HALEY ALDRICH

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REPORT ON

SELECTION OF REMEDY – REVISION #2
WINYAH GENERATING STATION
ASH POND A AND ASH POND B
GEORGETOWN, SOUTH CAROLINA

by
Haley & Aldrich, Inc.
Greenville, South Carolina

for
Santee Cooper
Moncks Corner, South Carolina

File No. 0132892-013
December 2025

HALEY & ALDRICH, INC.
400 Augusta Street
Suite 100
Greenville, SC 29601
864.214.8750

December 4, 2025
File No. 0132892-002

Santee Cooper
1 Riverwood Drive
Moncks Corner, South Carolina

Attention: Brian Holmes

Subject: Selection of Remedy – Revision #2
Winyah Generating Station
Ash Pond A and Ash Pond B
Georgetown, South Carolina

Dear Mr. Holmes:

Haley & Aldrich, Inc. (Haley & Aldrich) has amended the March 30, 2022, *Selection of Remedy Report* for Ash Pond A and Ash Pond B at Winyah Generating Station. As an outcome of conducting an Alternate Source Demonstration for the Class 3 Landfill Area 2 in 2024, Haley & Aldrich recommended a revision to the original report to align with the refined Conceptual Site Model. The amendments herein provide clarification and updated information but do not alter the original selected remedy.

Sincerely yours,
HALEY & ALDRICH, INC.

Montgomery Spillane, P.G.
Senior Project Manager

Brian Colonnese, P.E.
Technical Expert, Environmental Engineer

Enclosures

https://haleyaldrich.sharepoint.com/sites/SanteeCooper2/Shared Documents/0132892.Santee Cooper CCR Consulting Service/0_Winyah Generating Station/Deliverables/2025_RemedySelectionReportUpdates/2025-1204-HAI-WGS-PondAB-Remedy-Selection-Report_F.docx

HALEY & ALDRICH, INC.
400 AUGUSTA STREET
SUITE 100
GREENVILLE, SC 29601
864.214.8750

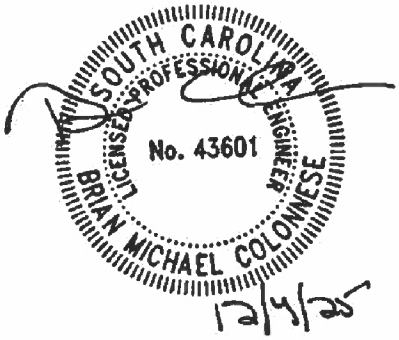
SELECTION OF REMEDY REPORT CERTIFICATION STATEMENT

Professional Engineer Certification: I, Brian Colonnese, being a registered Professional Engineer in the State of South Carolina do hereby certify and belief that the information contained in this Remedy Selection Report amended December 4, 2025, was prepared in conformance with the requirements of the United States Environmental Protection Agency Coal Combustion Residuals Rule entitled Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities Title 40 Code of Federal Regulations § 257.97.

The signature on this document represents that to the best of my knowledge, readily available information, and belief in the exercise of its professional judgment; it is my professional opinion that the aforementioned information is accurate as of the date of such signature. Opinions or decisions are made based on my experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties.

Brian Colonnese (SC P.E. #43601)

December 4, 2025
Date



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Revision	Reason	Date
Original #1	The initial selected remedy report to meet the requirements of 40 CFR § 257.97 including addressing source removal and groundwater remediation for Ash Ponds A and B at Winyah Generating Station.	March 30, 2022
Revision #2	Update to details regarding the remedy to acknowledge dynamic site conditions associated with ash pond closures and landfill construction and clarify the associated need for adaptive management as the site is monitored and conditions change. The remedy was not altered.	December 4, 2025

1. Introduction

1.1 OVERVIEW

In 2022, South Carolina Public Service Authority (Santee Cooper) retained Haley & Aldrich, Inc. (Haley & Aldrich) to complete the *Selection of Remedy Report* (Report) for Ash Pond A and Ash Pond B located at the Winyah Generating Station (WGS) in Georgetown, South Carolina in coordination with Santee Cooper. Santee Cooper is implementing the April 17, 2015, United States Environmental Protection Agency (USEPA) Federal Coal-Combustion Residual (CCR) Rule (Title 40 Code of Federal Regulations [40 CFR] § 257) for WGS Ash Pond A and Ash Pond B. In addition to Federal CCR Rule regulations, these surface impoundments are also regulated by the South Carolina Department of Environmental Services (SCDES; formerly known as the South Carolina Department of Health and Environmental Control) under National Pollutant Discharge Elimination System (NPDES) Permit #SC0022471.

In 2024, when refining the Conceptual Site Model (CSM) and conducting an Alternate Source Demonstration for the Class 3 Landfill Area 2, the benefit of providing technical amendments to the original Report was recognized. While developing the Report, an adaptive site management approach was acknowledged because of the complexity of the site and the uncertainty associated with changing site conditions. Dynamic site conditions due to ash pond closures coupled with landfill construction activities create variability in the shallow aquifer. Additionally, during the original remedy selection process, site-specific data to address long-term monitoring and natural attenuation was limited. These amendments provide clarification and updated information but do not alter the selected remedy.

Research regarding the site's dynamic hydrology indicates the need for additional site-specific information to improve the accuracy of the lithium remediation model, which was originally created for the Corrective Measures Assessment (CMA) and the associated Report. The remediation model was created to provide a comparative analysis of several alternatives.

The Class 3 Landfill Area 2 is in the footprint of the majority of Ash Pond A and throughout construction and operations, site conditions have continued to change and remain dynamic. This amended report omits the lithium remediation model graphic from the Report until site-specific data are available, or conditions are considered stable. Additionally, the Report was amended to highlight the phased approach for conducting monitored natural attenuation (MNA), including the use of adaptive site management. Lastly, general edits and improvements were made to the Report for clarity. As new information and details regarding site conditions unfold, further amendments may be warranted.

This selection of remedy for Ash Pond A and Ash Pond B was completed March 30, 2022, and amended March 21, 2025, according to the requirements of the USEPA CCR Rule entitled Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities 40 CFR § 257.97, Selection of Remedy. This Report concludes the CMA process and will subsequently initiate the corrective measures implementation phase of the CCR Rule.

Ash Pond A and Ash Pond B are two CCR units within the same hydrogeologic system essentially located on an island surrounded by a permitted industrial wastewater cooling pond and an intake and discharge canal system. Accordingly, both CCR units are addressed together in this Report. Assessment monitoring conducted in 2018 identified the presence of arsenic, lithium, and molybdenum in one or more

downgradient wells at a statistically significant level (SSL) exceeding the established Groundwater Protection Standards (GWPS).

