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Scoping Summary for the D-Area Coal Storage Area (484-17D)

Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis

SEMS Number: 63

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SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

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1.0 PROJECT PHASE AND STATUS

This scoping summary supports the development of a Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for the 484-17D D-Area Coal Storage Area (DCSA). The DCSA is associated with the 484-D Powerhouse and is listed in the Federal Facility Agreement Appendix K.1 as a D&D Facility to be Decommissioned. This RSER/EE/CA does not address D&D activities but instead pertains to a non-time critical (NTC) removal action at the DSCA to improve conditions in the D-Area Groundwater (DAG) Operable Unit (OU). The characterization and assessment of the DAG OU are scheduled to begin with a Remedial Investigation Field Start in June 2020. A final remedial action for the DAG OU will be selected in the Record of Decision (ROD) for the DAG OU due for submittal in 2023. The final remedial action for the DCSA will be selected with the ROD for the D-Area OU (DAOU) scheduled for submittal in 2046.

A NTC removal action is needed because infiltration of rainwater through the DCSA acidic vadose zone creates an acidic leachate that contributes to low pH and metal plumes in groundwater. A NTC removal action to return the pH in the DCSA vadose zone soils to more natural conditions may minimize future impact to groundwater. The Revision 0 RSER/EE/CA is scheduled for submittal to the Core Team for review on September 30, 2018.

2.0 UNIT HISTORY AND BACKGROUND

The 484-D Powerhouse was built in 1953 and shut down in 2012 after 59 years of operation. The facility burned ~160,000 tons of coal per year during this period. A general area map is shown in Figure 1. Deactivation of the 484-D Powerhouse and associated facilities began following the shutdown. The DCSA was a temporary storage area for coal prior to its use in the 484-D Powerhouse. Based on acidic pH levels in the groundwater in the surrounding area, the surface and subsurface soils in the coal yard was suspected to be negatively impacted by acidic leachate. The acidic nature of the coal pile runoff water was caused by leaching of coal particles with rainwater and the concurrent oxidative degradation of solid iron sulfide (pyrite) to soluble sulfuric acid when contacted by

oxygen-saturated rainwater. Observed metals in groundwater coincide with the low-pH groundwater plume and/or nearby source areas, including the DCSA and the 489-D Coal Pile Runoff Basin (CPRB).

Removal actions have been completed at the 489-D CPRB to address that source. In 2011, a NTC removal action was performed in the northern 25% of the 489-D CPRB to remove highly acidic surface water. Contaminated sediment from other subunits within D-Area were consolidated in the northern 25% section followed by installation of a compacted soil/topsoil layer. In 2016, a NTC removal action was performed in the southern 75% section to remove highly acidic surface water as well as coal fines and contaminated soil from the 489-D CPRB. Clean fill was added to the southern 75% section of the 489-D CPRB followed by contouring and regrading for the 75% southern section to function as a storm water retention basin (Figure 1).

During the closure of the northern 25% section of the 489-D CPRB in 2011, a drainage ditch was constructed in the southern five acres of the DCSA and was groomed with topsoil and a grass cover (Figure 1). No actions have occurred in the northern 10 acres of the DCSA other than the visual coal removal maintenance action in 2012 and 2013. Recent (June 2018) soil sampling of the DCSA vadose zone soils was conducted to confirm soil pH conditions as well as metal concentrations, depth to groundwater, and soil types. Sampling results confirm low pH soil conditions in the DCSA. Rainwater coming into contact with the low pH vadose zone soils creates an acidic leachate that contributes to the low-pH groundwater within the area (Figure 2) and resulting metal plumes.

3.0 LAND USE

The DCSA is located within an industrial use area. Land use of the DAOU, including the 484-D Powerhouse and DCSA, will be controlled consistent with the SRS Land Use Control Assurance Plan to prevent unrestricted land use if remedial goals are not attained through final remediation, as well as groundwater that exceeds MCLs. The Upper Three Runs Aquifer, which is the zone where the pH and metal plumes are located, is not currently used as a drinking water source and future use is not reasonably anticipated.

