

Leveraging Digital Workflows & Integrated Conceptual Site Models to Streamline Complex Assessment Projects

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Agenda

- 01 Overview
- 02 Background
- 03 Approach
- 04 Results
- 05 Next Steps

01

Overview

Conceptual Site Model (CSM) Guidance (US)

- EPA (Regulators)
- ITRC (Mix of Regulators and Technical Experts)
- ASTM (Recording of the Standard/Best Practice)



Designation: E1689 – 20

Standard Guide for
Developing Conceptual Site Models for Contaminated Sites¹



Designation: E2531 – 06 (Reapproved 2020)

Standard Guide for
Development of Conceptual Site Models and Remediation
Strategies for Light Nonaqueous-Phase Liquids Released to
the Subsurface¹

What are CSMs?

- A representation of the of the nature, extent and fate of contaminants that allows assessment of the potential exposure to contamination, so that the decision maker(s) can evaluate strategies to reduce the risks from contamination.¹
- Can be tabular/checklist, written, or visual.
- Is meant to evolve as additional information is gathered.

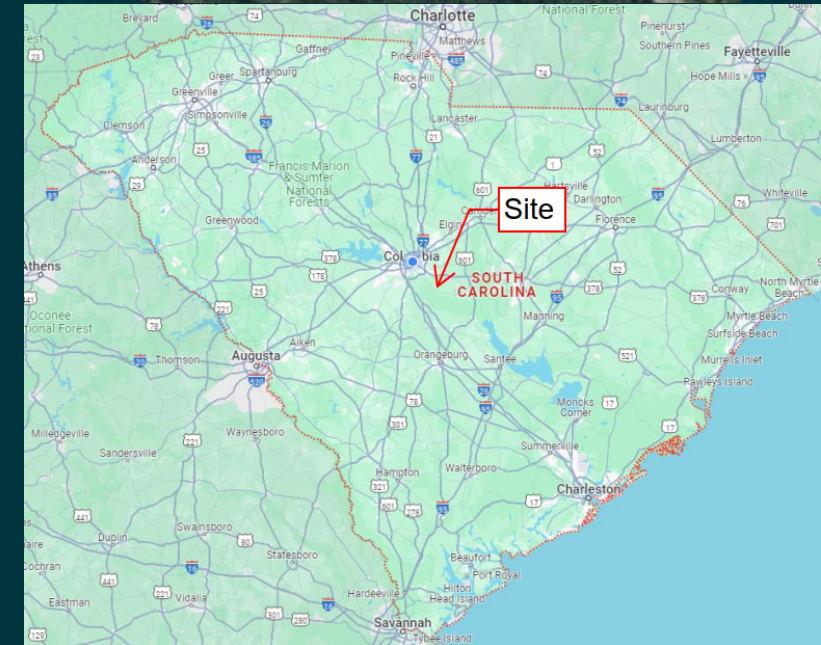
¹ EPA, 2008. Module 6, Truth Serum for Environmental Decision Making: Efficient and Effective Program Designs. Short course manual for Best Practices for Efficient Soil Sampling Designs. CERCLA Education Center.

02

Background

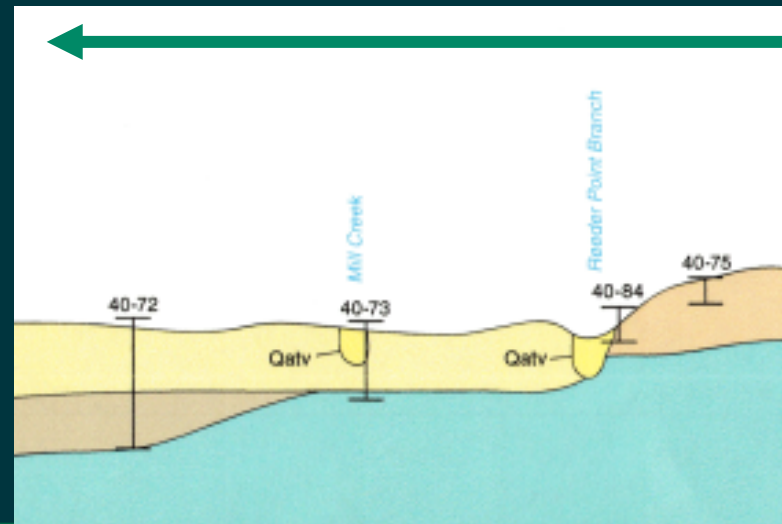
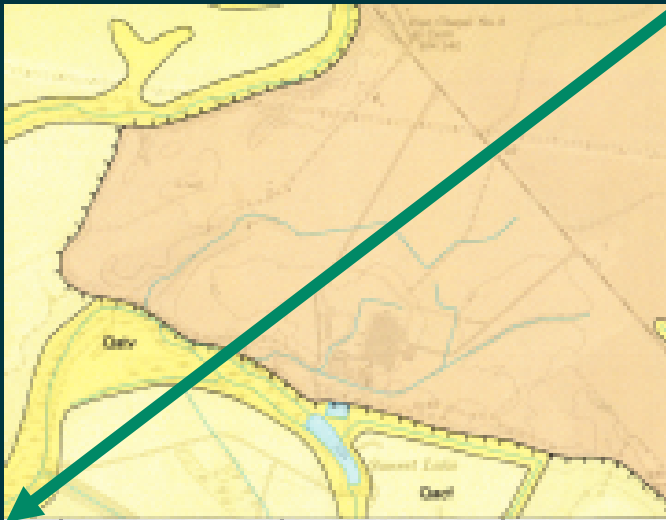
Site Background

- Manufacturing facility that has been in operation since 1969.
- Located on 1,151 acres outside of Columbia, South Carolina, with the operational area encompassing 75 acres.
- Manufactures fuel assemblies and components for the commercial nuclear fuel industry.



