AECOM

Uranium Source Assessment Work Plan

Columbia Fuel Fabrication Facility
Hopkins, Richland County, South Carolina

Westinghouse Electric Company, LLC

Project Number: 60700386

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Acronyms

BGS	below ground surface
BSS	below soil surface
CFFF	Columbia Fuel Fabrication Facility
CWW	contaminated wastewater
EPA	United States Environmental Protection Agency
GEL	GEL Laboratories LLC
HA	hand auger
MCL	maximum contaminant level
SOLX	Solvent Extraction
TOC	total organic carbon
U	uranium
Westinghouse	Westinghouse Electric Company, LLC

1. Introduction

Westinghouse Electric Company, LLC (Westinghouse) Columbia Fuel Fabrication Facility (CFFF) is located at 5801 Bluff Road (referred to as site or property hereafter) in Hopkins, approximately 15 miles southeast of Columbia, South Carolina (**Figure 1**). The site includes approximately 1,151 acres, with the developed area encompassing approximately 75 acres centrally located on the site, thereby creating substantial buffers from adjoining properties. The property is surrounded by rural forested and agricultural property. CFFF was opened in 1969 and manufactures fuel assemblies and components for the commercial nuclear power industry.

Scrap materials generated by manufacturing activities involving uranium (U) are processed to recover and recycle the uranium. The site has a Solvent Extraction (SOLX) process to remove impurities from recycled material, resulting in clean uranyl nitrate. Historical assessment of SOLX in 1991, as documented in the Final Remedial Investigation Report (AECOM, 2023), indicated that soil beneath the building is impacted by historical releases of U. SOLX is located within the Chemical Area Operational Unit (**Figure 2**).

In 2011, CFFF personnel discovered a breach in the contaminated wastewater (CWW) line underneath SOLX. Soil samples and a process wastewater sample collected by CFFF personnel in this area indicated U impact. As a result of the discovery of the condition of the CWW line beneath the plant, the CWW piping beneath the floor was abandoned in place and replaced with new above ground piping.

CFFF instituted an underground piping integrity program in 2018 to perform periodic inspections, maintenance and life cycle management of its underground piping. On September 9, 2024, a breach was confirmed in a closed loop cooling tower return line beneath SOLX when water was unexpectedly found to be flowing from the abandoned in place underground CWW line. Upon discovery of the cooling water leak, the compromised section of the cooling water return line was isolated, and repairs were completed under configuration change control ID CCF-D-24179.

Recent total U concentrations in groundwater from perimeter monitoring well W-56 indicate an increase in U concentration of 297 µg/L and 693 µg/L during the April 2025 and October 2025 sampling campaigns (AECOM, 2026). Groundwater samples from W-56 have been collected on a quarterly basis since October 2023 and groundwater from this well contained a total U concentration of 758 ug/L in January 2026. The exceedance of the total U maximum contaminant level (MCL, 30 ug/L) in groundwater is localized near the plant building and is delineated by the existing monitoring well network. The closest downgradient well, monitoring well W-73, is approximately 40 feet away from monitoring well W-56 and contains total U at concentrations near 0.1 µg/L. Although groundwater from side gradient monitoring well W-55 located 50 feet north of W-56 is impacted with U concentrations above the MCL, concentration of total U in groundwater from this well has been decreasing over time since October 2020 (183 ug/L) to approximately 61 ug/L in both April 2025 and October 2025. Groundwater monitoring wells side gradient of monitoring wells W-55 and W-56 (W-54 and W-57) were either non-detect or minimally impacted with total U (0.55 ug/L to 0.756 ug/L in groundwater from W-57) in both April 2025 and October 2025. Monitoring well locations and the horizontal extent of U impact in groundwater are displayed on **Figure 3**.

Monitoring well W-56 is located down-gradient of SOLX. It is possible that the cooling water leak leached U from the vadose soil and transported it to the water table or provided the motive force to move groundwater impacted with U from beneath the plant building to monitoring well W-56. As part of the site’s ongoing investigation, CFFF confirmed there were no active leaks, and while mitigation of this impact in W-56 is approved in the Pilot Study Work Plan (AECOM, 2025), it is important to understand the cause(s) of this issue. This work plan describes the methodology and extent of the source area assessment.

2. Site Investigation Objective

The objective of this effort is to assess if historical U impact and conditions beneath SOLX resulting from the cooling water return line leak could be the source of the increasing trend of U concentrations in groundwater from monitoring well W-56.