4.0 D-AREA COAL STORAGE AREA

The DCSA vadose zone consists of relatively thin interbedded sands, silts, and clays. The entire area is approximately 15 acres, with five acres in the southern portion groomed with topsoil and a grass cover that is maintained (Figure 1). During the June 2018 sampling of the DCSA, a consistent thin layer (~six to eight inches) of coal fragments was found in the five acre southern portion, between one-half to one foot below the topsoil layer. The remaining northern 10 acres has no vegetative cover, and decades of coal storage and large construction equipment use have compacted the soil greatly. Groundwater beneath the DCSA is approximately 10 - 15 feet (ft) below ground surface (~120 – 125 ft mean sea level) and the ground surface is fairly level. Groundwater flows towards the southwest and a portion of the upper water table aquifer discharges into the D-Area Discharge Canal located southwest of the DCSA (Figure 1).

4.1 *DCSA Vadose Zone*

The vadose zone and groundwater beneath the DCSA have been impacted by low pH and dissolved metals from 59 years of coal-fed power plant operations. Recent (June 2018) soil sampling at multiple depth intervals at eight locations within the DCSA (Figure 3) was conducted to determine pH levels, presence of metals, depth to groundwater, and soil types and strata. The pH results from both field measurements and laboratory results show a consistent 3 to 4.5 pH in the vadose zone soils at most of the sampled locations and throughout the entire depth of the vadose zone (Figure 4). These pH levels are consistent with the pH levels seen in groundwater and surface water downgradient of the DCSA. The soil samples were analyzed for many of the metals that are prevalent in groundwater (aluminum, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, sulfate, and uranium). Metal analyses show that concentrations are elevated compared to SRS median background values, but the majority of the results are within SRS maximum background levels. Out of a total of 55 samples, 15 exceeded SRS maximum background levels for aluminum, chromium, cobalt, iron, lead, and/or manganese.

The presence of a low-pH plume in groundwater demonstrates that the buffering capacity of the sediment soils in the vadose zone and the aquifer has been consumed by sulfuric acid and aluminum acidity in the leachate. The sulfuric acid and aluminum acidity have saturated the cation exchange capacity (CEC) of the soil with proton (H^+) acidity, dissolved iron, aluminum, and manganese oxide surface coatings, and changed the net surface charge of the soil from negative to positive such that dissolved metals present in the groundwater remain in solution. The saturation of the sediment CEC with H^+ ions will cause the continued presence of an acid plume, and the resulting impact on downgradient groundwater and the D-Area Discharge Canal is estimated to persist for decades. Precipitation infiltrating through the vadose zone and upgradient groundwater will become strongly acidic when it encounters proton and aluminum acidity in the sediments, until such time that most of the reserve acidity is depleted. If the reserve acidity of the soil can be largely neutralized and the pH of the aquifer ultimately raised to less-acidic background conditions, the metals plume in and around the DCSA can be reduced or eliminated and surface water conditions in the D-Area Discharge Canal will improve to more natural conditions.

A NTC removal action to "lime" the DCSA vadose zone soil via the addition of agricultural limestone (calcium carbonate) or effective calcium carbonate equivalent (e.g., quick lime, hydrated lime, etc.) could return the soil to more natural conditions and allow groundwater pH to return to natural background levels over time. The NTC removal action will complement the recently submitted Treatability Study (*Treatability Study Work Plan for Groundwater Injection and Discharge Canal Treatment at the D-Area Groundwater (OU) (U)*, SRNS-TR-2018-00128, Rev. 0, July 2018) for treatment of groundwater and surface water. As part of the Treatability Study, potable groundwater from nearby production wells in D-Area will be injected in the upper water table upgradient of the DCSA and the 489-D CPRB to raise the water table approximately 5 ft to flush and raise the pH levels in the upper water table. Additionally, acidic surface water in the D-Area Discharge Canal will be treated with calcium carbonate reactive structures to raise the pH of the surface water prior to discharge into Beaver Dam Creek and the Savannah River floodplain and river.