Site Background

- Fluvially deposited sediments with a 20–30-foot bluff separating the two halves of the site.
- Confining unit across the site at approximately 30-40 feet BLS.
- Manufacturing area is located above the extensive floodplain of the Congaree River (~ 3 miles).



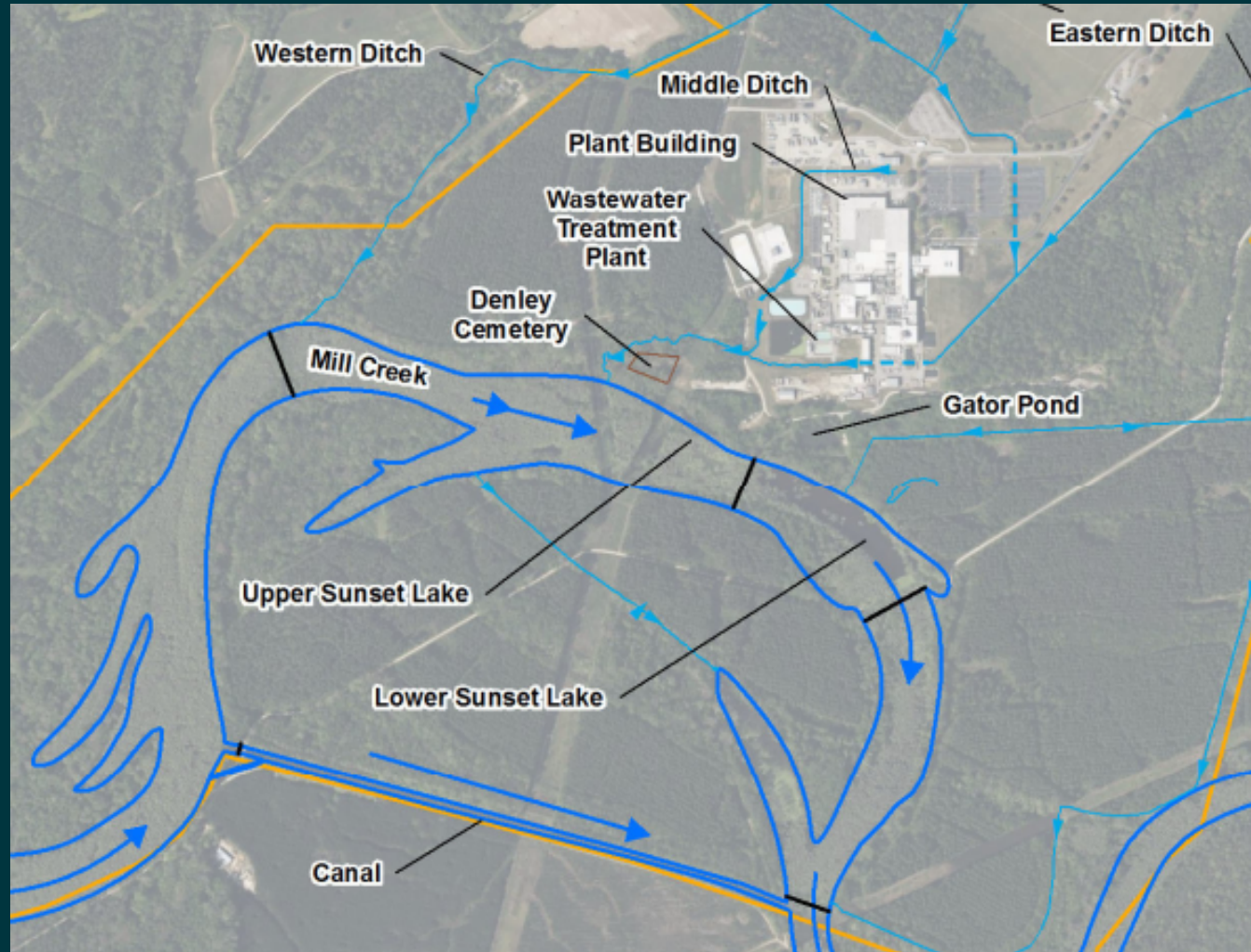
Site Background

- Release of uranium in 2018 resulted in heightened regulatory, media, political and public scrutiny.
- Client entered into a consent agreement with SCDHEC in February 2019.
- Groundwater impacted with CVOCs, fluoride, nitrate, U and Tc-99.
- Maximum PCE concentrations in the hundreds.



Site Background

- Multiple surface water bodies which affect groundwater flow very differently.