The GWPS are set as the Maximum Contaminant Level (MCL) of 10 micrograms per liter (µg/L) for arsenic and the USEPA Regional Screening Level (RSL) of 40 µg/L for lithium and 100 µg/L for molybdenum. As a result, Santee Cooper initiated the CMA process including characterizing the nature and extent of arsenic, lithium, and molybdenum, continuing semiannual groundwater sampling and statistical evaluations, and issuing a CMA report. Haley & Aldrich completed the CMA report that proposed six alternatives and discussed how each alternative met the threshold and balancing criteria outlined in the CCR Rule. Santee Cooper published the CMA report to its publicly available CCR Website. A public meeting was held December 10, 2019, at the WGS to discuss contents of the CMA in accordance with 40 CFR § 257.96(e) and accepted comments during and after the public meeting.

The comments received related to the CMA were considered for the remedy selection. Subsequently, additional information to further characterize site conditions that could ultimately affect a remedy was obtained to further evaluate and support remedy selection. This included an update to the groundwater flow and transport model, site borings to determine the vertical extent of source removal, progress of ongoing source removals, and ongoing groundwater sampling to evaluate changes in groundwater flow and concentration trends associated with CCR source removal operations.

1.2 PURPOSE

In accordance with 40 CFR § 257.97(b), a remedy must satisfy the following threshold criteria:

(i) be protective of human health and the environment;

(ii) attain the GWPS as specified pursuant to 40 CFR § 257.95(h);

(iii) control the source of releases to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents into the environment;

(iv) remove from the environment as much of the contaminated material that was released from the CCR units as is feasible, considering factors such as avoiding inappropriate disturbance of sensitive ecosystems; and

(v) comply with standards for management of wastes as specified in 40 CFR § 257.98(d).

To select a remedy, six alternatives were evaluated based on the threshold criteria and then compared to three of the four balancing criteria listed in 40 CFR § 257.97(c)(1), which include:

(vi) the long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful;

(vii) the effectiveness of the remedy in controlling the source to reduce further releases; and

(viii) the ease or difficulty of implementing a potential remedy.

The fourth balancing criteria is the degree to which community concerns are addressed by a potential remedy.

Alternative 4 in the CMA report is the selected remedial option. This corrective measure is a two-part approach consisting of closure-by-removal (CBR) of the CCR material and affected subsurface soil (determined based on an extensive field sampling and analytical program), followed by MNA of arsenic,

lithium, and molybdenum in groundwater. Pursuant to 40 CFR § 257.97(a) and (d), this Report describes the selected remedy, how it meets the criteria outlined above, and specifies a schedule for implementing and completing remedial activities.

1.3 SITE CHARACTERIZATION

WGS's geology and hydrogeology is described in the *Preliminary Site Hydrogeologic Characterization Study Report* prepared by Geosyntec Consultants (Geosyntec) in March 2015, *Site Hydrogeologic Characterization Study Report* prepared by Geosyntec in August 2016, and in the *NPDES Groundwater Monitoring Plan* prepared by Santee Cooper in December 2010.

The preliminary and final *Site Hydrogeologic Characterization Study Reports* prepared by Geosyntec were to satisfy SCDES landfill permit application requirements to construct a new Class 3 Landfill Area 2. Santee Cooper conducted investigations to collect geologic, hydrologic, and geotechnical data to better define the best locations for a landfill and to conduct groundwater modeling. Ash Pond A and Ash Pond B were included in these investigation efforts, and a portion of Ash Pond A was selected for the footprint of the Class 3 Landfill Area 2.

Geosyntec geologists used Doar's (2012) geologic descriptions to categorize the subsurface soils at the WGS and its surrounding areas into: fill soils, unconsolidated Pleistocene sediments, and Williamsburg Formation sediments. The Chicora Member can be present in the upper portion of the Williamsburg Formation and can contain cemented layers (cemented Chicora) ranging from several inches to several feet in thickness.

Generally, the site hydrogeologic conditions consist of an unconfined surficial aquifer comprised of mixtures of predominantly sand and minor amounts of silt and clay. The surficial aquifer at the site also includes the permeable portion of the Gordon Aquifer, which is represented by the cemented and non-cemented Chicora Member of the Williamsburg Formation. The Chicora Member overlies the dense, low permeability dense-clays of the Williamsburg Formation and is sporadic at the site; however, the dense clays of the Williamsburg Formation are continuous and extend to a minimum elevation of at least -60 feet National Geodetic Vertical Datum. Groundwater flow within the surficial aquifer is controlled by the onsite ponds and regional topography and is generally toward the Pennyroyal and Turkey Creeks. Additional details of the hydrogeologic conditions are in Geosyntec's *Site Hydrogeologic Characterization Reports*.

These studies generated subsurface data characterizing the geology and hydrogeology used to support the development of a hydrogeologic CSM. The CSM has been further enhanced with ongoing CCR groundwater monitoring, statistical evaluations, and supplemental subsurface investigation activities. Findings from these investigations have been added to the CSM that supports the CMA report.

1.4 GROUNDWATER MONITORING

Groundwater monitoring under the CCR Rule occurs through a phased approach to allow for a graduated response (i.e., baseline, detection, and assessment monitoring, as applicable) and evaluation of steps to address groundwater quality. Haley & Aldrich prepared a *Groundwater Monitoring Plan* (GMP) as required by the CCR Rule. The *Sampling and Analysis Plan* and the GMP for WGS were updated to reflect changes in site conditions and procedures on August 18, 2023, and October 2, 2023, respectively. The

GMP presents the design of the groundwater monitoring system and groundwater sampling and analysis procedures.

To monitor Ash Pond A and Ash Pond B, downgradient wells were installed along the perimeter of the units. Haley & Aldrich concluded that two previously existing downgradient monitoring wells (WAP-9 and WAP-10) located at the boundary of the units and screened in the uppermost aquifer, monitor the release and migration of ash constituents from Ash Pond A and Ash Pond B. To supplement these wells and comply with the CCR Rule, three additional wells were installed around Ash Pond A (WAP-17, WAP-18, and WAP-19) and two additional wells were installed around Ash Pond B (WAP-20 and WA-P21). Since the changing of site conditions, including lower water levels in the groundwater monitoring wells, WAP-20 was later replaced with WAP-27 and WAP-30 was replaced with WAP-23.

Well placement was determined based on interpretations of site-specific hydrogeology including groundwater flow direction and rate of groundwater movement under operating conditions. As described above, groundwater flow within the surficial aquifer is controlled by the onsite ponds and regional topography and is generally toward the Pennyroyal and Turkey Creeks. Figure 1 provides a map of well locations for Ash Pond A and Ash Pond B at the time of the Report and Figure 2 provides the expanded monitoring system as of 2024, including monitoring the Class 3 Landfill Area 2, which is in the same footprint as Ash Pond A and Ash Pond B.