DCSA Vadose Zone (Soil)

Problem(s) Warranting Action	Removal Action Objectives	Scope of Problem(s)	Likely Removal Actions
• Leaching of acidic DCSA vadose zone soil results in low pH and dissolved metals exceeding groundwater protection standards in groundwater.	• Increase pH in the DCSA vadose zone soils to more natural conditions to minimize future impact to groundwater	• 15 acres of 10 to 14 feet of vadose zone • ~5 of the 15 acres contains ~6-8 inch layer of buried (≤1 ft below the grass and topsoil layer) coal fragments	• No action • Addition of soil neutralization amendments (15 acres) • Partial excavation of coal fragments (5 acres) and addition of soil neutralization amendments (15 acres)
Uncertainty			
None.			

5.0 DCSA STRATEGY

The remedial action for groundwater will be addressed DAG OU ROD scheduled for submittal in 2023. The remedial action for the DCSA will be addressed in the DAOU ROD scheduled for submittal in 2046.

To improve the vadose zone, groundwater, and emerging surface water in the DAG OU in the short term, the following NTC removal action strategy for the DCSA is proposed:

- A RSER/EE/CA (Revision 0) will be submitted in September 2018 to evaluate alternatives to address the neutralization of the DCSA vadose zone soils. Execution of the approved NTC removal action is planned in 2020. A Sampling and Analysis Plan will be submitted as an attachment to the RSER/EE/CA to address sampling activities following addition of the neutralization amendment.

Table 1. Record of Key Agreements

RECORD OF KEY AGREEMENTS	
Date	**Description of Agreement**
August 2018	Core Team agreed to the removal action objectives and removal actions to be evaluated in the RSER/EE/CA due for submittal in September 2018.

Figure 1. General Map of the 484-17D D-Area Coal Storage Area and Surrounding Area