Recognized Challenges

- Decades of multi-media investigations resulting in data silos.
- Ineffective transfer of historical knowledge and central data storage.
- Incomplete geologic or hydrogeologic understanding of the floodplain.
- Public and stakeholder perceptions.
- Public understanding of environmental assessment and remediation.
- PCE impact in the western portion of the property ~1700 feet from any potential source.

**'We don't trust you,' some tell DHEC,
Westinghouse after nuclear leak**

LATEST NEWS

**More leaks discovered at troubled SC
nuclear fuel factory; feds investigating**

03

Approach

Digital Management

- EQulS database
 - Direct import of lab EDDs for old and new data.
 - Communication with multiple applications allowing for efficient analysis of recent data and existing data gaps.



A

EQUIS Enterprise
7.23.3.23331 © EarthSoft, Inc.

CFFF Groundwater

Groundwater

Instructions

Use the filters below to select the set of data to view. Note that TASK and DATE RANGE might conflict!

Filter - Date Range

Select Range

CLEAR

APPLY FILTER

Task Code

CLEAR

APPLY FILTER

Analyte

CLEAR

Location

CLEAR

Map

The map displays an aerial view of a site with numerous groundwater monitoring wells marked by black diamond icons. The wells are labeled with codes such as W-1, W-2, W-3, W-4, W-6, W-8, W-9, W-10, W-11, W-12, W-13R, W-17, W-20, W-26, W-27, W-31, W-33, W-35, W-36, W-37, W-38, W-39, W-41R, W-42, W-43, W-44, W-46, W-47, W-48, W-49B, W-51, W-58, W-60, W-62, W-63, W-68, W-69, W-74, W-84, W-85, W-86, W-87, W-88, W-89, W-90, W-94, W-95, W-96, W-97, W-98, W-103, W-104, W-105, W-106, W-107, W-108, W-110, W-111, W-112, W-113, W-115, W-117, W-118, and W-24. A road labeled 'D'Amore Blvd' runs along the right side of the map. Two water bodies, 'Mill Creek' and 'Creek', are visible at the bottom. The map includes standard navigation controls like zoom in (+), zoom out (-), and full screen (f) buttons. At the bottom, it credits Maxar, Esri Community Maps Contributors, OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, U.S. Geological Survey, and is powered by Esri.

Investigation Approach

- Embedded interconnected digital tools from the field through final presentation.
- EQuIS Collect mobile app
- In-Situ AquaTROLL 600 connected to an iPad via Bluetooth
- Improved data quality and efficiency



Regulatory & Public Approach

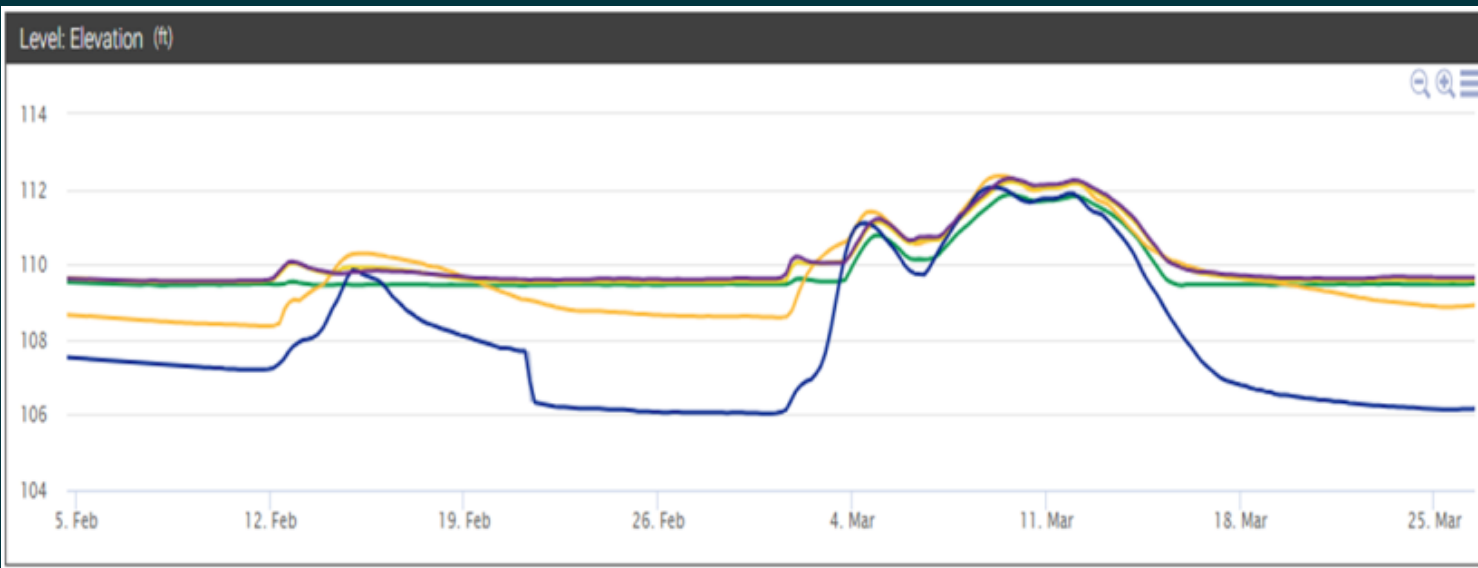
- Frequent meetings to discuss remedial investigation results
- Use of digital visualizations to improve understanding
- Buy in and input from regulators on next steps prior to submittal of plans
- Client driven changes to community engagement and complete transparency.