Baseline and detection monitoring sampling events occurred in 2015, 2016, and 2017. The results of the sampling events were compared to background, or natural groundwater values, using statistical methods to determine if Appendix III constituents downgradient of the units were present at concentrations representing statistically significant increases (SSI) above background. All Appendix III constituents were detected at SSIs above background concentrations; boron, calcium, chloride, pH, sulfate, and total dissolved solids were SSIs in all seven downgradient monitoring wells, while fluoride was only an SSI in wells WAP-18, WAP-19, and WAP-20 (Figure 1).

Haley & Aldrich conducted an alternate source evaluation for the SSIs found at Ash Pond A and Ash Pond B. This evaluation included a review of sampling procedures, laboratory procedures, and statistical analyses to determine if potential errors may have been made to that would result in the apparent SSI; potential point and non-point sources of contamination in the vicinity of Ash Pond A and Ash Pond B; and observed natural geochemical conditions that could affect the natural variability of groundwater quality. The April 2018 report alternate source evaluation concluded that there were no apparent alternate sources that could account for the apparent SSIs found at Ash Pond A and Ash Pond B. Thus, assessment monitoring was initiated for both units.

During the assessment monitoring phase, CCR groundwater samples were collected in June and September 2018 and subsequently analyzed for Appendix III and IV constituents in accordance with 40 CFR § 257.95(b) and § 257.95(d)(1). After establishing GWPS for the Appendix IV constituents, a statistical analysis of the assessment monitoring results was conducted to determine if the detected Appendix IV constituents were present in groundwater at SSLs above the GWPS. This analysis produced SSLs for arsenic (WAP9, WAP17, WAP18, WAP19, and WAP20), lithium (WAP9, WAP17, WAP18, WAP19, and WAP20), and molybdenum (WAP20). The GWPS are the MCL of 10 µg/L for arsenic and the USEPA RSL of 40 µg/L for lithium and 100 µg/L for molybdenum. As a result, Santee Cooper initiated the CMA process including conducting a nature and extent characterization, continuing groundwater sampling, and issuing a CMA report.

1.5 CORRECTIVE MEASURES ASSESSMENT PROCESS

The CMA process involved a review of groundwater remediation technologies that will achieve the threshold criteria stated in Section 1.2. To develop appropriate remedial alternatives, a nature and extent investigation was initiated in 2019 prior to the development of the CMA report.

The nature and extent investigation was initiated with the installation of five additional monitoring wells to further delineate the site vertically and horizontally: one downgradient at the boundary of Ash Pond A (WAP-22), two downgradient at the boundary of Ash Pond B (WAP-23 and WAP-24), and two downgradient on the perimeter of the industrial Cooling Pond (WAP-25 and WAP-26). The three wells installed at the boundary of Ash Pond A and Ash Pond B were designed and constructed to vertically delineate the extent of the SSLs to supplement the existing monitoring wells that provide horizontal delineation. The two wells installed along the perimeter of the industrial Cooling Pond were designed and constructed to horizontally delineate the extent of SSLs to the north and east of Ash Pond A and Ash Pond B along the property boundary.

Analytical results for two of the three nature and extent wells constructed downgradient of Ash Pond A and Ash Pond B (WAP23 and WAP24) indicated that arsenic, lithium, and molybdenum were not detected above GWPS in a deeper aquifer that is hydraulically disconnected by a clay confining unit. Likewise, analytical results for the nature and extent wells constructed along the perimeter of the industrial Cooling Pond (WAP25 and WAP26) indicated that arsenic, lithium, and molybdenum were not detected above GWPS at the property boundary. Arsenic and lithium were detected above GWPS in monitoring well WAP22 in its first sampling event after installation in June 2019; analytical results since then have been below GWPS. The final CMA report was placed in the operating record in September 2019.

2. Assessment of the Fourth Balancing Criteria

After the development of the CMA report, the remedy selection process continued by holding a public meeting to discuss the proposed alternatives for corrective measures (Figure 3). Pursuant to 40 CFR § 257.96(e), *"The owner or operator must discuss the results of the corrective measures assessment at least 30 days prior to the selection of remedy, in a public meeting with interested and affected parties."* A public meeting was conducted at WGS on December 10, 2019. Notices were published in the local newspaper and signs were installed in advance of the meeting at WGS's entrance. Adjacent property owners were notified of the public meeting. Six alternatives from the CMA were presented at the public meeting in which the public was invited to comment. Verbal comments expressed support of the preferred alternative without dissention. Only one written public comment was received, which was in favor of the selected remedy: *"Excellent to remove the ash from these unlined pits." – Southern Environmental Law Center.*

The CMA addressed the first three balancing criteria. These comments were considered for assessment of the fourth balancing criterion listed pursuant to 40 CFR § 257.97(c)(4) of the CCR Rule which states: *"...the degree to which community concerns are addressed by a potential remedy(s)."* Consideration of the comments supports the selected remedy.

3. Progress Since Completion of the Corrective Measures Assessment

During the interim period between the issuance of the CMA report and the issuance of this Report, semiannual progress reports were prepared and posted on Santee Cooper's publicly accessible website describing the progress in selecting and designing the remedy.

In addition to the public meeting, the following is a list of activities supporting the selection of remedy completed by Santee Cooper since the publication of the CMA with further explanation below:

- Conducted assessment monitoring through ongoing semiannual groundwater sampling consistent with 40 CFR § 257.95(b) and (d)(1).
- Continued an aggressive beneficial use schedule to reduce the volume of CCR onsite.
- Sited, permitted, and constructed additional disposal areas of an onsite Subtitle D Class 3 Landfill for CCR disposal. Construction activities required abandonment and replacement of three groundwater monitoring wells.
- Developed a sampling and analysis plan to determine the extent of CCR and soil removals that included obtaining SCDES approval of the methodology.

Implemented the sampling and analysis plan to delineate the bottom of the CCR (i.e., ash/soil interface) via multiple borings and to determine the extent of soil excavation. Mapped the bottom of the ash and the subsurface soils for removals through visual observations of the borings and laboratory analysis of the soils.

- Updated the groundwater flow and transport model to evaluate potential changes in groundwater flow related to pond closure and landfill construction activities. Specifically, the model anticipated future site conditions once Ash Pond A and Ash Pond B are CBR and the subsurface soils are remediated through removal.
- The Subtitle D Class 3 Landfill is located in a portion of the Ash Pond A footprint and is now operational.
- Assessed metrics for monitoring groundwater remediation progress for lithium, molybdenum, and arsenic.

Groundwater monitoring continued to identify the same Appendix IV constituents at SSLs above GWPS. No additional Appendix IV constituents have been identified. In fact, some overall decreasing trends, with variability, have been observed for arsenic, lithium, and molybdenum. As of 2024, molybdenum is no longer an SSL.

