RVAAP-50 – Atlas Scrap Yard Former Storage Area Ex-Situ Thermal Remediation

PIKA-INSIGHT JV, LLC

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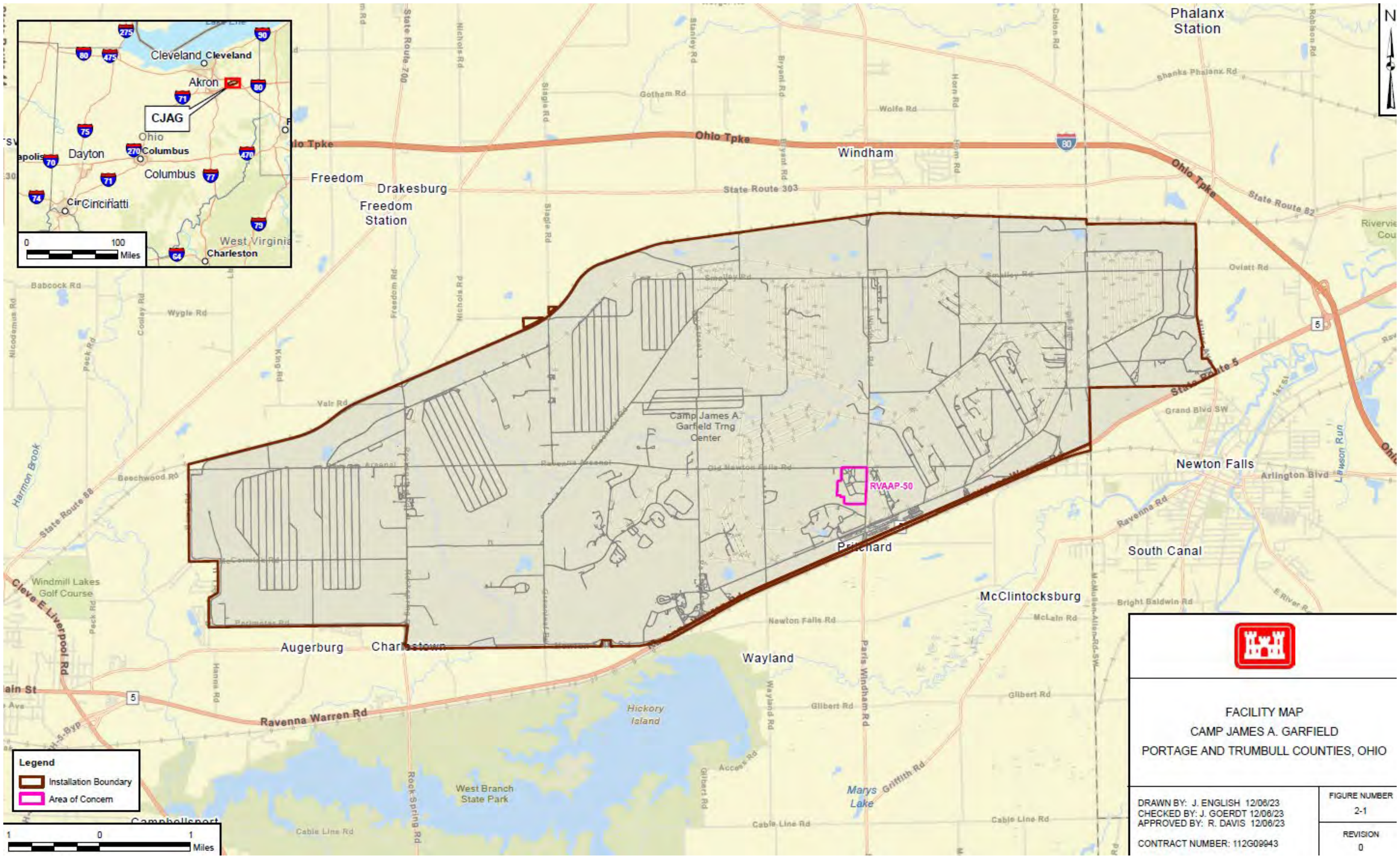
Presenter: Brian Krumbholz of GEO, VP of Operations