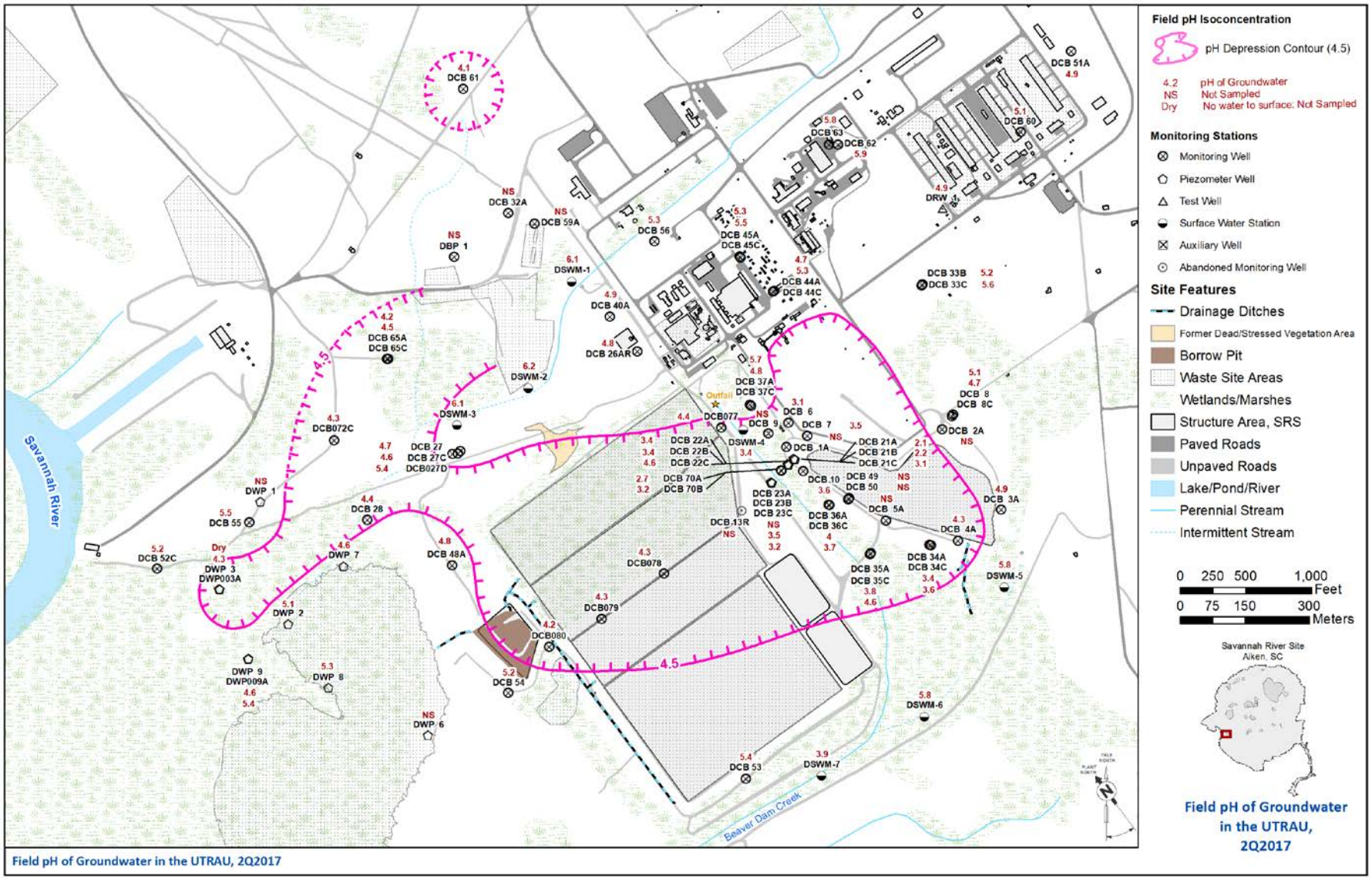

Figure 2. pH of Groundwater in the D-Area Groundwater OU

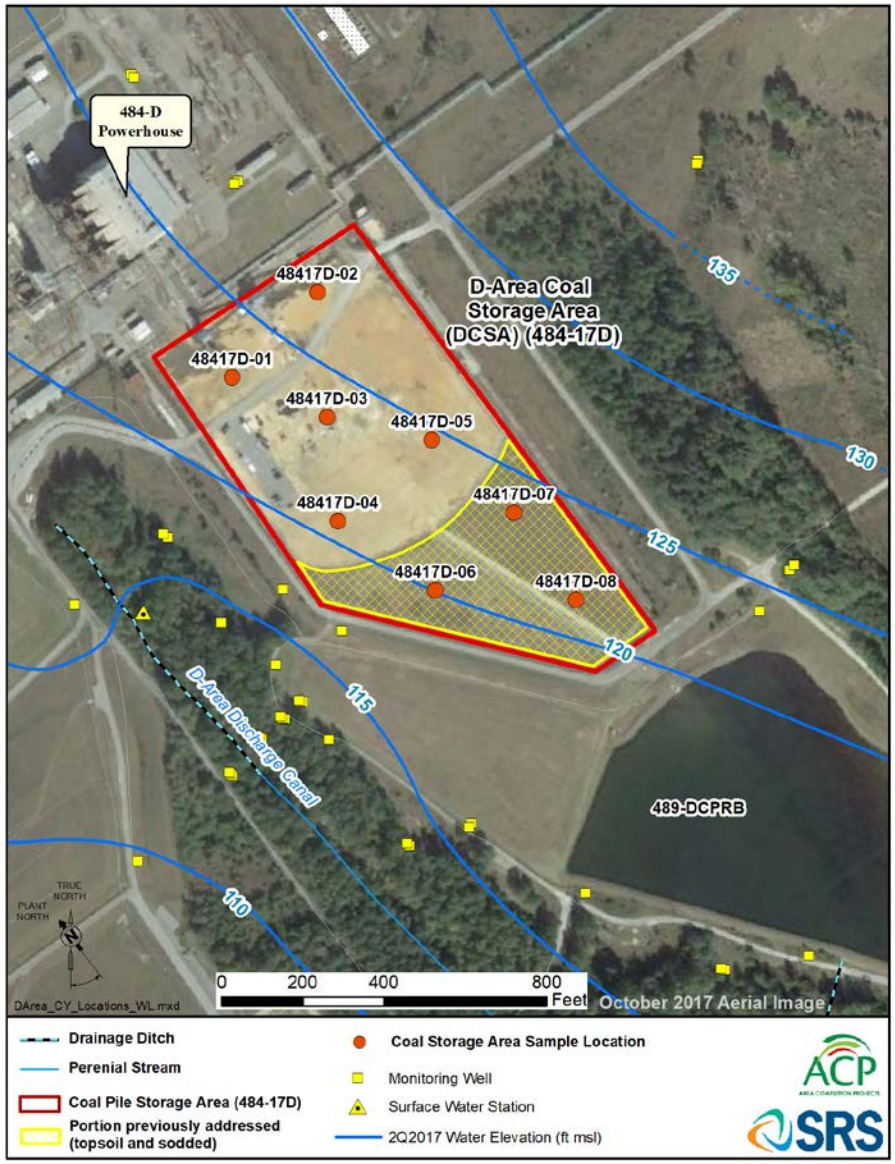