3. Site Investigation Activities

This section discusses the rationale and methods for collection of vadose zone soil and potentially perched water (discussed in **Section 3.1.2**) beneath SOLX and around a manhole for the CWW line. In addition, investigative activities will attempt to discern if there is a correlation between the total organic carbon (TOC) in soil and/or groundwater and increasing U concentrations in groundwater from monitoring well W-56.

3.1 Field Investigation Activities

Field Investigation activities will include installation of two hand auger (HA) borings near the locations where elevated concentrations of gross alpha radioactivity were detected in the 1991 assessment and one HA boring near the location of the pipe breach identified in 2011 to collect soil samples. Due to the 2024 cooling water return line leak, it's possible that vadose zone soils may still be saturated. If perched aquifer conditions are encountered in the borings in sufficient quantity, then a sample of this water will be collected.

3.1.1 Solvent Extraction Area Soil Assessment

Prior to the HA boring work being conducted, a core whose diameter is at least 4-inches will be drilled through the plant building floor to daylight underlying soils at each sampling location. AECOM personnel will tape down a 4-mil polyethylene plastic sheet to the floor centered that is at least 5 feet by 5 feet on each sampling location to prevent soil that is potentially impacted with U from further impacting the plant building floor. After being taped down, a hole will be cut through the plastic over the boring location to create an access port through the plastic liner. The plastic liner around the borehole will also be taped to the floor to hold the liner in place. The active sampling area will be barricaded to keep non-essential personnel from entering the workspace.

Five borings will be advanced using dedicated stainless steel HAs within the SOLX study area (**Figure3**). Two borings will be installed near the locations of the highest gross alpha activity from the 1991 investigation, two borings will be installed as close to the abandoned in place CWW line, and one boring will be installed near the product concentrators which contain some of the highest uranyl nitrate concentrations in this area.

These borings will be advanced to a depth of 11 feet below soil surface (BSS) unless the water table is encountered shallower than expected, or HA refusal, whichever comes first. The seasonal high depth to the water table below SOLX is approximately 11.5 feet BSS based upon historical water levels since September 2018 from monitoring wells W-55 and W-56. Soil will be logged by an AECOM geologist and recorded by Westinghouse personnel through verbal communication. Efforts will be made during soil logging to identify the transitionary zone between the vadose zone and the capillary fringe so that groundwater is not collected along with the soil samples. The HA will not be advanced into the water table.

Composite samples will be collected from the following intervals: 1-2 feet BSS, 2-4 feet BSS, 4-6 feet BSS, 6-8 feet BSS, 8-10 feet BSS, and 10-11 feet BSS. Soil samples will be submitted for U and TOC analysis. The top foot of soil generated at each boring will be discarded since the surface of the soil beneath the concrete may be impacted with U during the core drilling of the concrete floor.

When retrieving the HA bucket from the borehole, or inserting the HA bucket into the borehole, soil from the sidewalls of the boring may collapse to the bottom of the boring. To make sure that representative samples are collected from the desired depths, AECOM personnel will use a tape measure before and after each advancement of the HA bucket within each sample interval to document how much soil within each retrieved HA bucket is representative at a given depth. Soil from the top of the HA bucket will be emptied into a criticality safety approved receptacle until only the measured increase in the total borehole depth remains within the HA bucket before compositing the sample.

Soil from the composite sample interval will be emptied from the HA bucket onto a 3 foot by 3 foot 4-mil polyethylene plastic mixing square, dedicated to the specific sampling interval, and homogenized. Homogenized soil samples will be placed in pre-cleaned, laboratory-provided sample bottles. Soil samples will be submitted to GEL Laboratories, LLC (GEL) for analysis of isotopic U using United States Environmental Protection Agency (EPA) DOE EML HASL-300 (U-02-RC Modified), TOC using SW-846 Test Method 9060A, pH by EPA Method 9045D, and percent moisture by ASTM Method D2216. Samples that are analyzed for TOC and pH will be placed on ice after collection or refrigerated and placed on ice for transportation to the lab.

Excess soil and materials from the sampling will be properly disposed of per CFFF procedures. The borehole will be abandoned immediately after completion by pouring bentonite pellets down the open borehole until the borehole is filled to the bottom of the concrete floor. After the borehole is filled to the bottom of the cored concrete, the pellets will be hydrated to seal the borehole. A traffic cone, steel plate or equivalent will be placed over the borehole until CFFF personnel replace the concrete of the borehole opening.