Digital Analysis Approach

- 3-D CSM using ArcGIS and Earth Volumetric Studio (EVS)
- Plume statistics using Surfer
 - Evaluate plume trends holistically versus single well snapshots
 - Statistically accurate and defensible conclusions about plume size, mass, and stability

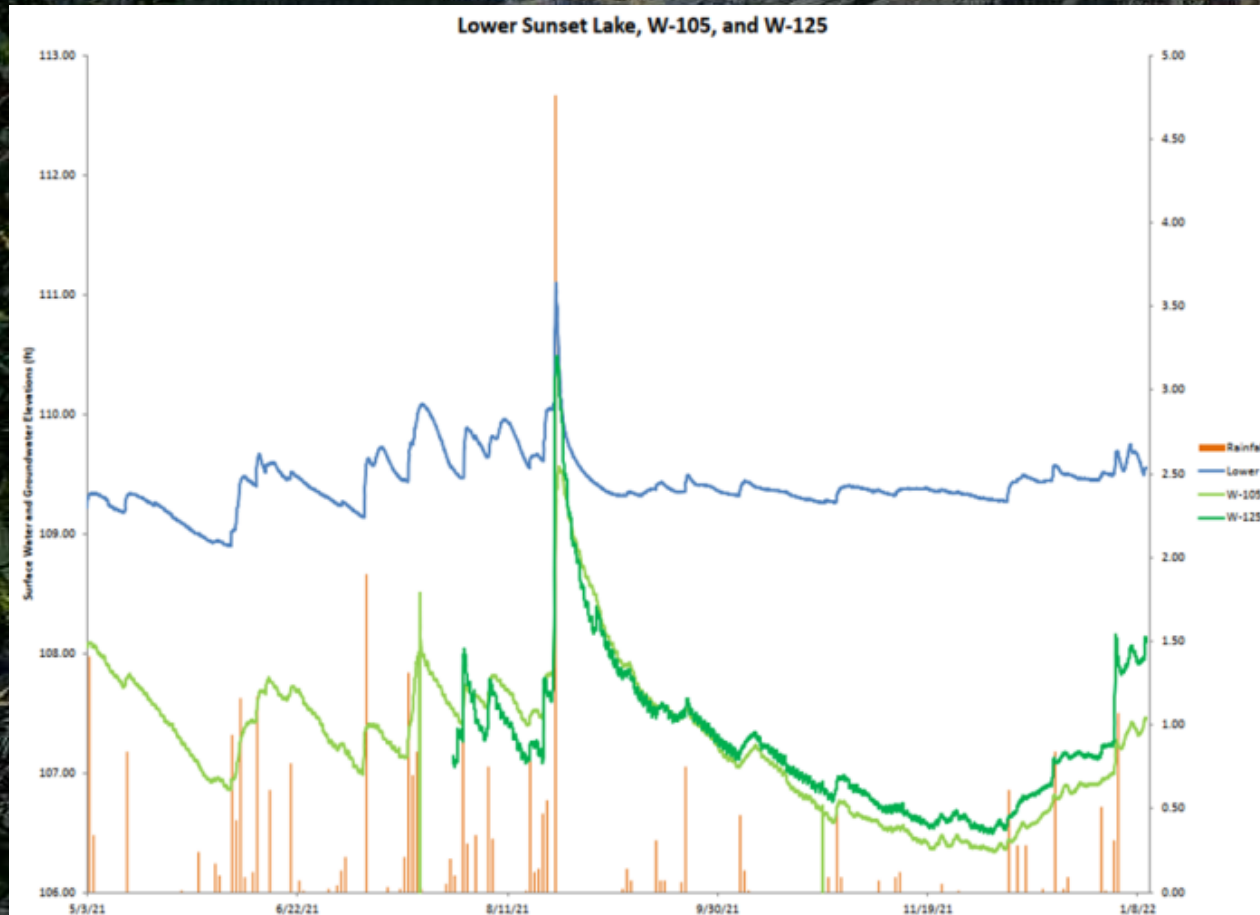
Groundwater – Surface Water Interaction Analysis

- Use of VuLinks and pressure transducers in surface water.



Groundwater – Surface Water Interaction Analysis

- Use of pressure transducers in select monitoring wells.