GEO Environmental Remediation Company

SITE LOCATION MAP



Site Background- Atlas Scrap Yard

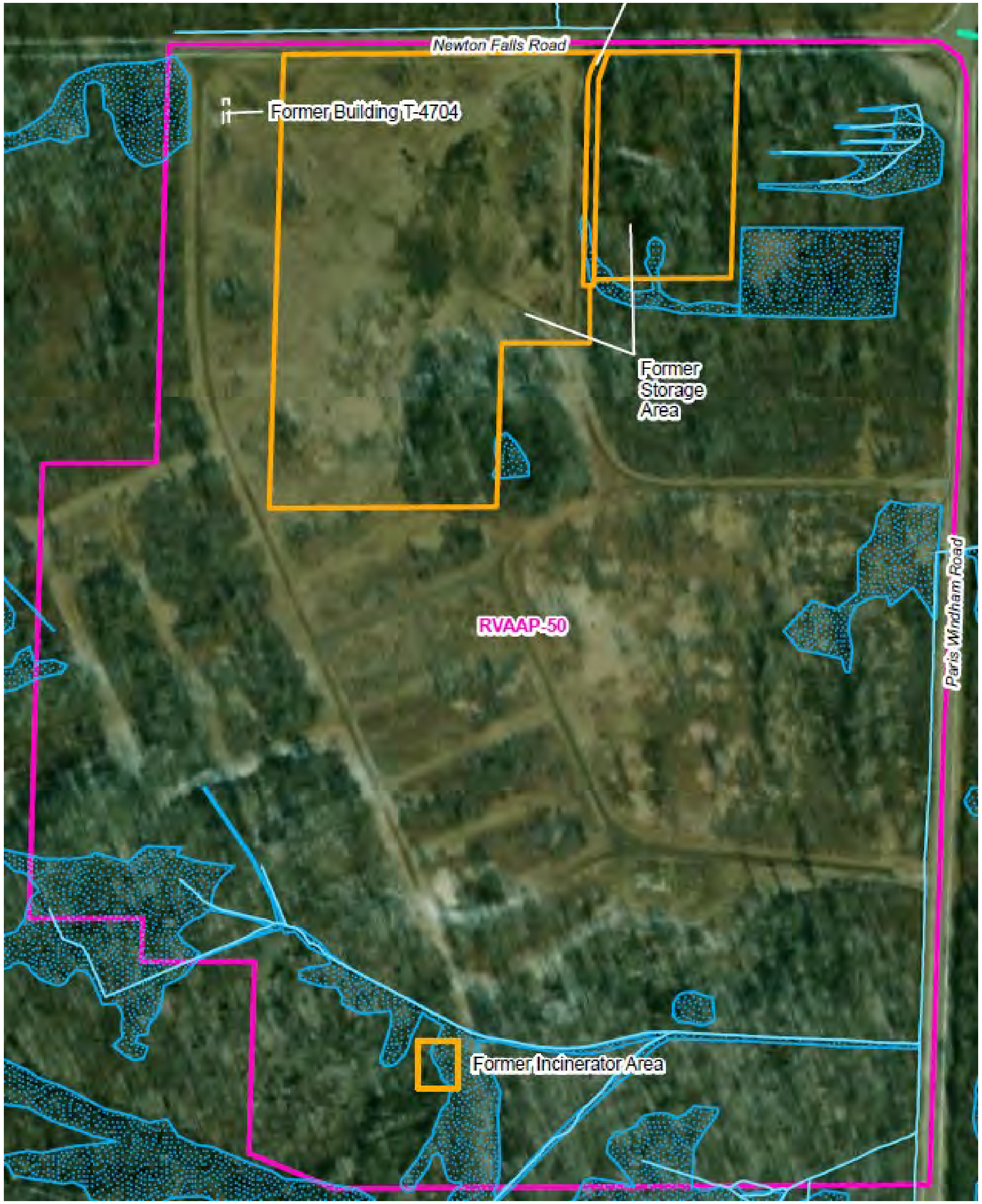
- Site Uses
  - 1940-1945 - used to house construction worker families
  - Grounds maintenance activities through the 1950's
  - Storage and stockpiling of various materials including railroad ties, railroad ballasts, gravel, sand, culvert piping, and telephone poles from the mid 1970's.
- All remaining stockpiled materials removed in 2017