3.1.2 Perched Aquifer Assessment

There is the potential to encounter perched water shallower than 11 feet BSS in each sampling location attributable to the pipe breach reported in September 2024. Perched aquifer conditions occur when water percolating through unsaturated soil encounters a soil layer with lower conductivity that impedes or stops its downward migration to the water table. If perched water is encountered in these borings, an attempt will be made to collect a sample of this water. A peristaltic pump equipped with single-use polyethylene or Teflon™ and silicone tubing will be used in conjunction with a single-use 0.45 micron particulate filter to remove suspended solids.

U has a high affinity to adsorb to soil and perched water will likely contain a large quantity of suspended soil. Therefore, the use of the field filter is considered necessary to remove the suspended soil particles from the sample prior to sample preservation so the dissolved phase U concentrations within this water can be quantified. Nitric acid preservative in the water sample bottles would cause U adsorbed to soil particles to desorb, thereby resulting in water quality data that would skew high by including both U concentrations within the water and the desorbed U concentrations from the soil.

Perched water samples will be placed on ice after collection, or refrigerated and later placed on ice during transportation, and submitted to GEL for analysis of isotopic U using EPA DOE EML HASL-300 (U-02-RC Modified), and TOC using SW-846 Test Method 9060. Geochemical field parameters (e.g., temperature, pH, dissolved oxygen, oxidation reduction potential, and specific conductivity) will be measured with a calibrated In-Situ Aqua TROLL 600 or equivalent, if there is an adequate quantity of perched water to collect this data.

3.1.3 CWW Line Soil Assessment

Outside of the plant building, the CWW line remains underground and runs parallel to the building. A manhole (**Figure 3**) was installed above the CWW line in 2011 in preparation for connecting above ground CWW line piping inside the plant building to the underground CWW line outside of the plant building. This connection was made in 2013. The seal at the connection of the underground CWW line to the above ground piping coming out of the plant building represents a potential weak point in this line where leaks may have occurred. The location of the manhole and associated connection point is upgradient of monitoring well W-56. Piping integrity inspections have not indicated that a release is occurring at this seal, but CFFF desires verification by collecting soil samples during this assessment.

Using the same method described in **Section 3.1.1**, three soil samples will be taken around this manhole as close to the CWW line as practical. The bottom of the CWW line is located approximately 6 feet below ground surface. The depth to water in monitoring well W-56 has been measured to be as shallow as 8.03 feet below ground surface (BGS) since September 2018, when the well was installed. There is no known source for U impact in the vadose zone in this area; therefore, soil samples will only be collected from the 6-7 feet BGS interval near the manhole.

3.1.4 Groundwater Assessment

Groundwater at Westinghouse is routinely sampled semiannually in the monitoring well network in April and October. Samples from monitoring wells W-37, W-54, W-55, W-56, W-57, W-73, and W-75 (**Figure 4**) will be analyzed by GEL for TOC using SW-846 Test Method 9060 during the April 2026 groundwater sampling campaign. Analyzing groundwater samples from these wells for TOC will allow CFFF to understand if there is a correlation between U and TOC concentrations. Suspended solids can also falsely indicate elevated TOC concentrations similar to U because the suspended solids consist of soil, organic matter, and microorganisms that may contain organic carbon. Both field filtered and unfiltered samples will be submitted for analysis to understand what the dissolved phase TOC concentration is in groundwater from these wells. Groundwater samples that are analyzed for TOC will be on a separate chain of custody because this analysis is specific to this scope of work and not part of the routine sampling.

4. Reporting

Following completion of this scope of work, AECOM will submit a Source Assessment Report to document the results of this investigation.