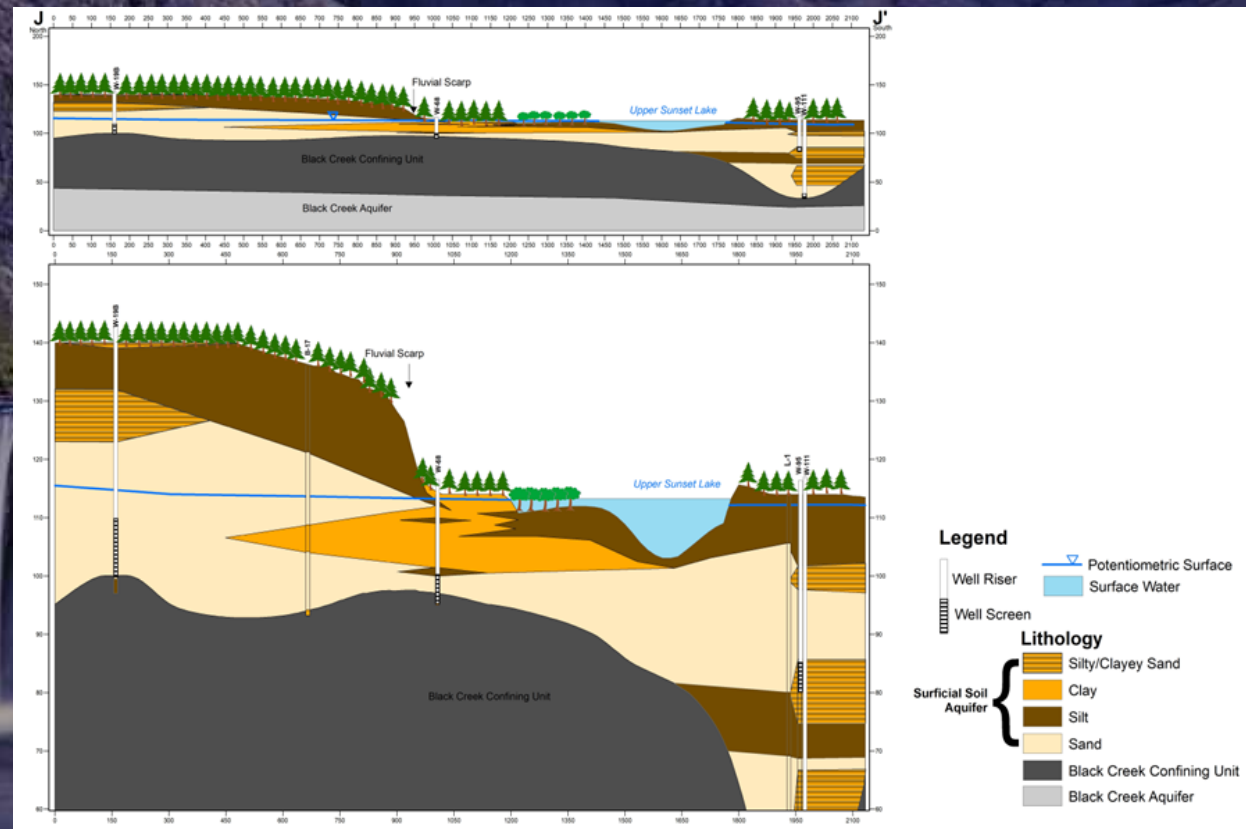
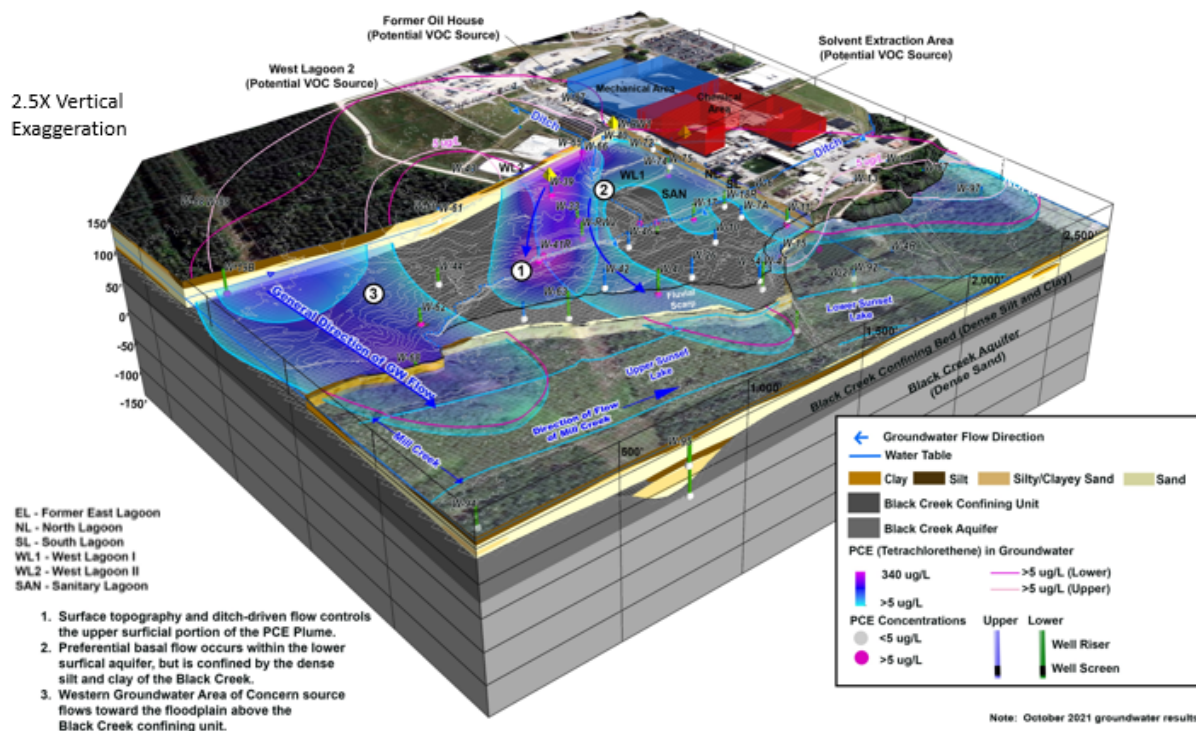