Site Background- Atlas Scrap Yard

- 2 remediation areas located within Atlas Scrap Yard
  - Former Incinerator Area (FIA) containing a former incinerator building

  - Former Storage Area (FSA) encompassing a drainage ditch with the FSA

Site Plan- Atlas Scrap Yard



AOC boundary

FSA/FIA boundary

Previous Investigations -Atlas Scrap Yard

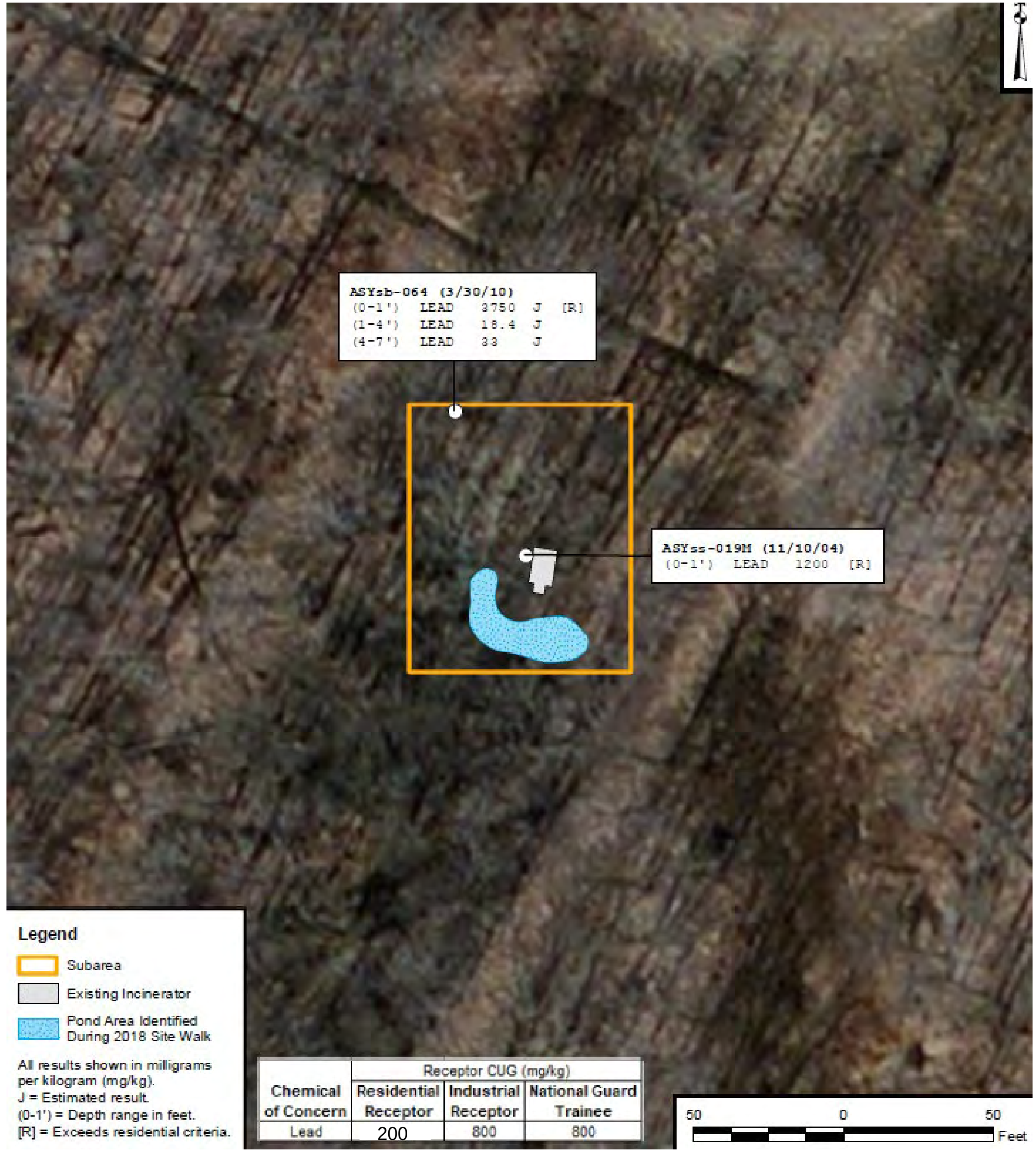
- Relative Risk Site Evaluation for Newly Added Sites (USACHPPM, 1998)
- 2004/2005 Characterization of 14 AOCs (MKM, 2007)
- 2010 Remedial Investigation
- 2011 Supplemental Sampling
- Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard (Leidos, 2017)
- Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard (Leidos, 2019)
- Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard (Leidos, 2020)