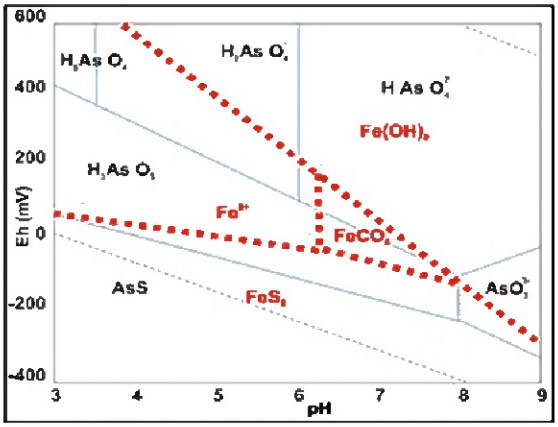
In 2020 and 2021, a CCR and subsurface soils sampling and analysis plan was implemented to determine the extent of CCR and CCR-contaminated soils required for source removal. This information was needed to confirm feasibility of removal of the volume of material and to plan for dewatering and other operational considerations based on the depth of material to be removed. The bottom of ash and soil samples were collected by drilling borings within the ash pond footprint. A Geoprobe® drilling rig was used to obtain the soil samples. SCDES approved the boring workplan in February 2020 and the contractor was onsite May through July 2020 to collect the boring and soil samples. The soil cores were visually assessed to determine the depth of the ash/soil interface and to select sampling intervals for analysis. Soil samples were collected and sent to a certified laboratory for analysis. Laboratory analyses

were completed by February 2021. The depth to which contaminated soil will be removed was determined by analyzing the soil for a specified list of constituents so that the soil remaining in place does not pose an unacceptable risk to human health and the environment. The soil sample results for each analyte were compared to established target levels that are specified values derived from the comparison of USEPA risk-based RSL values and background soil concentrations. The soil results, evaluation, and recommended soil excavation depth was compiled and submitted to SCDES in a phased approach: Ash Pond A #1 in November 2020 (approved December 2020), Ash Pond B in May 2021, Ash Pond A #2 in September 2021, and Ash Pond A #3 in December 2021 (approved February 2022). To date, SCDES has not completed their review on the submittal packages for Ash Pond A or Ash Pond B. SCDES must approve the soil excavation plan as required by state regulations R.61-82, Proper Closeout of Wastewater Treatment Facilities.

Since there are ongoing activities regarding source removal for beneficial use or landfilling, and/or landfill construction activities, site conditions are dynamic. Since the original model was established to simulate operating conditions of the ash ponds, the groundwater flow and solute transport model was updated by Haley & Aldrich to evaluate potential changes in groundwater flow related to pond closure and landfill construction activities. Specifically, the model simulated a condition where the Ash Pond A, and then Ash Pond A and Ash Pond B combined were CBR of CCR, backfilled with a layer of clean soil, then capped with a Class 3 Landfill in 65 acres of the 90-acre Ash Pond A.

The remedy includes not only full source removal of the CCR and a predetermined layer of subsurface soil, but also MNA of arsenic, lithium, and molybdenum in the groundwater. Ongoing groundwater monitoring, combined with statistical trend analysis, and geochemical evaluations will be the primary metrics used to evaluate the performance of the remedy following CBR.

In the 2019 CMA report, lithium was modeled as a surrogate for molybdenum and arsenic to evaluate and compare relative time frames to achieve the GWPS for the six alternatives. Lithium was chosen as the surrogate for the 2019 CMA report since it was detected above the GWPS in both Ash Pond A and Ash Pond B, and it has a higher degree of mobility compared to arsenic. The CMA model evaluated and predicted remediation trends when the primary attenuation mechanisms are dilution, dispersion, and adsorption. For the CMA model, limited site-specific data was available. For example, there was not a site-specific Kd value for lithium. The model was intended to provide a means to evaluate the relative remediation time frames for a comparative analysis between the options. It is not intended to provide a specific remediation time frame in years because of the dynamic site conditions and lack of site-specific data for the model's input. To provide a more accurate and site-specific time frame for remediation, additional site-specific information is warranted. Since the primary mechanism for arsenic remediation at this site appears to be mineral precipitation (co-precipitation) and secondarily dilution, dispersion, and adsorption, the CMA model was determined to not be an appropriate tool to predict the reduction of arsenic over time. As previously indicated, groundwater flow and quality conditions surrounding these units are in a state of flux as dewatering for CCR and soil removals, landfill construction, and landfill operations continue. In 2022, groundwater monitoring results from wells located closest to these operations showed an increase in oxidation-reduction potential (ORP) (Figure 4). This increase in Eh correlates with a decrease in the arsenic concentrations consistent with the arsenic solubility diagram below.



Arsenic Solubility

Arsenic and ORP trends, as shown on Figure 4, will be evaluated on an ongoing basis with semiannual groundwater sampling and analysis. If needed, once the site has stabilized after CBR and landfill construction activities are complete, a geochemical groundwater model may be developed using site-specific information. Molybdenum was not originally modeled with the CMA since it intermittently met the GWPS and there was an outlier in the data. Molybdenum is being monitored as a component of the routine semiannual groundwater monitoring to determine if the outlier was a one-off due to landfill construction activities in the area or indicative of evolving site conditions.

4. Selection of Remedy

4.1 REMEDIAL OPTION

Alternative 4 in the CMA report is the selected remedial option. It is a two-part approach consisting of a CBR of the CCR material and a predetermined layer of subsurface soil, followed by MNA of arsenic, lithium, and molybdenum in groundwater. In accordance with 40 CFR § 257.97, this alternative has been evaluated in the context of, and subsequently meets, the threshold and balancing criteria as described in Section 1.2. Additionally, in accordance with 40 CFR § 257.97, this alternative has been evaluated in the context of the required factors compared to the other five alternatives evaluated in the CMA report.

4.1.1 Part 1: Closure-by-Removal

CBR is a form of source control. In fact, the CBR for Ash Pond A and Ash Pond B not only removes the CCR source, but also a predetermined layer of underlying soil as well. Removal of a layer of underlying soil is planned so that residual soil remaining in place should not pose an unacceptable risk to human health or the environment. The total CCR quantity expected to be removed from Ash Pond A and Ash Pond B was approximately 5.5 million tons. Additionally, the total soil quantity anticipated to be removed from Ash Pond A and Ash Pond B was approximately 406,000 tons. At the time of this amendment, the CCR has been removed from both ponds. However, soil removals are not fully complete for Ash Pond B.

CCR material that was not beneficially reused due to time constraints to complete closure and meet beneficial use contractual obligations was disposed of in the onsite Class 3 Landfill that meets state and federal design standards. The Class 3 Landfills Area 1 and Area 2 were sited, permitted, designed, and constructed onsite at WGS. The Class 3 Landfill Area 1 was primarily used for disposal from Ash Pond A. The Class 3 Landfill Area 2 was sized to contain the full quantity of Ash Pond B plus the CCR material and soils that are being excavated from other onsite ponds.

Together, the beneficial use program and the onsite disposal capacity made the option of CBR viable by removing the source thus eliminating further releases to the groundwater.