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Results

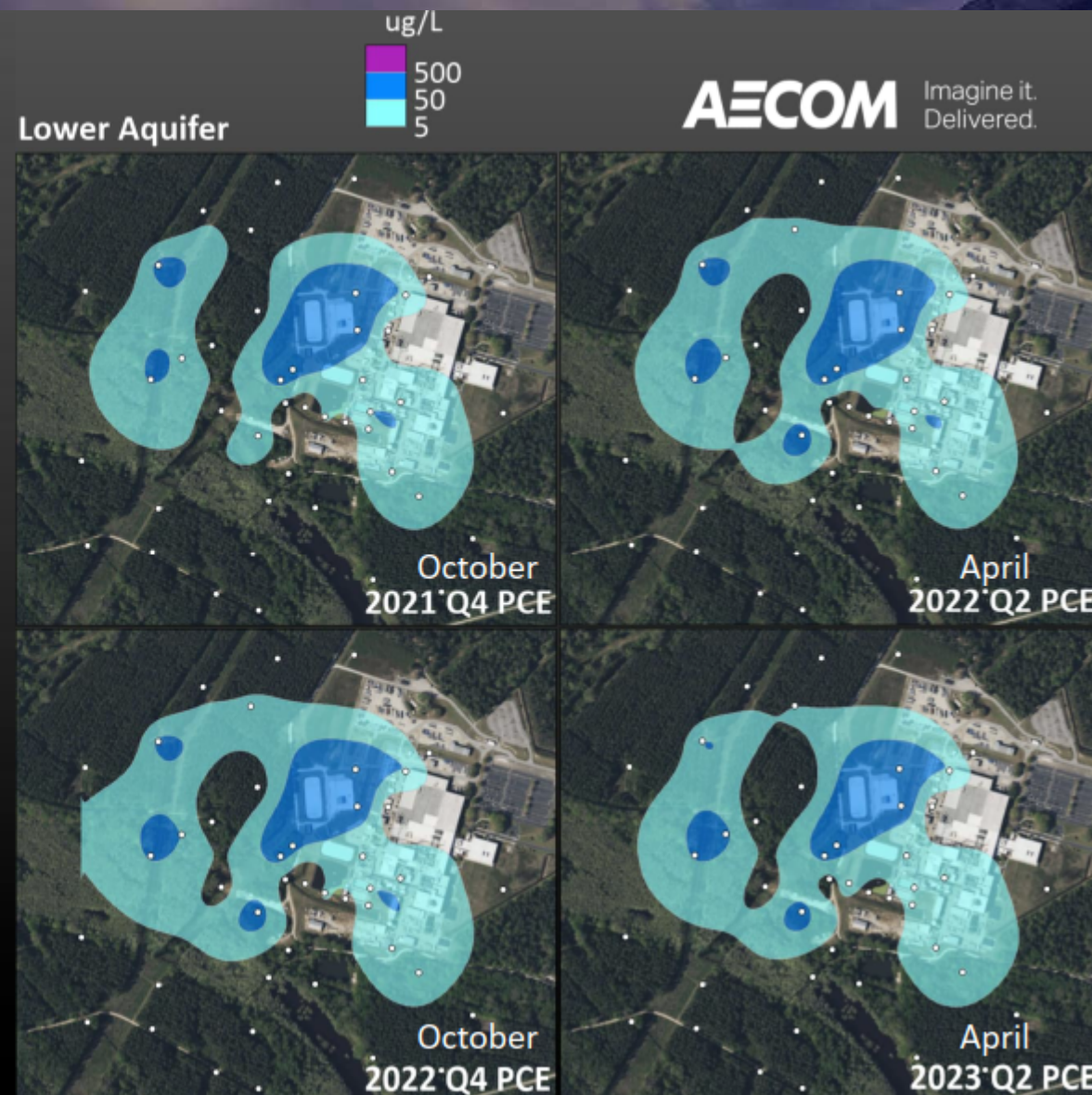
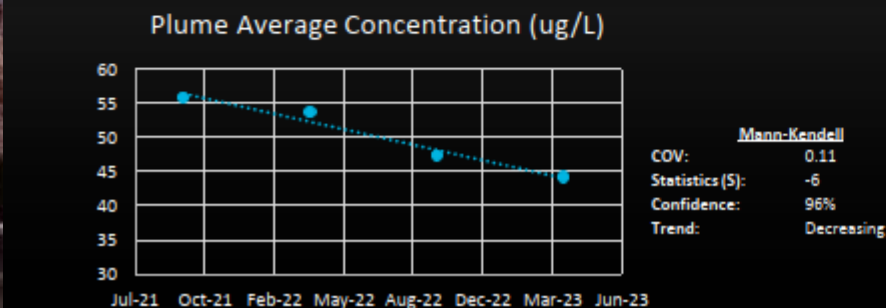
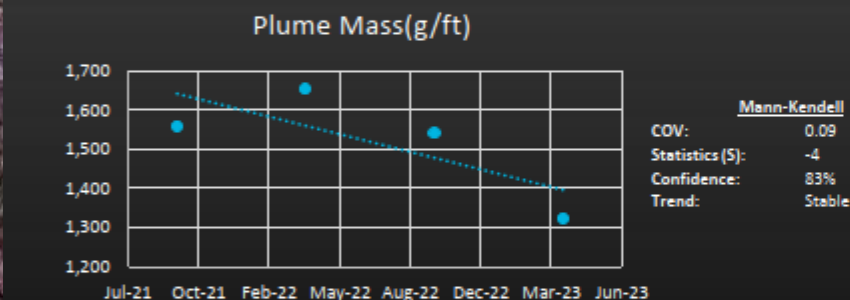
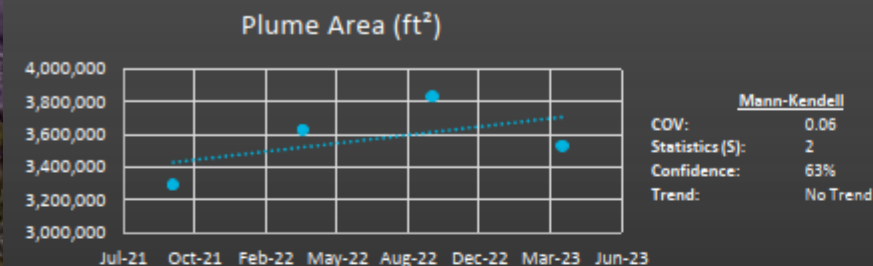
3-D Geologic Block Model and Cross Sections