Previous Investigations -Atlas Scrap Yard

Investigation results were used to evaluate the nature and extent of contamination, assess potential future impacts to groundwater, conduct human health risk assessments and ecological risk assessments, and evaluate the need for remedial alternatives.

- The selected remedial alternative for the FIA and FSA is detailed in the Record of Decision (ROD) for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard (Leidos, 2022). The remedy will address:
  - Lead in surface soil at the FIA through excavation, transport and disposal to achieve the residential cleanup goal
  - Polycyclic Aromatic Hydrocarbons (PAHs) [benzo(a)pyrene] in surface soil at the ditch line at the FSA through excavation and thermal treatment to achieve the commercial/industrial cleanup goal

Former Incinerator Area Site Plan

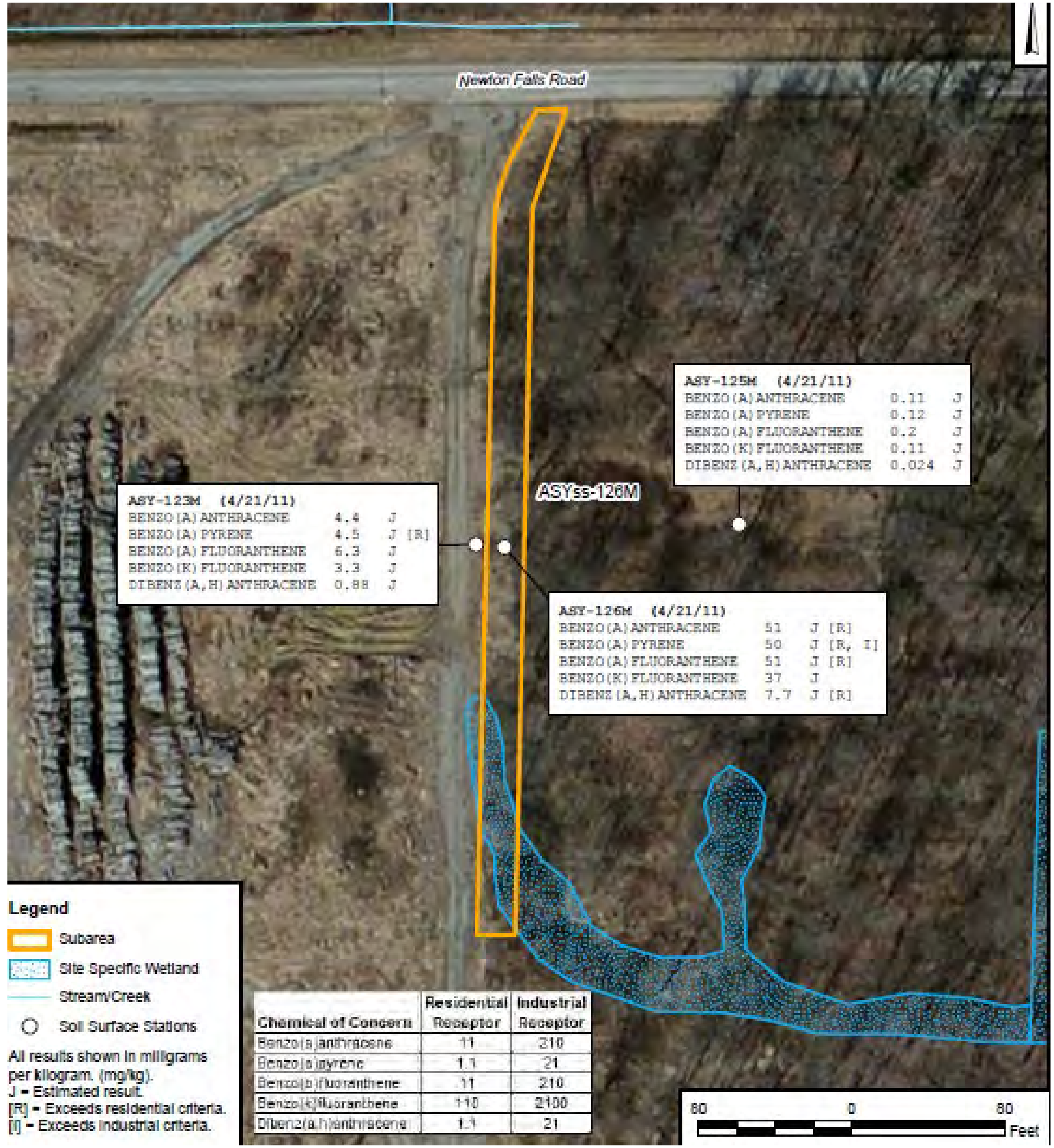


Chemical of Concern	Receptor CUG (mg/kg)		
	Residential Receptor	Industrial Receptor	National Guard Trainee
Lead	200	800	800

FIA boundary

*Boxes depict historical Lead results

Former Storage Area Site Plan



FSA boundary

*Boxes depict historical PAH results

Overview of Remedial Action

Former Incinerator Area

- Demo and remove the former incinerator building
- Excavation and offsite disposal of an estimated 366 cubic yards of lead impacted surface soil
- Collect and analyze confirmation soil samples to confirm if the cleanup goal (CUG) for lead has been met
- Backfill with clean soil and restore the area
- Reseed and plant per approved wetlands restoration plan