Figure 3. Sample Locations in 484-17D D-Area Coal Storage Area, June 2018

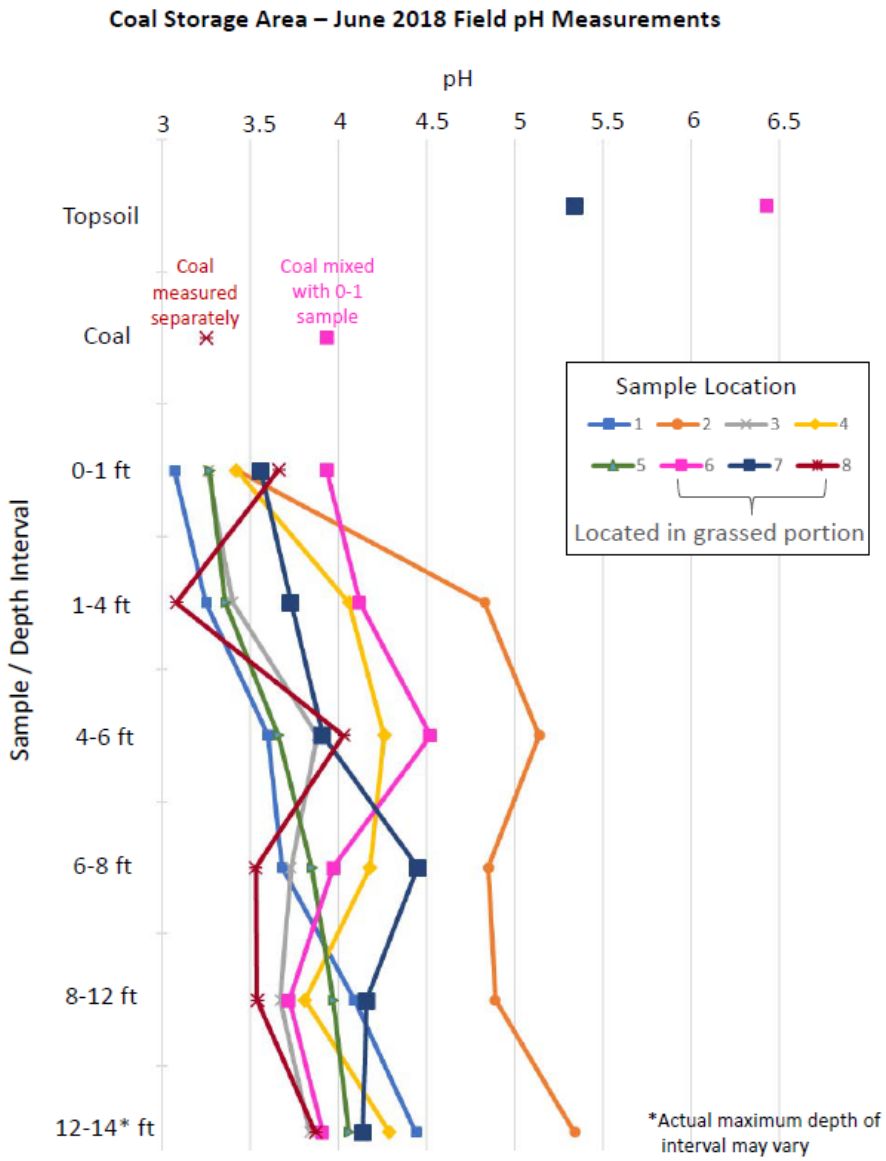

Figure 4. June 2018 Soil pH Measurements at Depth