggered once the operating water level reaches a set elevation. An auxiliary pump is located adjacent to the permanent pump structure. The pump and associated equipment appeared to be in satisfactory condition, as did the pipes conveying the process water.

4.3.7 Emergency Spillway

There is no emergency spillway for the Gypsum Filtrate Pond. The main emergency outlet is described in detail in Section 4.3.5 above.

4.3.8 Other Conduits

The Gypsum Filtrate Pond has one (1) steel pipe penetration near the top of the dike along the western side of the pond. This pipe appears to have been abandoned in place and was in poor condition at the time of inspection. However, the pipe is well above the elevation of the overflow outlet for the pond and poses minimal risk for further operation of the pond until closure in early 2016.

4.4 Adequacy of Maintenance, Operating, and Surveillance Procedures

4.4.1 Adequacy of Maintenance Procedures

Overall, maintenance of the impounding embankments and emergency outlet works of the Bottom Ash Pond and the Gypsum Filtrate Pond appears to be adequate. No major maintenance issues were noted during the field inspection or in the weekly inspection reports completed by CGS personnel and reviewed by the inspection team.

Some minor maintenance of small erosion areas on the downstream slope of the Bottom Ash Pond is warranted. These repairs should be completed within the timeframes discussed in the Executive Summary and Section 5.4 of this report. Similarly, the condition of the downstream slope of the Bottom Ash Pond near the "pipe bridge" crossings on the southwest edge of the pond should be repaired and closely monitored for future erosion (As noted above, this deficiency was repaired the week of the field inspection).

Steps should be taken to minimize further damage to the inside slope of the Gypsum Filtrate Pond perimeter dike due to removal of gypsum from the pond until the pond is closed.

4.4.2 Adequacy of Operating Procedures

Based on field observations and discussions with CGS personnel, the operating procedures for both the Bottom Ash Pond and the Gypsum Filtrate Pond appear to be adequate.

4.4.3 Adequacy of Surveillance Procedures

CGS personnel complete daily informal inspections and weekly formal inspections on the Bottom Ash Pond and Gypsum Filtrate Pond dikes in accordance with good engineering practice and Section 257.83 of the Federal Register. These inspections are being properly documented and should continue as they are currently being conducted. The "pipe bridge" crossings on the southwest edge of the Bottom Ash Pond should be closely inspected following heavy rainfall as outlined in Section 5.4.1 below.

The Bottom Ash Pond and Gypsum Filtrate Pond have no formal dam performance monitoring instrumentation. A staff gage in the Wastewater Decant Pond is used to monitor water levels in the Bottom Ash Pond as well due to their hydraulic connectivity.

5.0 Conclusions and Recommendations

Conclusions are based on visual observations from a one-day site visit on November 16, 2015, and review of technical documentation provided to the inspection team.

5.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

Based on a review of the engineering data provided and the observations of the inspection team during the site visit, the embankments and emergency outlets of the Bottom Ash Pond and Gypsum Filtrate Pond appear to be structurally sound under static loading conditions. The dike embankments are also indicated to be stable under moderate seismic loading conditions, provided no excessive loss of shear strength occurs in the Pleistocene foundation soils. Isolated layers of very loose to loose sands and some layers of very soft to soft silty clays occur at depth in the foundation soil profile beneath the dikes. However, localized liquefaction or deformations probably would not be reflected through the firmer and stiffer overlying soils in sufficient magnitude to create unacceptable displacements in the dike embankments under moderate earthquake shaking.

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

No hydrologic/hydraulic analyses have been provided for the Bottom Ash Pond or the Gypsum Filtrate Pond. However, for purposes of this assessment, rigorous analyses are not needed for evaluation of hydrologic safety of the impoundments, which are totally contained within perimeter dike systems and do not receive uncontrolled off-site drainage. By inspection, the Bottom Ash Pond and Gypsum Filtrate Pond currently have adequate hydrologic safety for at least the 50-year design precipitation depth of 8.40 inches, since there currently is more than sufficient flood storage volume between the normal operating water levels and the lowest crest elevations on the impounding dikes. In addition, these ponds recently received historic rainfall totals during October 2015 (nearly 13 inches over 72 hours) and were operated safely during this event.

5.3 Conclusions Regarding Field Observations

The inspection team was provided access to all areas in the vicinity of the Bottom Ash Pond and the Gypsum Filtrate Pond as required to conduct a thorough field inspection. The visible portions of the embankment dikes and emergency outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. Some excavation of the inside slope of the Gypsum Filtrate Pond perimeter dike was noted, resulting in slopes steeper than the original design intent; however, given the low head on the structure and the small size of the pond (approximately one (1) acre), the pond should be safe for continued operation until it is removed from service and closed during early 2016. Embankments appear structurally sound. There are no apparent indications of unsafe conditions or conditions needing emergency remedial action. Some maintenance is needed (see Section 5.4.1 and 5.4.2). No changes to the geometry of the impounding structures at the Bottom Ash Pond were noted. As indicated above, the inside slopes of the Gypsum Filtrate Pond have been excavated during removal of the gypsum material from the impoundment, resulting in slopes that are much steeper than the original design of the pond. This impoundment is slated for closure in early 2016.

5.4 Recommendations

5.4.1 Bottom Ash Pond

The following maintenance and monitoring items were noted during the field inspection. Recommendations for repair and/or monitoring follow:

1. Minor tractor rutting and occasional minor erosion was noted at various locations on the downstream slope of the Bottom Ash Pond. These areas should be monitored for further displacement of material during weekly inspections. If condition changes are noted in weekly inspections that warrant repair, an engineered solution should be implemented.
2. Erosion of the downstream slope of the Bottom Ash Pond perimeter dike was noted directly below both pipe bridges for the bottom ash feed lines on the southwestern side of the impoundment, likely due to heavy rains received on-site in the past six (6) weeks (over 30 inches reported in the vicinity).

Although no seepage or further movement was noted at the time of inspection, these areas should be repaired to prevent further damage to the downstream toe of the perimeter dike. Competent, properly compacted soil or rock should be used to complete this repair. These areas should be more closely inspected during the station's weekly impoundment inspections, especially after heavy rains. (NOTE: This repair was completed within two (2) days of the date of inspection).

3. Minor damage to the top of the inside slope of the perimeter dike was noted near the rail car shop, including damage to and removal of the revetment protecting the pond liner. The missing revetment should be replaced and the crest road properly graded to direct water away from the area to avoid ponding of storm water during rain events within ninety (90) days of the date of this report.
4. Erosion of the downstream slope of the perimeter dike was noted on the northeastern corner of the pond. This erosion should be repaired and the area should be stabilized with vegetation within ninety (90) days of the date of this report to avoid further damage during storm events.

5.4.2 Gypsum Filtrate Pond

Two (2) maintenance items were noted during the field inspection. Recommendations for monitoring follow:

1. The interior slope of the perimeter dike was found to be steeper than the original design drawings indicate due to excavation during the removal of gypsum from the pond using mechanical excavation. Because the pond is no longer receiving CCRs and is scheduled to be closed in the next several months, repair is likely unnecessary at this time; however, these slopes should be closely monitored for signs of erosion, further movement and/or slumping of the interior of the crest into the pond. If further movement or erosion is noted, an engineered repair should be investigated in light of the upcoming closure of the pond.
2. An old surficial slope failure was noted on the southeast corner of the Gypsum Filtrate Pond perimeter dike's downstream slope. No signs of recent movement were noted. This area should be monitored for further

movement during CGS' weekly inspections. If further movement is noted, an engineered repair should be investigated in light of the upcoming closure of the pond.