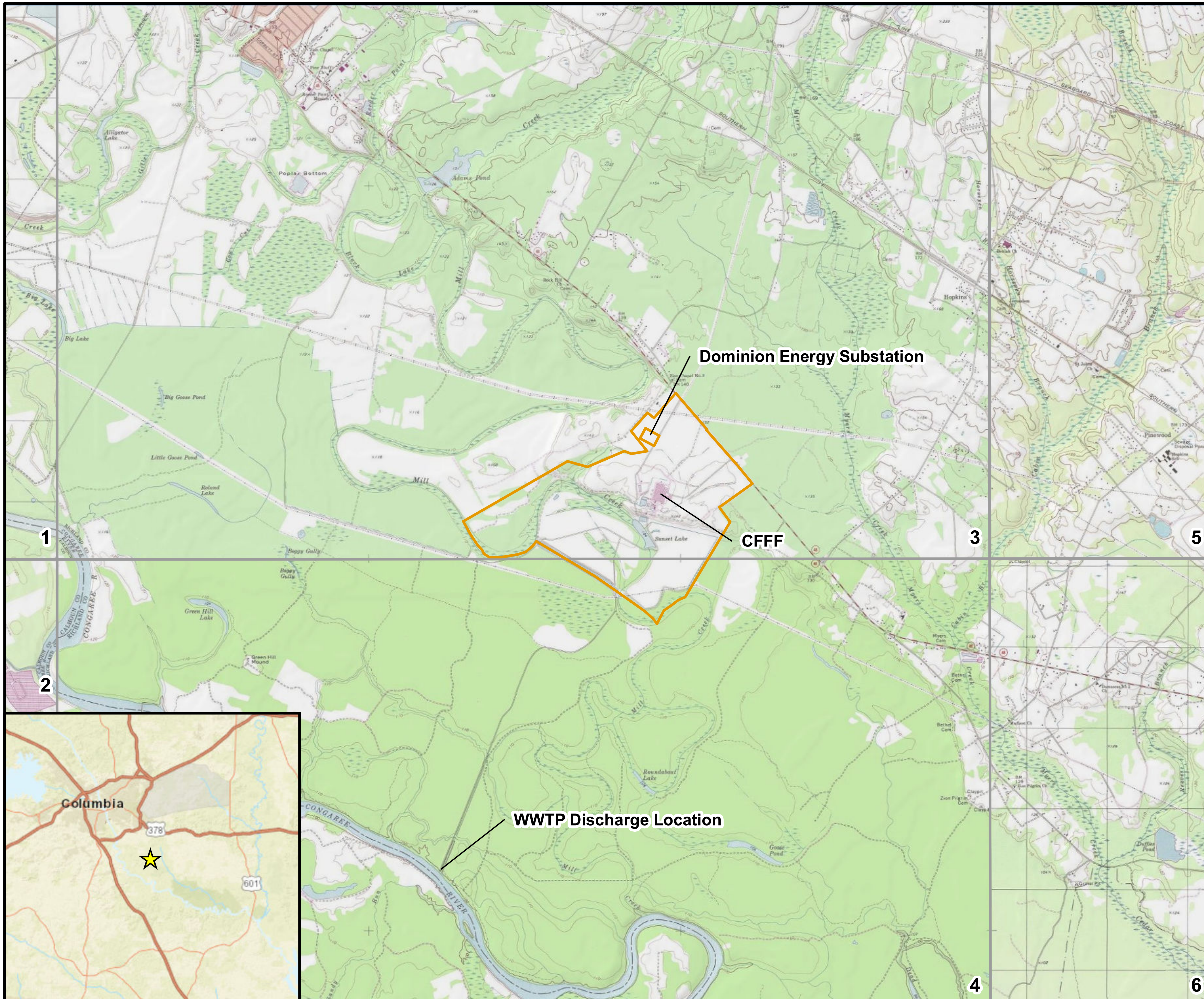
5. References

AECOM, 2023. Final Remediation Investigation Report, Westinghouse Columbia Fuel Fabrication Facility, February 2023.

AECOM, 2025. Pilot Study Work Plan, Columbia Fuel Fabrication Facility, Hopkins, Richland County, South Carolina, Westinghouse Electric Company, LLC, January 2025.

AECOM, 2026. 2025 Annual Groundwater Monitoring Report, Westinghouse Columbia Fuel Fabrication Facility, January 2026.