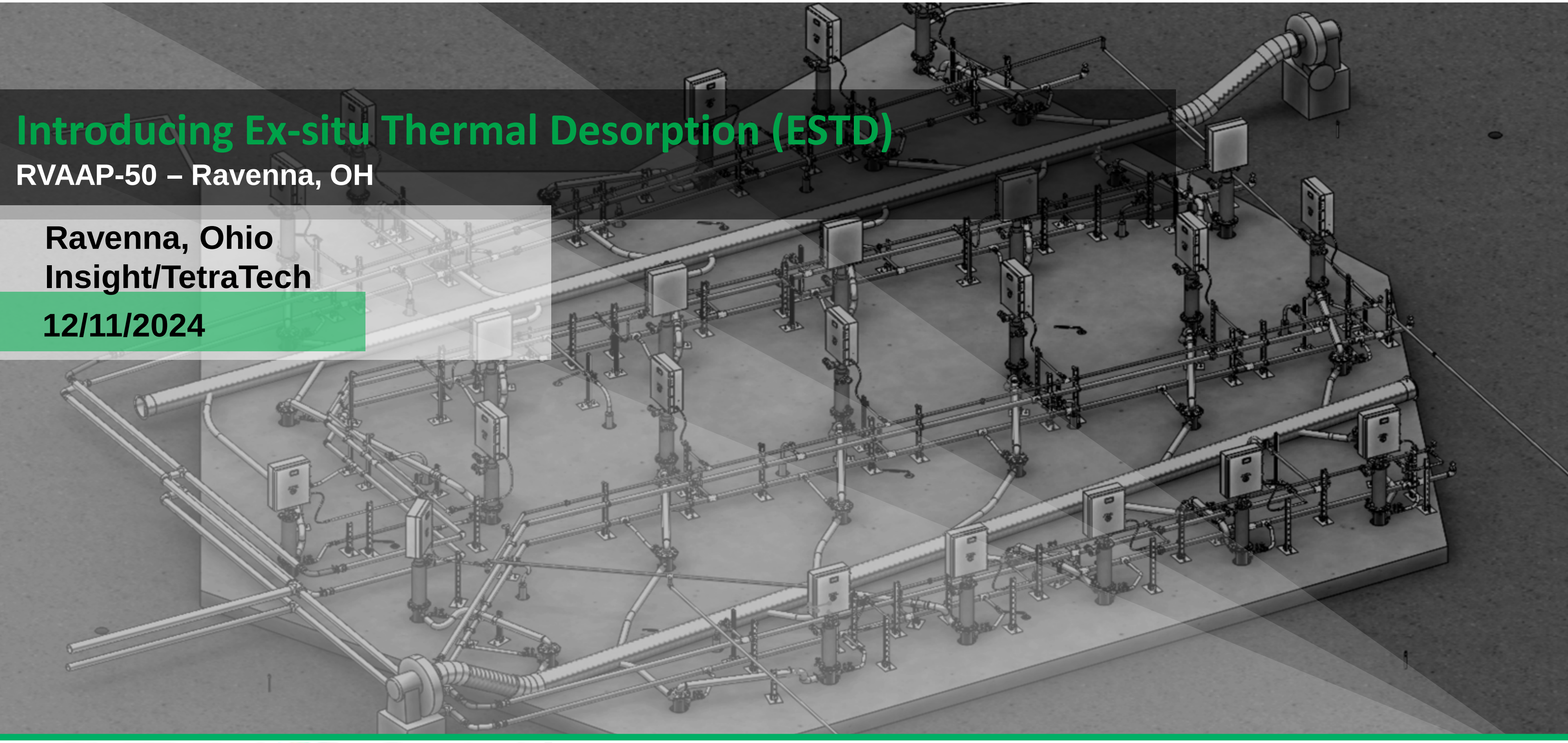
Former Storage Area

- Excavation of an estimated 473 cubic yards of PAH impacted surface soil
- Stockpiling of the surface soil into a thermal treatment system to remove benzo(a)pyrene
- Collect and analyze confirmation soil samples to confirm the CUG for benzo(a)pyrene within the excavation has been met
- Operate thermal system to strip soil of contamination and collect and analyze soil after treatment to confirm CUGs have been met
- Backfill with treated soil and reseed and plant per approved wetlands restoration plan

Ex-Situ Thermal Treatment Area at the Former Storage Area

Introducing Ex-situ Thermal Desorption (ESTD)

RVAAP-50 – Ravenna, OH



Ravenna, Ohio
Insight/TetraTech

12/11/2024

GEO Environmental Remediation Company

ESTD Introduction

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The ESTD technique represents a groundbreaking advancement in highly contaminated soil treatment. Combining high vacuum extraction and soil desorption processing within a compact setup; PAHs, Total Petroleum Hydrocarbons (TPH), and other Volatile Organic Compounds (VOCs) and Semi Volatile Organic Compounds (SVOCs) are efficiently removed from the soil. Benzo(a)pyrene (PAH) is the main constituent of concern for removal at the FSA. This innovative approach reduces the need for pre-treatment and minimizes secondary pollution.