4.1.2 Part 2: Groundwater

Upon removal of the source (i.e., all CCR material and delineated underlying soil), the second component of the selected remedial alternative addresses groundwater improvements through MNA. MNA is a viable remedial technology recognized by both state and federal regulators that is applicable to inorganic compounds in groundwater when the primary source has been removed. MNA is a risk-management approach that relies on monitoring of groundwater and technical evaluation to confirm natural attenuation processes are acting at a sufficient rate to ensure that unacceptable risks are managed. According to *Guidance on the Assessment and Monitoring of Natural Attenuation of Contaminants in Groundwater*, April 2024, CLAIRE, Reading Business Centre, Fountain House, Queens Walk, Readying, RG1 7QF, a "lines of evidence" approach is recommended for MNA assessment and verification. An MNA lines of evidence assessment should build on an existing CSM and further describe the relevant natural attenuation processes and their effectiveness. The need for the CSM to continue to evolve as site conditions change and the need for additional MNA lines of evidence is recognized.

Available lines of evidence were evaluated to confirm that site constituents can be remediated via MNA. With the exception of WAP-19, historical trends show concentrations are generally observed to be decreasing with ongoing source removals and dewatering. Second, geochemical data (Figure 4) indicates subsurface conditions are amenable to MNA, specifically increasing ORP is consistent with observed decreases in arsenic that is observed with the trends shown from 2014 through 2025 for groundwater monitoring wells WAP-9 and WAP-18. Of note, trends for some of the wells show that a decreasing ORP trend can also be correlated with an arsenic concentration decrease trend as shown for WAP-20.

After completion of CCR and subsurface soil source removals and once the site stabilizes, MNA is expected to reduce concentrations of arsenic, molybdenum, and lithium in groundwater at the boundary of Ash Pond A and Ash Pond B; thereby, attaining the GWPS. Over time, the removal remedy allows concentrations of these constituents in downgradient groundwater to attenuate through adsorption, precipitation, dispersion, and dilution. This will be determined by continuing to monitor and evaluate using the metrics described in Section 3. Since the combined Ash Pond A and Ash Pond B is surrounded by the 400-acre closed-loop industrial Cooling Pond complex, groundwater extending beyond the boundary of the waste has the potential to discharge into the onsite permitted wastewater treatment system. This Cooling Pond treatment system has the capacity to handle the mass-loading from groundwater discharges without causing reasonable potential to impair receiving waters.

A corrective measures groundwater monitoring program as prepared and implemented in accordance with 40 CFR § 257.98, to document the effectiveness of the selected remedial option and will be amended as necessary. Corrective measures are considered complete when groundwater monitoring reflects that the SSL constituent concentrations in groundwater downgradient of the Ash Pond A and Ash Pond B do not exceed Appendix IV GWPS for three consecutive years.

As the USEPA modifies certain CCR Rule requirements and, depending upon the nature of such changes, assessments made herein could be modified or supplemented to reflect such future regulatory revisions.

4.2 ATTAINMENT OF THE THRESHOLD CRITERIA

40 CFR § 257.97(b) specifies that the selected remedy must attain certain threshold criteria. The following sections explain how the selected remedy meets these criteria.

(i) Be protective of human health and the environment

The constituents of concern are confined to the WGS and the uppermost aquifer that is not used for drinking water purposes. For the uppermost aquifer, drinking water receptors have not been identified within a quarter mile of Ash Pond A and Ash Pond B based on a 2011 Receptor Survey. Drinking water is supplied by Georgetown County Water and Sewer District (GCWSD) to WGS. Adjacent property owners are supplied by GCWSD except for a community well (Water System SC2220002, GCWSD Kilsock Water System), which is located north of WGS beyond the quarter mile radius of Ash Pond A and Ash Pond B. Groundwater monitoring at select locations at the property boundary will continue.

The onsite industrial Cooling Pond and canal system fully surround Ash Pond A and Ash Pond B, and this water body has the capacity to handle the mass-loading from groundwater discharges without causing reasonable potential to impair receiving waters. For these reasons, human health and the environment are adequately protected.

(ii) *Attain the groundwater protection standard as specified pursuant to 40 CFR § 257.95(h).*

Following completion of CBR of CCR, a corrective action groundwater monitoring program was established in accordance with 40 CFR § 257.98(a)(1). The arsenic, lithium, and molybdenum concentrations are expected to continue to decline through chemical and physical processes of natural attenuation that occur without human intervention. The effectiveness of the corrective measure will be evaluated by comparing semiannual groundwater monitoring results to the GWPS, evaluating expected decreasing trends of arsenic to corresponding increasing ORP, and monitoring arsenic, lithium, and molybdenum concentration trends. Short-term increases in Appendix IV concentrations may be observed during the CCR and soil excavation and landfill construction process. Maintaining the ponds in a dewatered state during excavation should help minimize short-term increases or variability but may not completely prevent them. Concentrations will continue to be monitored in the context of a longer-term trend analysis. Additionally, a more robust MNA program will be initiated once site conditions stabilize.

(iii) *Control the source(s) of releases to reduce or eliminate further releases into the environment*

Removing CCR material and underlying soil from the pond achieves this criterion. The CCR material and underlying soil will be either beneficially used or disposed in an onsite Class 3 Landfill, which has been designed, constructed, and is operated to be compliant with the CCR Rule and SCDES requirements. Completely removing the CCR source will not only reduce but should eliminate further releases into the environment.

(iv) *Remove as much of the contaminated material that was released from the CCR units as is feasible considering factors such as avoiding inappropriate disturbance of sensitive ecosystems.*

Following source removal, the mass of constituents available to leach into groundwater should be eliminated and continuance of contamination to the surrounding environment should not occur. Dissolved concentrations will attenuate through adsorption, precipitation, dispersion, and dilution. The onsite industrial Cooling Pond has the capacity to handle the mass-loading from groundwater discharges without causing reasonable potential to impair receiving waters. The industrial Cooling Pond discharge outlet is covered under an existing NPDES permit. Groundwater will continue to be monitored to assess the post-closure groundwater concentrations until GWPSs are achieved for a minimum of three years.

(v) *Comply with the standards for management of wastes as specified in 40 CFR § 257.98(d).*

CCR material and underlying soil will be either beneficially used or disposed in a Class 3 Landfill that is designed to meet CCR Rule standards and SCDES requirements. Both options meet Resource Conservation and Recovery Act requirements.

4.3 ATTAINMENT OF THE BALANCING CRITERIA

The remedy selection process included consideration of balancing criteria set forth in 40 CFR § 257.97(c). The following sections explain how the selected remedy will meet these criteria.