Figures



Legend

Locations

Property Line

Topographic Quadrangle Boundary

ID	Topographic Quadrangle Name
1	Southwest Columbia
2	Gaston
3	Fort Jackson South
4	Saylors Lake
5	Congaree
6	Gadsden

0 2,000 4,000 Feet

1:48,000

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

Data Source: Esri/USGS

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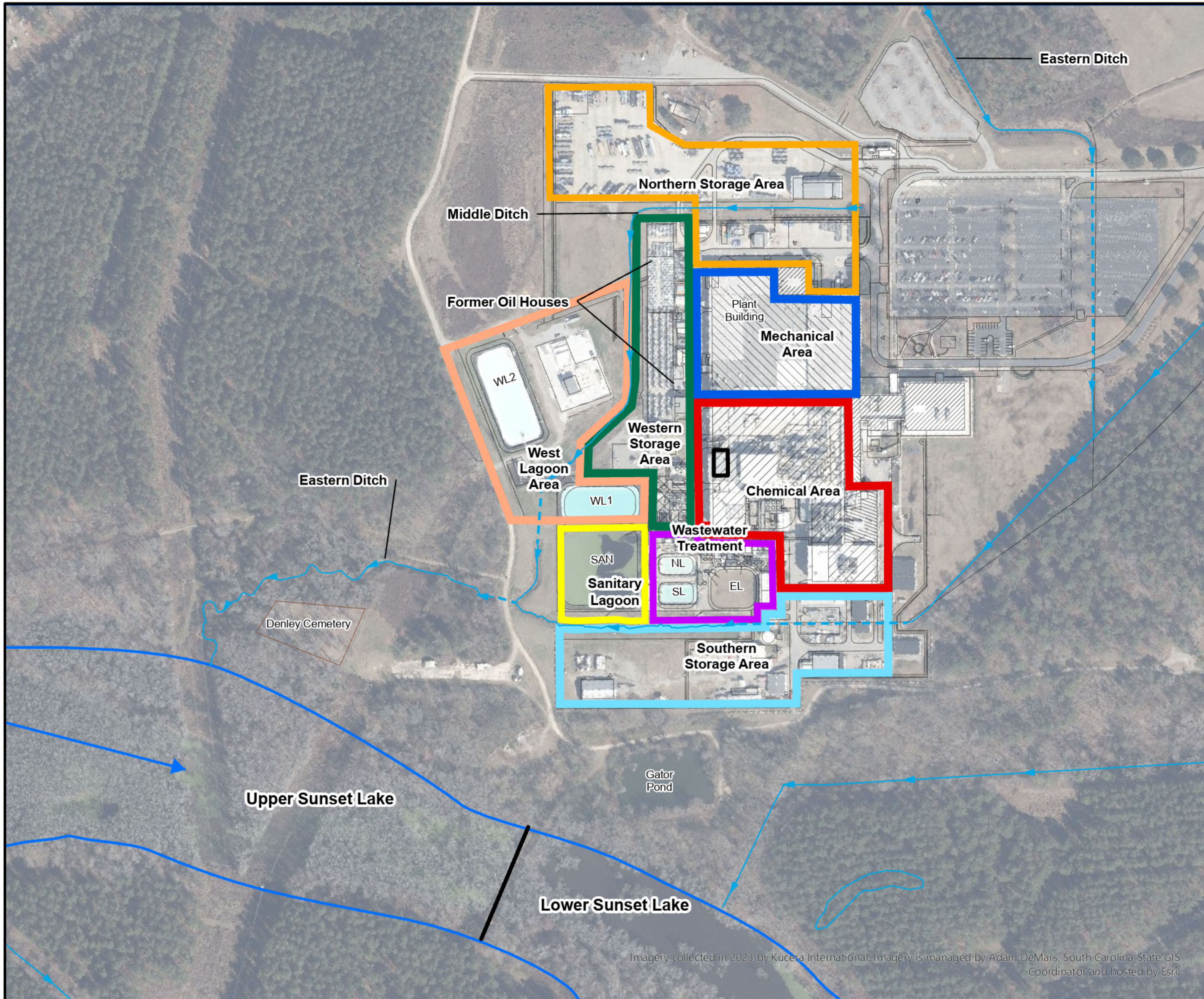
Site Location Map

WESTINGHOUSE COLUMBIA FUEL FABRICATION FACILITY
HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60700386	CCS	December 2025	FIGURE 1

Path: M:\EnvDataViz\Westinghouse\mxd\2024 RI Report\F1 Site Location Map.mxd



Legend

- Ditch
- Culvert
- Mill Creek Flow Direction
- EL Former East Lagoon
- NL North Lagoon
- SL South Lagoon
- SAN Sanitary Lagoon
- WL1 West Lagoon I
- WL2 West Lagoon II
- Mill Creek
- Dike Location
- Solvent Extraction Area Location

Operable Units

- Chemical Area
- Mechanical Area
- Northern Storage Area
- Sanitary Lagoon Area
- Southern Storage Area
- Wastewater Treatment Area
- West Lagoons Area
- Western Storage Area