Technology Introduction

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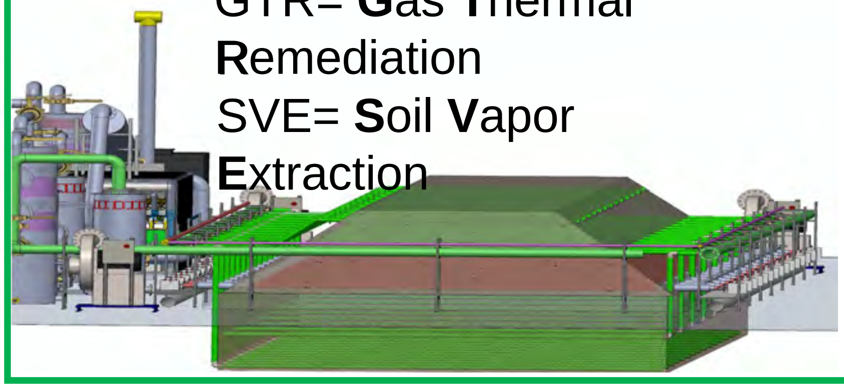
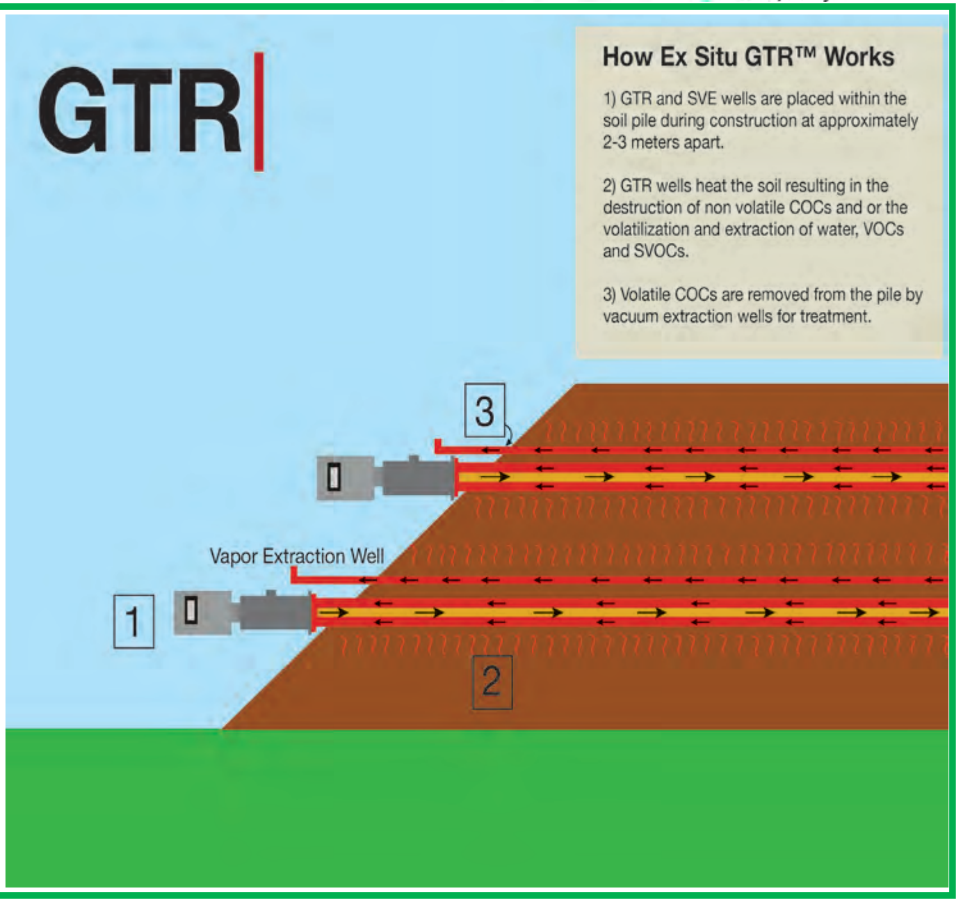
ESTD involves placing contaminated soil or sludge into a pit or pile, inserting heating well and vapor extraction wells, and applying thermal conductive heating. This process involves a combination of liquid extraction, steam stripping, and vaporization.

