

Cross Generating Station Bottom Ash Pond Closure Plan

Pineville, SC

Water & CCR Environmental Services

PREPARED BY SOUTH CAROLINA PUBLIC SERVICE AUTHORITY (SANTEE COOPER)

November 10, 2023

Revision: 3

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Cross Generating Station

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Document Revision No.	Revision Date	Revision Notes
0	10/14/2016	Original document prepared.
1	8/21/2019	Revision to incorporate changes in site conditions and update the closure schedule.
2	12/21/2022	Revision to incorporate changes in site conditions and update the closure schedule.
3	11/10/2023	Revision to incorporate dewatering activities via existing underdrain system (SCDHEC permit received October 11, 2023), reflect closure deadline extension, and change in current CCR inventory.

1 Introduction

Santee Cooper prepared this Closure Plan for the Coal Combustion Residuals (CCR) surface impoundment, known as the Cross Bottom Ash Pond, at Cross Generating Station in Pineville, SC pursuant to the requirements of 40 CFR § 257.102(b). The Cross Bottom Ash Pond (Pond) is an approximately 79-acre impoundment regulated by South Carolina Department of Health and Environmental Control (SCDHEC), NPDES Permit #SC0037401. At the time of this writing, the Cross Bottom Ash Pond is no longer used for industrial wastewater treatment and CCR disposal for the four Cross Generating Station units. The impoundment ceased receipt of waste and initiated closure on August 31, 2020. Bottom ash and gypsum are being reclaimed from the Pond for beneficial use. Bottom ash is being removed from the Pond and used to produce concrete blocks. It was also used in the construction of the Class 3 landfill, as a protective layer over the drainage layer above the liner. Gypsum is being reclaimed from the Pond and beneficially used by the agriculture industry as landplaster and by the cement industry as a cement additive. Groundwater monitoring is conducted under a state-approved monitoring program and the CCR Rule. This Closure Plan will be used to assist Santee Cooper in the closure of the Cross Bottom Ash Pond.

The United States Environmental Protection Agency (EPA) promulgated regulations regarding Coal Combustion Residuals which were published in the Federal Register on April 17, 2015 (40 CFR Part 257). Section §257.102(b)(1)) requires a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The initial closure plan for the Cross Generating Station Bottom Ash Pond, dated October 14, 2016, was written by Worley Parson, and placed in the operating record prior to the regulatory deadline of October 17, 2016, as required by §257.102(b)(2). This revised version was amended to update the closure schedule, make technical modifications, and reflect the current status of the Pond. This Closure Plan may be additionally amended pursuant to the requirements of § 257.102(b)(3).

2 Narrative of Closure by Removal

Per §257.102(b)(1)(i), the closure plan must include: a *narrative description of how the CCR unit will be closed in accordance with this section.*

The purpose of this Closure Plan is to describe steps to close the Cross Bottom Ash Pond consistent with recognized and generally accepted good engineering practices. Closure is designed to minimize long-term maintenance and control the post-closure release of constituents into environmental pathways of air, surface water and groundwater. The existing Cross Bottom Ash Pond at Cross Generating Station in Pineville, South Carolina will be closed by removal of CCR pursuant to §257.102(c).

Prior to initiation of closure, plant upgrades were implemented to eliminate or divert waste and wastewater from entering the Pond. As of August 2020, pyrites, bottom ash, coal pile run-off, site stormwater, and FGD wastewater no longer enter the Pond. To facilitate removal of CCRs in the Pond, the material is being excavated and dewatered to remove free water. It will then be either beneficially used or hauled to and placed in the existing onsite Class 3 CCR Landfill. All dewatering effluent from within the Pond will be pumped to the existing wastewater decant pond for treatment. To maintain the integrity of the liner system, an existing underdrain system will be used to pump down the groundwater level beneath the Pond to facilitate dewatering. The existing liner and revetment materials will either be disposed of in a suitable landfill, either the onsite Class 3 CCR Landfill, if permitted by SCDHEC, or in an off-site municipal solid waste landfill that is permitted to accept this waste. After verification testing confirms that all the CCRs have been removed, the dikes will be breached in one or more locations and used as fill within the excavated Pond, and the Pond bottom will be graded to provide positive drainage.