Site CSM Block – PCE (2021)



Plume Statistics

PCE Lower Aquifer



Advantages

- Client, regulators, and consultant in lock step with each other.
- Trust and teamwork built across all facets of the project.
- Updated conceptual site model done efficiently and effectively.
- Visualizations assisted in public understanding and perceptions.
- Improved understanding of the groundwater – surface water interaction.
- Improved efficiency across multiple aspects of routine activities and procedures.

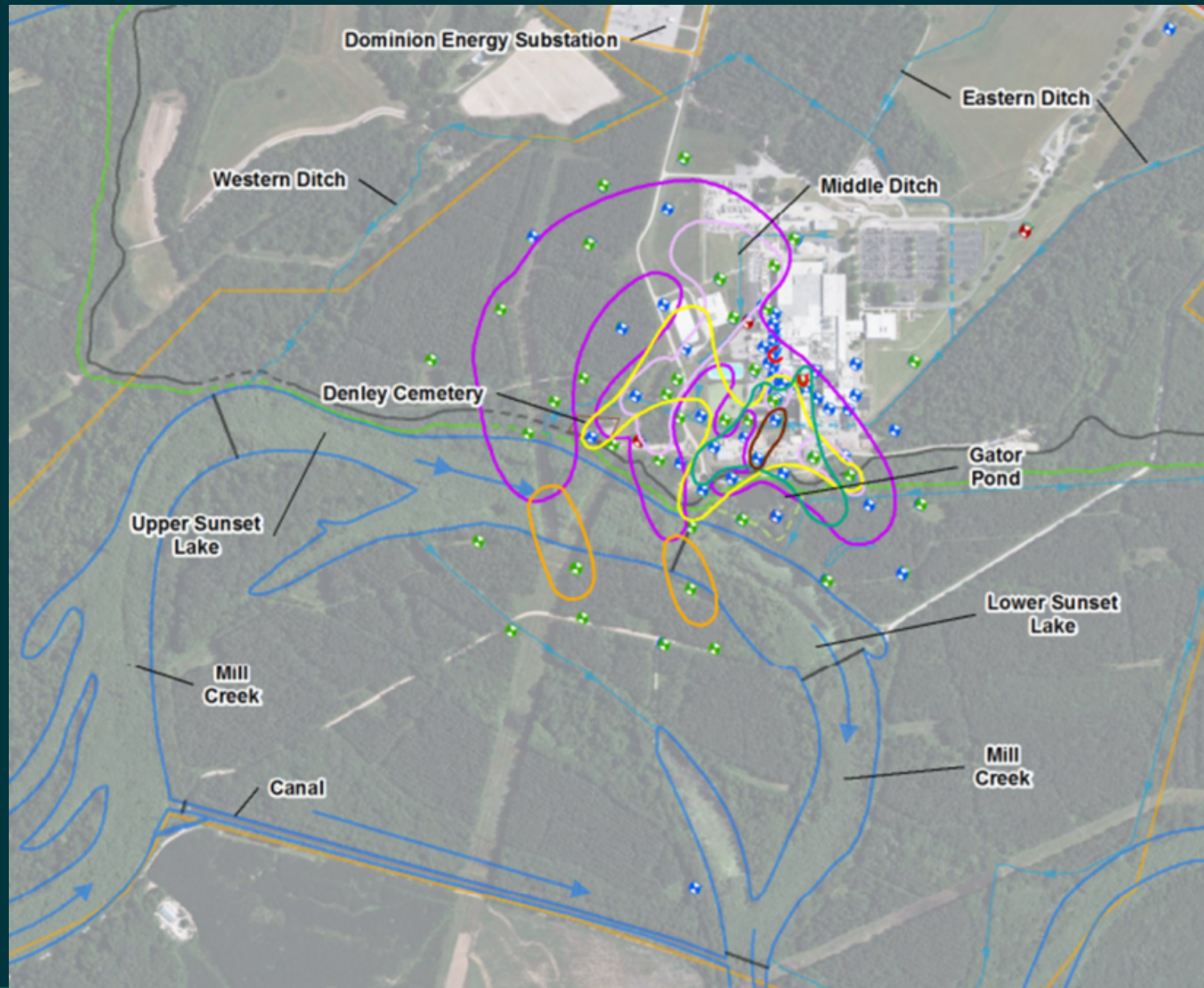
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Next Steps

What's Next?