(i) *Long- and Short-Term Effectiveness, Protectiveness, and Certainty of Success*

The selected remedy meets this criterion since the CCR source, the ponded ash, is removed from the environment. Santee Cooper's longstanding beneficial use program had reclaimed

material from Ash Pond A for years. Contracts with transportation services and end use markets have been secured and executed since 2015. Alternate disposal capacity was permitted and constructed with the onsite Class 3 Landfill. The landfill's capacity was designed to meet disposal requirements for CCR material and underlying soil that cannot be beneficially used within designated time constraints. The Class 3 Landfill was designed, constructed, and is being operated to contain the CCR and CCR contact water in a means that prevents uncontrolled releases by means of liners, CCR contact stormwater and leachate collection systems, and a landfill capping. This remedy has low, long-term residual risk since CCR along with a layer of subsurface soil is removed from the environment. An additional protectiveness measure associated with complete source removal is reducing the potential for liquefication since WGS is in a seismic hazard area. Groundwater is being addressed in-situ without ex-situ treatment and/or discharge, and thus the risk associated with managing secondary waste streams is eliminated. There are no mechanical systems as part of the selected remedy; therefore, there is no major operation or maintenance beyond maintaining the integrity of the monitoring wells.

(ii) Source Control Effectiveness

This criterion takes into consideration the ability of the remedy to control a future release and the degree of complexity of treatment technologies that will be required. The source will be controlled by removing the CCR material plus a layer of soil underlying the units; thereby, minimizing further release of arsenic, lithium, and molybdenum or other constituents into groundwater from CCR.

(iii) Ease of Implementation

While CBR is labor-intensive, Santee Cooper's longstanding beneficial use program had been reclaiming material from ash ponds for years. Contracts with transportation services and end use markets have already been secured and executed since 2015, with over 350,000 tons being removed each year to meet contract terms. To facilitate removal of CCR for closure within five years, this volume was increased. To accommodate this increase in volume, alternate disposal capacity was obtained with the construction of the onsite landfill. Additional specialty equipment is also not required to conduct CBR or MNA.

(iv) Addresses Community Concerns

As noted in Section 2, this criterion was addressed December 10, 2019, when a public meeting was held onsite at WGS, and verbal and written comments were received and heavily considered. The selected remedy was received favorably by the public without dissent.

4.4 REMEDY IMPLEMENTATION AND SCHEDULE

WGS presents materials management challenges that may impact the implementation and closure time frames for the CBR alternative. CCR in Ash Pond A and Ash Pond B will be dewatered to remove free water before being hauled to, and placed in, the future onsite lined Class 3 Landfill and/or beneficially used. The extent of the required removals was determined through extensive borings and sampling and analysis of the underlying soil below the CCR material. After excavation and removal of the CCR, visual confirmation of the ash removal will be conducted.

Technical and logistical challenges of implementing a large-scale ash removal project have been considered. Removal activities require dewatering and temporary staging/stockpiling of material for drying prior to transportation, which may affect productivity and increase removal duration. During periods of rain and inclement weather, the removal schedule will be impacted negatively. Excavation and construction safety during the removal duration is another concern due to heavy equipment (e.g., bulldozers, excavators, and front-end loaders) and dump truck operation within the active WGS. The factors outlined in 40 CFR § 257.97(d) were considered in the development of the schedule for design, implementation, and completion of the selected remedy. See Table 1 for schedule details. All dates are approximate and convey the overall sequence, scope, and duration of closure activities. Activities may commence or complete earlier or later than shown. The schedule is aggressive with the end dates driven by regulatory requirements.

(i) Nature and Extent of Contamination

Arsenic, lithium, and molybdenum have only been observed in downgradient wells at the boundary of the waste. SSLs of Appendix IV constituents have not been observed in downgradient wells at the property boundary. The selected remedy addresses the nature and extent of contamination observed at Ash Pond A and Ash Pond B, which is supported by groundwater modeling and is expected to be supported by future groundwater sampling results.

(ii) Reasonable Probability of Remedial Technologies in Achieving Compliance

Source removal, in combination with MNA, is expected to achieve compliance with the CCR Rule and meet the GWPS in the long-term. With an adaptive site management approach, the effectiveness of this approach may be modified if warranted based on new information. This conclusion is supported by observance of general decreasing trends for arsenic, lithium, and molybdenum concentrations in some wells, increasing ORP in combination with decreasing arsenic concentrations supports mineral precipitation as the process contributing to the reduction in arsenic, and results of the original CMA comparative groundwater model for lithium attenuation. The flow and solute transport model and additional MNA may be periodically updated, or recalibrated, if needed, as groundwater monitoring continues, and actual post-closure groundwater flow and quality conditions are more clearly defined.

(iii) Availability of Treatment or Disposal

As discussed previously, adequate disposal capacity is available with the completion of construction of the onsite Class 3 Landfill. Additionally, MNA relies on natural attenuation processes, which do not rely on the availability of ex-situ treatment technologies that generate secondary waste streams.

(iv) Potential Risks to Human Health and the Environment

Impacts of arsenic, lithium, and molybdenum at the site have been delineated and no offsite migration of impacts have been observed based on groundwater monitoring. Since there are no offsite impacts and the uppermost aquifer onsite or in the immediate vicinity of WGS is not used for human consumption, potential risks to human health and the environment are not affected in a way that would influence remedy implementation or the schedule. Additionally, MNA requires less equipment and labor than most other methods such as pumping groundwater to the surface for above ground treatment so the potential for contact

is limited. Ongoing groundwater monitoring will continue until the groundwater protection standards are met.

(v) Resource Value of the Aquifer

The resource value of the aquifer is not affected in a way that would influence the remedy implementation schedule. The uppermost aquifer is not currently used for drinking water or for other known commercial or industrial uses. Future known uses are not planned for this aquifer at this time. Drinking water receptors have not been identified within a quarter mile of Ash Pond A and Ash Pond B. GCWSD supplies drinking water to nearby residents, except for a community well located north of WGS. WGS may obtain water from the aquifer below the Crouch Branch confining unit (well screen is located 410 to 462 feet below ground surface) for emergency industrial operations through a groundwater withdrawal permit. The groundwater quality is expected to continue to improve over time as the remedy is implemented. The extent of the delineated impacted groundwater aquifer is not expected to cause damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents. The groundwater aquifer is in an industrial area that does not have adjacent commercial crops. The hydrogeologic characteristics of the site have been considered throughout the corrective action process.

5. Conclusion

The selected remedy of CBR of CCR and a predetermined layer of subsurface soil with MNA meets the CCR Rule requirements as described above. MNA represents a long-term commitment to groundwater risk management for years and decades. If circumstances change and MNA is no longer protective of receptors or viable to stakeholders, then contingency measures may be required, including consideration of additional remediation alternatives to MNA.

As such, the selected remedy of CBR with MNA is understood to include an adaptive site management approach with contingency remedy modification because of the complex subsurface hydraulic and geochemical heterogeneity. The need for an evolving CSM and additional lines of evidence are recognized and part of the long-term plan to continue to evaluate the natural attenuation process. An adaptive site management approach to MNA allows Santee Cooper to continue with source removals, site remediation, and groundwater monitoring, while conducting additional site-specific studies for the MNA process. Santee Cooper is committed to continuing to comply with 40 CFR § 257.98 *Implementation of the Corrective Action Program*.