3 CCR Removal and Decontamination Procedures

Per §257.102(b)(1)(ii): *if closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section.*

Paragraph §257.102(c) states: *Closure by removal of CCR. An owner or operator may elect to close a CCR unit by removing and decontaminating all areas affected by releases from the CCR unit. CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to §257.95(h) for constituents listed in appendix IV to this part.*

The existing Cross Bottom Ash Pond contains both CCRs and contact stormwater. At present, rainfall is the only source of stormwater in the Pond. Stormwater exits the Pond via pumps to the

Decant Pond, where it is treated prior to being discharged or recycled for plant use. The procedure to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) above is described as follows:

1. All waste and wastewater streams previously pumped to the Cross Bottom Ash Pond were re-routed or eliminated by August 31, 2020.
2. The hydraulic connectivity between the Cross Bottom Ash Pond and the Decant Pond was removed on August 31, 2020. The two ponds were previously connected by a weir that allowed wastewater and stormwater to overflow into the Decant Pond. Removal of this weir will prevent wastewater in the Decant Pond from back flowing into the Cross Bottom Ash Pond. That connection was removed by raising the dike separating the two ponds to full height at the weir location.
3. The Cross Bottom Ash Pond is and will be dewatered by pumping contact stormwater to the Decant Pond for treatment. Dewatering operations are anticipated throughout the duration of closure to minimize the amount of free water and may be conducted in phases to facilitate closure. Erosion control BMPs may be installed as needed to prevent solids from carrying over into the Decant Pond during dewatering.

Santee Cooper will utilize the existing underdrain system that was installed beneath the entirety of the Bottom Ash Pond when it was constructed in 1993 to dewater the pond. The underdrain system routes groundwater from beneath the Bottom Ash Pond to a junction box where it is pumped out and lowers the groundwater level to protect the integrity of the bentonite geocomposite clay liner. However, groundwater may put pressure on the liner if left unchecked as material is excavated which could disrupt the integrity of the liner. The withdrawn groundwater will be pumped to the existing wastewater decant pond for treatment. SCDHEC approved use of the underdrain system for dewatering and subsequent treatment in the decant pond in October 2023.

4. CCR material (e.g., gypsum and bottom ash) will be dewatered further using stacking and gravity decanting as required to remove free water in order to pass EPA Method 9095B (paint filter test). All CCR hauled to the onsite Class 3 Landfill Area must first pass this test. CCR that is beneficially used must be suitably dry for hauling.
5. CCR material is and will be excavated using conventional equipment (e.g., track hoes). CCR material intended for beneficial use is excavated and placed in temporary storage piles within the Cross Bottom Ash Pond for loading. The gypsum purchaser enters the Pond, loads the marketable material, and exits following a specified route. The trucks are weighed and recorded on certified scales prior to leaving the station. CCR material that is not beneficially used either due to the quality or to regulatory time constraints will be landfilled by placement in off-road trucks, hauled to, and compacted in the onsite Class 3 Landfill.

Santee Cooper is required to obtain an air construction permit from SCDHEC for hauling excavated material to the on-site landfill. A final permit was received in September 2023. One

permit condition is not to exceed 25 tons/year of fugitive dust emissions. Based on the designated hauling route from the Bottom Ash Pond to the on-site Class 3 Landfill, Santee Cooper can haul a maximum of 400,000 tons of CCR material per year and still meet this permit condition.