0 150 300 Feet

1:3,600

Map Projection: NAD 1983, South Carolina State Plane, FIPS 3900, Feet

Datum: North American 1983

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Operational Units Map

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HOPKINS, SOUTH CAROLINA

PROJECT NO.	PREPARED BY:	DATE:	
60700386	CCS	February 2026	FIGURE 2

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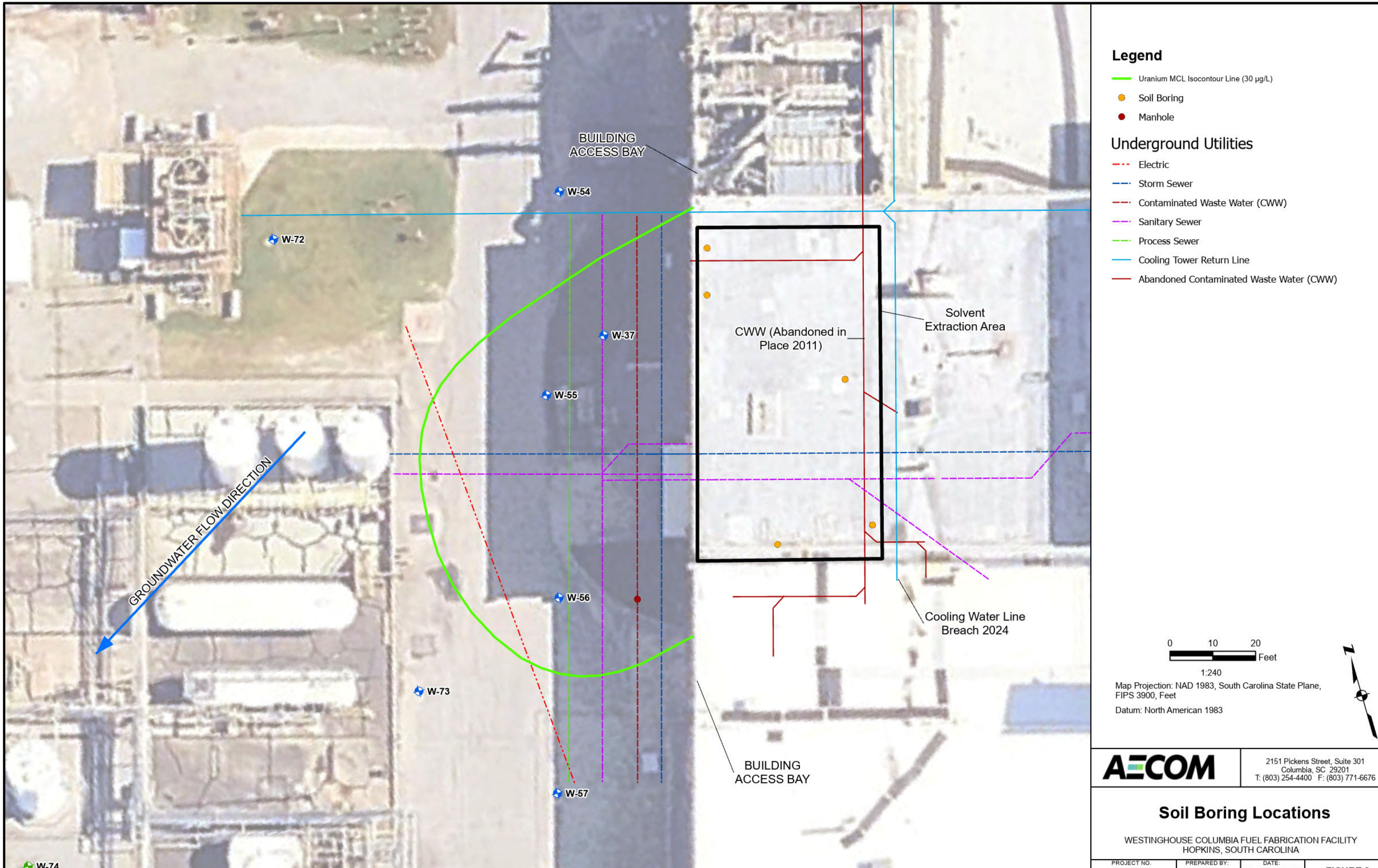

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Soil Boring Locations

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