References

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3. Geosyntec Consultants, 2016. *Site Hydrogeologic Characterization Study Report, Santee Cooper Winyah Generating Station, Georgetown, South Carolina*. February.

4. Haley & Aldrich, Inc., 2019. *Corrective Measures Assessment, Santee Cooper Winyah Generating Station, Georgetown, South Carolina*. September.

5. Haley & Aldrich, Inc., 2022. *Technical Memorandum, 2022 Groundwater Modeling Update, Winyah Generating Station, Ash Ponds A & B*. 18 March.

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7. Santee Cooper, 2010. *NPDES Groundwater Monitoring Plan*. December.

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TABLES

TABLE 1
ASH POND A AND ASH POND B CLOSURE SCHEDULE
WINYAH GENERATING STATION
GEORGETOWN, SOUTH CAROLINA

Activity	Anticipated Schedule
Intensification of decanting (increased pumping) and dewatering activities (installation of sock drain)	April 2021 (Completed)
Final receipt of CCR	April 11, 2021 (completed)
Submit Ash Ponds A and B Closure Plan to SCDES for approval	October 2025
Obtain SCDES approval for Closure Plan	October 2025
CCR removal for beneficial use and landfill disposal	April 2021 – December 2025
Completion of physical closure by removal for Ash Ponds A and B and fill soil qualification sampling	March 2026
Submit notification of closure completion to SCDES for approval and request SCDES closure inspection	March 2026
Obtain SCDES approval of Closure Plan requirements	March 2026
Post-Closure Activities for Ash Ponds A and B (dike leveling, additional grading and construction, dike breaching, groundwater monitoring, etc.)	April 2026 – TBD

Notes:

CCR: coal combustion residuals

SCDES: South Carolina Department of Environmental Services

TBD: to be determined

FIGURES

LEGEND

- BACKGROUND WELL
- ASH POND B MONITORING WELL
- PROPERTY BOUNDARY WELL

ASH POND A MONITORING WELL

- ABANDONED
- EXISTING
- REPLACEMENT
- CCR UNIT BOUNDARY
- PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 1,000 2,000

SCALE IN FEET

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WINYAH GENERATING STATION
ASH POND A AND ASH POND B
GEORGETOWN, SOUTH CAROLINA

2022 SITE LOCATION OF ASH POND A AND ASH POND B GROUNDWATER MONITORING WELLS FOR CCR RULE COMPLIANCE

DECEMBER 2025

FIGURE 1

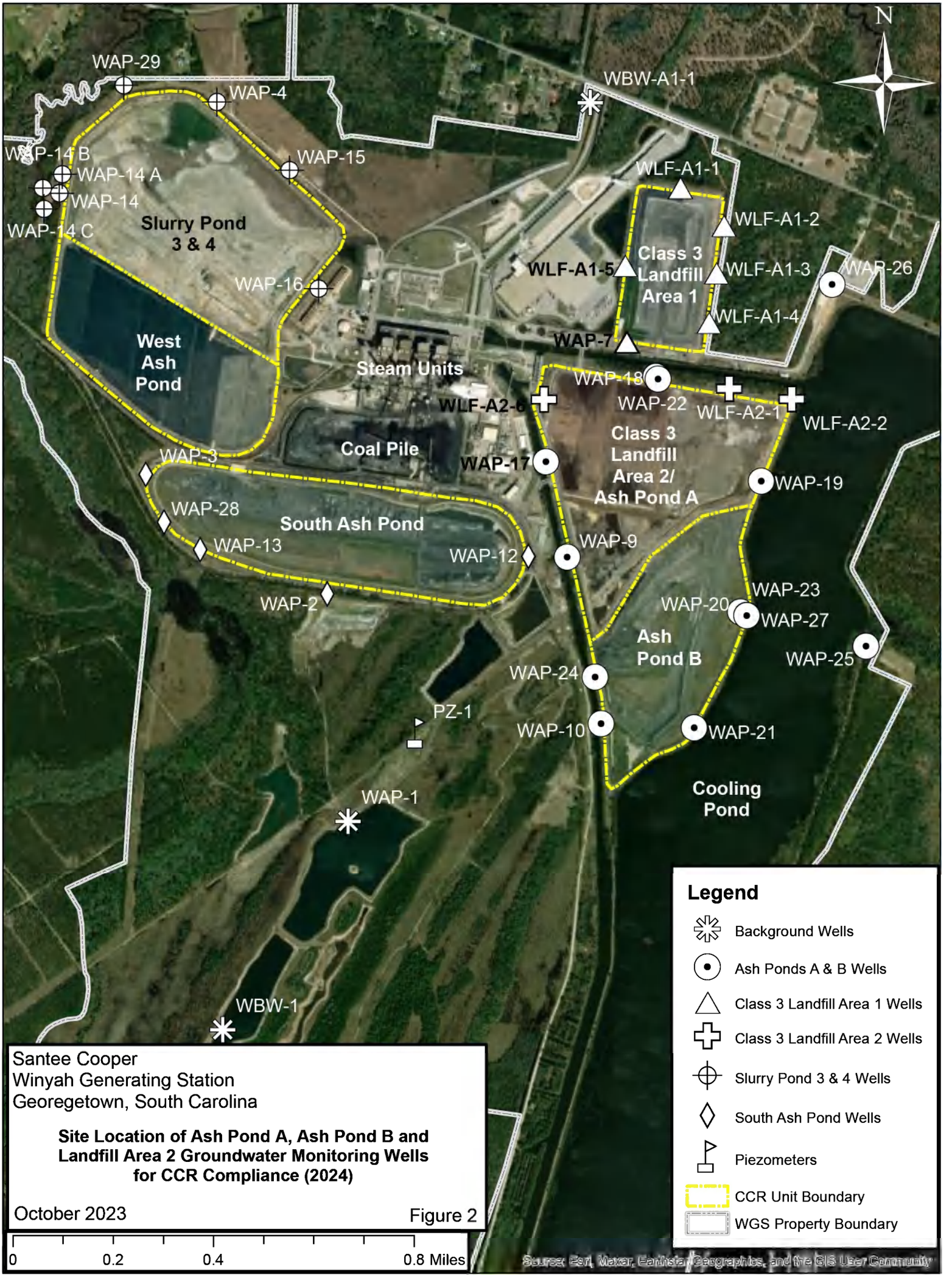
N
WAP-29
WAP-4
WBW-A1-1
WAP-14 B
WAP-14 A
WAP-14
WAP-14 C
WAP-15
Slurry Pond 3 & 4
WLF-A1-1
WLF-A1-2
WLF-A1-5
Class 3 Landfill Area 1
WLF-A1-3
WAP-26
WAP-16
WLF-A1-4
WAP-7
West Ash Pond
Steam Units
WAP-18
WAP-22
WLF-A2-1
WLF-A2-2
WLF-A2-6
Class 3 Landfill Area 2/ Ash Pond A
Coal Pile
WAP-3
WAP-17
WAP-19
WAP-28
South Ash Pond
WAP-13
WAP-12
WAP-9
WAP-2
WAP-23
WAP-20
WAP-27
Ash Pond B
WAP-25
WAP-24
PZ-1
WAP-10
WAP-21
Cooling Pond
WAP-1
WBW-1
Legend
Background Wells
Ash Ponds A & B Wells
Class 3 Landfill Area 1 Wells
Class 3 Landfill Area 2 Wells
Slurry Pond 3 & 4 Wells
South Ash Pond Wells
Piezometers
CCR Unit Boundary
WGS Property Boundary
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Santee Cooper
Winyah Generating Station
Georegetown, South Carolina
Site Location of Ash Pond A, Ash Pond B and Landfill Area 2 Groundwater Monitoring Wells for CCR Compliance (2024)
October 2023
Figure 2
0
0.2
0.4
0.8 Miles