6. After CCR material is removed to expose the existing concrete erosion control revetment along the interior side slopes and the existing geosynthetic clay liner (GCL) across the pond bottom, the concrete revetment will be evaluated and a determination will be made to either leave in place, use as fill in low areas of the Pond for positive drainage, or remove it. If removed, the waste will be characterized and then it will be hauled to either a suitable off-site landfill or the existing on-site Class 3 Landfill.
7. The existing GCL provides a physical barrier to prevent releases of CCRs. Once exposed, the GCL will be observed to determine if there are any areas that appear compromised. Any such areas will be noted for further investigation.
8. The existing GCL will be removed working from the top of the Pond dikes downward, then from the perimeter of the pond inward towards the low point in the bottom of the pond. This overall approach will prevent contact stormwater runoff from draining onto areas where the liner has already been removed. The work area will remain pumped down during closure. Care will be taken to ensure any CCR remnants on top of the GCL are removed with the GCL and not released to the surrounding area.
9. If any areas of compromised GCL indicate CCR in contact with underlying soils, removal of a thin layer of underlying soil may be required. Representative soil samples will be visually evaluated to verify decontamination of the CCR unit is complete.
10. Erosion and sediment controls will be installed prior to breaching or removing the pond dikes to ensure all non-contact construction stormwater is controlled in a manner to prevent erosion and sedimentation in areas surrounding the pond.
11. The Cross Bottom Ash Pond dikes will be breached in one or more locations with the dike material used to partially fill the pond to promote positive drainage. This will prevent the impoundment of water.
12. If necessary, additional fill material will be imported to the site and compacted within the pond to raise the overall grade. A stormwater detention pond may be located within a portion of the closed pond footprint to attenuate stormwater runoff to existing levels after closure is complete. The area will be graded as required to provide positive drainage and to allow maintenance access. The area will be permanently seeded.
13. Existing appurtenant structures, such as ditches, culverts, and miscellaneous piping, will be either abandoned in place, or removed and disposed of in a permitted disposal facility or recycled.

14. Groundwater monitoring will continue throughout the closure process following both a SCDHEC-approved program required under the station’s NPDES permit and a CCR Rule groundwater monitoring plan.

4 Maximum Inventory of CCR

Per §257.102(b)(1)(iv), the closure plan must include: *An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.*

The total storage capacity of the Cross Bottom Ash Pond is 1,868,240 cubic yards ¹. In 2016, Worley Parsons conducted a site survey to evaluate the structural stability and CCR inventories of the Pond. The estimated volume of CCR in the Pond was approximately 1,200,000 cubic yards as of April 27, 2016⁴. This quantity determined by Worley Parsons was used as a starting point to begin tracking the inventories within the Pond by estimating inflows based on plant operating efficiencies and accounting for outflows to beneficial use customers and onsite landfills. In August 2023, a LIDAR survey of the material remaining in the Pond was completed and documented approximately 1,880,000 million tons, which is more than was previously estimated. The quantities shown in Table 4-1 are estimates.

Table 4-1: Estimated Quantities and Types of CCR Materials –Bottom Ash Pond

Type	Volume ¹ (cy)	Type of Materials
Historic Max CCR	1,868,240 (2,241,888 tons)	Bottom ash, gypsum, cenospheres, boiler slag, and pyrite
Current Quantities CCR	1,566,667 CY (1,880,000 tons)	

Note(s):

[1] Tons calculated assuming a density of approximately 1.2 tons/cy.

5 Schedule of Closure by Removal

Per §257.102(b)(1)(vi), the closure plan must include: *A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. When preparing the written closure plan, if the owner or operator of a CCR unit estimates that the time required to complete closure will exceed the timeframes specified in paragraph (f)(1) of this section, the written closure plan must include the site-specific information, factors, and considerations that would support any time extension sought under paragraph (f)(2) of this section.*

Various projects were completed to upgrade plant equipment that allowed for all waste and wastewater inflows to the Cross Bottom Ash Pond to cease on August 31, 2020. The Cross Bottom Ash Pond initiated closure at that time. Extended periods of inclement weather will impact the schedule since neither the Cross Bottom Ash Pond nor the Cross Class 3 Landfill are accessible in extreme weather events due to safety. Supply chain management issues impacting equipment purchases and repairs and labor shortages may also affect the closure schedule. Extensions to complete CCR removal may be sought if the schedule is adversely impacted by these or other factors out of Cross Generating Station's control in accordance with §257.102(f)(2). In fact, an extension demonstration was certified in November 2023 due to an air permit condition that restricted the amount that could be hauled from the Bottom Ash Pond to the Class 3 Landfill to limit fugitive dust emissions. The revised closure deadline is now August 31, 2027, though additional extensions are anticipated because the air permit restrictions extend the closure period by 4.7 years beginning in September 2023 (i.e., concluding in May 2028 which is after the August 2027 deadline). The schedule for completing all activities required to close the Pond is as follows:

Table 5-1: Anticipated Closure Schedule

Activity	Estimated Completion Date
Submit state Closure Plan to SCDHEC for approval	Mar 2020 (completed)
Commissioning of low volume waste and coal pile runoff wastewater treatment systems	Aug 2020 (completed)
Final receipt of industrial stormwater and wastewater flows/Notification of intent to initiate closure	Aug 2020 (completed)
SCDHEC approval of state Closure Plan	December 2023

Engineering and Contract Bid	Jan – Dec 2023
CCR Excavation for Beneficial Use and/or Landfilling	Current – May 2028
Post-excavation evaluations and removals (GCL and revetment)	May 2027 – May 2028
Breach dikes, final grading, and stabilization	May 2028 – May 2029
Notification of completion of physical closure	May 2028

Notes:

- 1) Per §257.102(g), no later than the date the owner or operator initiates closure of a CCR unit, the owner or operator must prepare a notification of intent to close a CCR unit.
- 2) Per §257.102(f)(1)(ii), the owner or operator must complete closure of the CCR unit, for existing and new CCR surface impoundments and any lateral expansion of a CCR surface impoundment, within five years of commencing closure activities, unless an extension is certified per §257.102(f)(2) and §257.102(f)(2)(ii)(B).
- 3) Per §257.102(h), within 30 days of completion of closure of the CCR unit, the owner or operator must prepare a notification of closure of a CCR unit.

Closure completion will be certified by a Professional Engineer licensed in South Carolina. In accordance with §257.102(h), Santee Cooper will prepare a notification of closure of the Cross Bottom Ash Pond within 30 days of completion of closure and place the notification in the operating record.

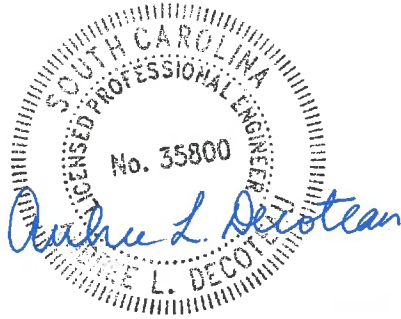
6 Conclusion

This report satisfies the written closure plan requirements outlined in §257.102 for the Cross Bottom Ash Pond at Cross Generating Station in Pineville, South Carolina. Closure by removal of CCR material commenced on August 31, 2020, and is expected to be completed by May 2028.

7 Certification

I, Aubree L. Decoteau, being a registered Professional Engineer in the State of South Carolina, do hereby certify to the best of my knowledge, information, and belief that the information contained in this Cross Bottom Ash Pond Closure Plan dated November 10, 2023, was developed pursuant to the requirements of 40 CFR 257.102 and has been prepared with recognized and generally accepted good engineering practices.

Signature



Date 11/10/2023

8 References

1. CCR Impoundment Inspection – Cross Generating Station, October 2019
2. Garrett & Moore, Santee Cooper Cross Generating Station Proposed Class Three Landfill, Site Hydrogeologic Characterization Report, April 2011
3. Santee Cooper, Cross Bottom Ash Pond Closure Plan, August 2019
4. WorleyParson Document CROSS-O-LI-044-0009, Bottom Ash Pond Initial Structural Stability Assessment
5. WorleyParson Document CROSS-O-LI-044-0011, Bottom ash Pond closure plan Rev 0 Document: 14 Oct 2016
6. WorleyParson, Santee Cooper Cross Generating Station Bottom Ash Pond History of Construction, June 2016
7. Santee Cooper, Certification/Demonstration for 2-Year Extension of Time to Complete Closure, November 2023