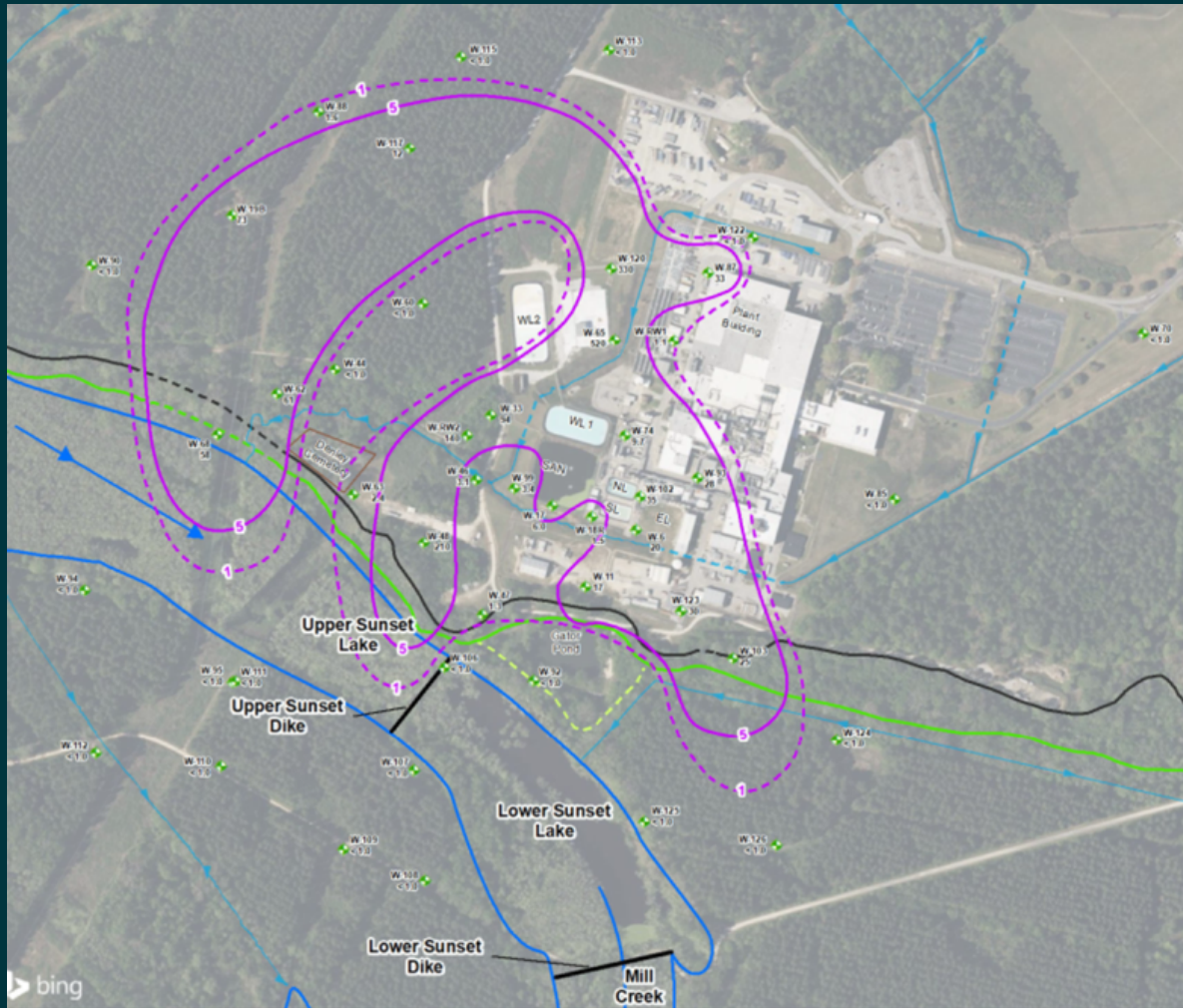
- Continue down the path of the CERCLA Process
 - Feasibility Study to assess remedial alternatives
 - Record of Decision (~ 2-3 years from now)
- Groundwater Fate and Transport Model
- Well sufficiency analysis

Extent of Groundwater Impacts



- PCE MCL Isocontour Line (5 µg/L)
- TCE MCL Isocontour Line (5 µg/L)
- VC MCL Isocontour Line (2 µg/L)
- Nitrate MCL Isocontour Line (10 mg/L)
- Fluoride MCL Isocontour Line (4 mg/L)
- Technetium 99 MCL Isocontour Line (900 pCi/L)
- Uranium MCL Isocontour Line (30 µg/L)

Groundwater F&T Model Simulation of PCE



THANK YOU!

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