FIGURE 3: SUMMARY OF CORRECTIVE MEASURES

SANTEE COOPER – WINYAH ASH PONDS A & B

Alternative Number	Remedial Alternative Description	THRESHOLD CRITERIA					BALANCING CRITERIA			
		Be protective of human health and the environment	Attain the groundwater protective standard	Control the source of releases	Remove from the environment as much of the contaminated material that was released from the CCR unit as feasible	Management of waste in accordance with RCRA requirements	CATEGORY 1 Long- and Short-Term Effectiveness, Protectiveness, and Certainty of Success	CATEGORY 2 Effectiveness in Controlling the Source to Reduce Further Releases	CATEGORY 3 Ease of Implementation	CATEGORY 4 Consideration of Community Concerns*
1	Closure in Place (CIP) with Capping and Monitoring & Natural Attenuation (MNA)	✓	✓	✓	✓	✓	Effective short-term & long-term, groundwater monitoring used to verify MNA	Moderate effectiveness to control further releases but not as good as beneficial use due to ash being left in place	Relative ease to implement. Permitting expected to be straightforward.	Comment #1: "Excellent to remove the ash from these unlined pits." – Southern Environmental Law Center
2	CIP with Capping and Hydraulic Containment through groundwater pumping and direct discharge	✓	✓	✓	✓	✓	Effective short-term; long-term requires ongoing operations & maintenance	Moderate effectiveness to control further releases but not as good as beneficial use due to ash being left in place; still a risk of release from the hydraulic discharge	More difficult to implement due to more complexity. Permitting will be required.	
3	CIP with Capping and Hydraulic Containment through groundwater pumping and ex-situ treatment	✓	✓	✓	✓	✓	Effective short-term; long-term requires ongoing operations & maintenance	Moderate effectiveness to control further releases but not as good as beneficial use due to ash being left in place; still a risk of release from the treatment system chemicals and treatment media	[redacted]	
4	Closure by Removal (CBR) with MNA	✓	✓	✓	✓	✓	Effective short-term & highly effective long-term since ash is being removed from the environment and success is certain	Moderate effectiveness short-term (beneficial use is ongoing & successful), high degree of long-term release control	Relative ease to implement & straightforward permitting; however, volume of material takes time to move	
5	CBR with Capping and Hydraulic Containment through groundwater pumping and direct discharge	✓	✓	✓	✓	✓	Effective long-term but requires ongoing operations & maintenance to manage hydraulic discharge	Eliminates long-term releases; still a risk of release from the hydraulic discharge	More difficult to implement than above due to more complexity. Permitting will be required.	
6	CBR with Capping and Hydraulic Containment through groundwater pumping and ex-situ treatment	✓	✓	✓	✓	✓	Effective long-term but requires ongoing operations & maintenance to manage treatment system; short-term effectiveness not certain	Eliminates long-term releases; still a risk of release from the treatment system chemicals and treatment media.	More difficult to implement due to more complexity. Logistical and safety challenges expected.	

Most favorable when compared to other alternatives

Less favorable when compared to other alternatives

Least favorable when compared to other alternatives

Santee Cooper's selected alternative is No. 4.

*Public comments were received during the public meeting held December 10, 2019.

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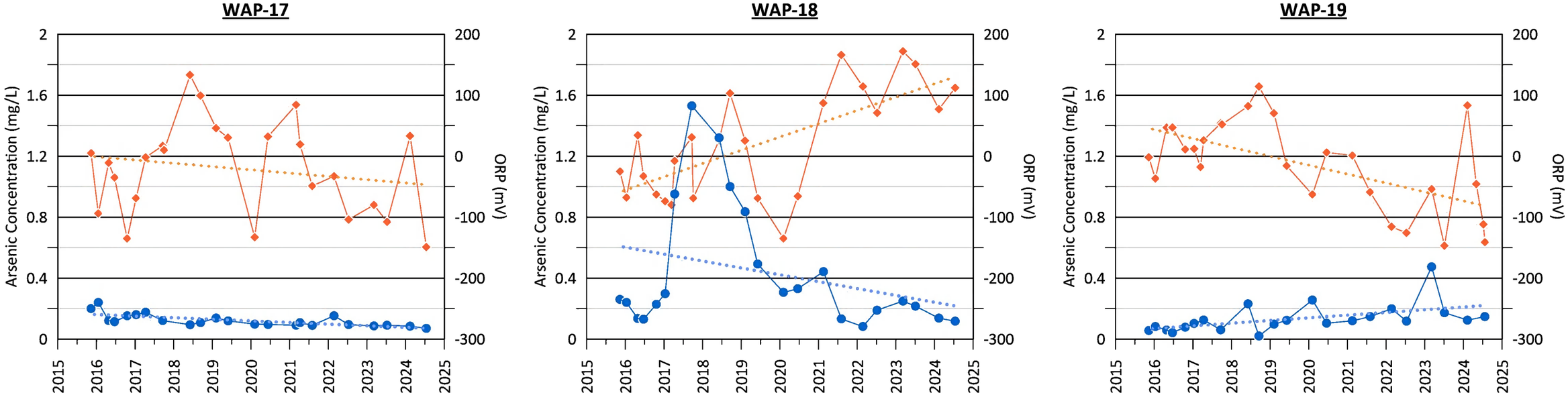
FIGURE 4
ARSENIC TREND GRAPHS
WINYAH GENERATING STATION
GEORGETOWN, SOUTH CAROLINA



NOTES:
OPEN SYMBOL INDICATES A NON-DETECT. REPORTING LIMIT IS GRAPHED.
mg/L = MILLIGRAMS PER LITER
mV = MILLIVOLTS
*DUE TO DEWATERING DURING EXCAVATION OF THE ASH POND, WAP-27 IS GRAPHED IN PLACE OF WAP-20.

LEGEND:
Arsenic
ORP
Linear Fit - Arsenic
Linear Fit - ORP

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DECEMBER 2025