GTR= **G**as **T**hermal **R**emediation
SVE= **S**oil **V**apor **E**xtraction





Removal Mechanism

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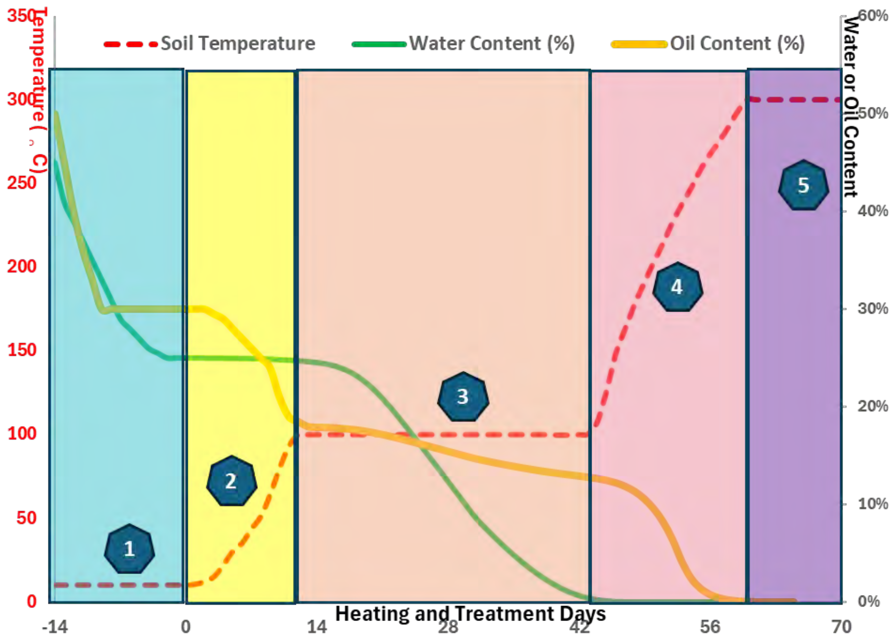

Phase 1: SVE Extraction (before heating, Days): Utilizes high vacuum extraction wells to remove mobile oil phases before heating begins. Not applicable to the FSA.

Phase 2: Initial Heating (Pre-Boiling, up to 80-90°C, days to weeks): enhance the mobility of NAPLs by reducing their viscosity and enhance solubility of contaminants for removal.

Phase 3: Steam Stripping (Plateau at 90-110°C, weeks to months): Generates steam to strip TPH significantly aided by vapor extraction systems.

Phase 4: High-T after Desiccation (100°C to 300-350°C, weeks to months): Increases soil permeability and cracking, enhancing desorption and vaporization of contaminants.

Phase 5: Sustained High-T Maintenance (350-450°C, days):achieve over 99.9% contaminant mass reduction, ensuring thorough contaminant breakdown.

ESTD Design and Practice Based on Projects

RVAAP-50 ESTD Project

Former Ravenna Army Ammunition Plant Restoration Program

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Summary of Project Characteristics

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Treatment Soil Information		
Item	**Quantity**	**Unit**
Average Dry Soil Density	120.00	lbm/ft3
Moisture Content	0.30	
Total Treatment Volume	570	yard3
Total Dry Soil Mass	923	tons
Total Treatment Mass	1,201	tons

Summary of Site Contamination in Soil			
COC (mg/kg)	**Average**	**Treatment Goal**	**% Reduction**
Benzo[a]pyrene	1.00E+02	2.10E+01	79%

ESTD Pile Design, Construction and Operation

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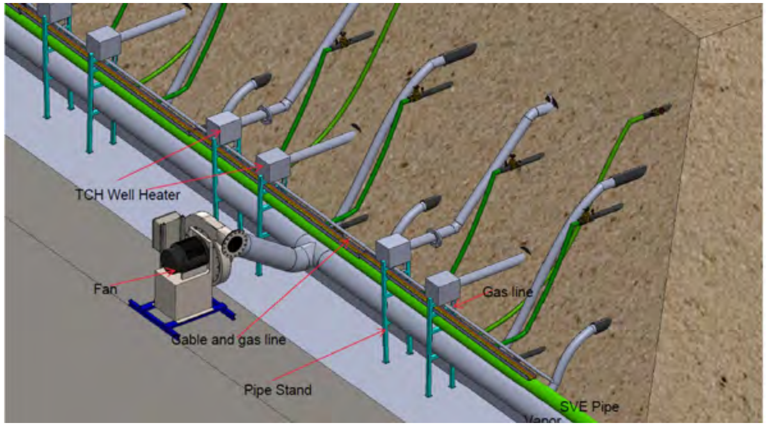
Contaminated Soil Displacement						
Ex-situ Treatment Type	Batch #	Volume (ft3)	Length (ft)	Width (ft)	Height (ft)	slope
by Soil Pile	1	9,710	92	31	4.1	1

Wellfield Design	
TTT(°F)	617
Well Spacing (ft)	5.5
GTR Heater Units	5
TCH Heating Wells #	5
SVE Wells #	26
Thermal Monitoring Wells #	3
Wells Length (ft)	89
Pressure Monitoring #	3



ESTD Pile Design

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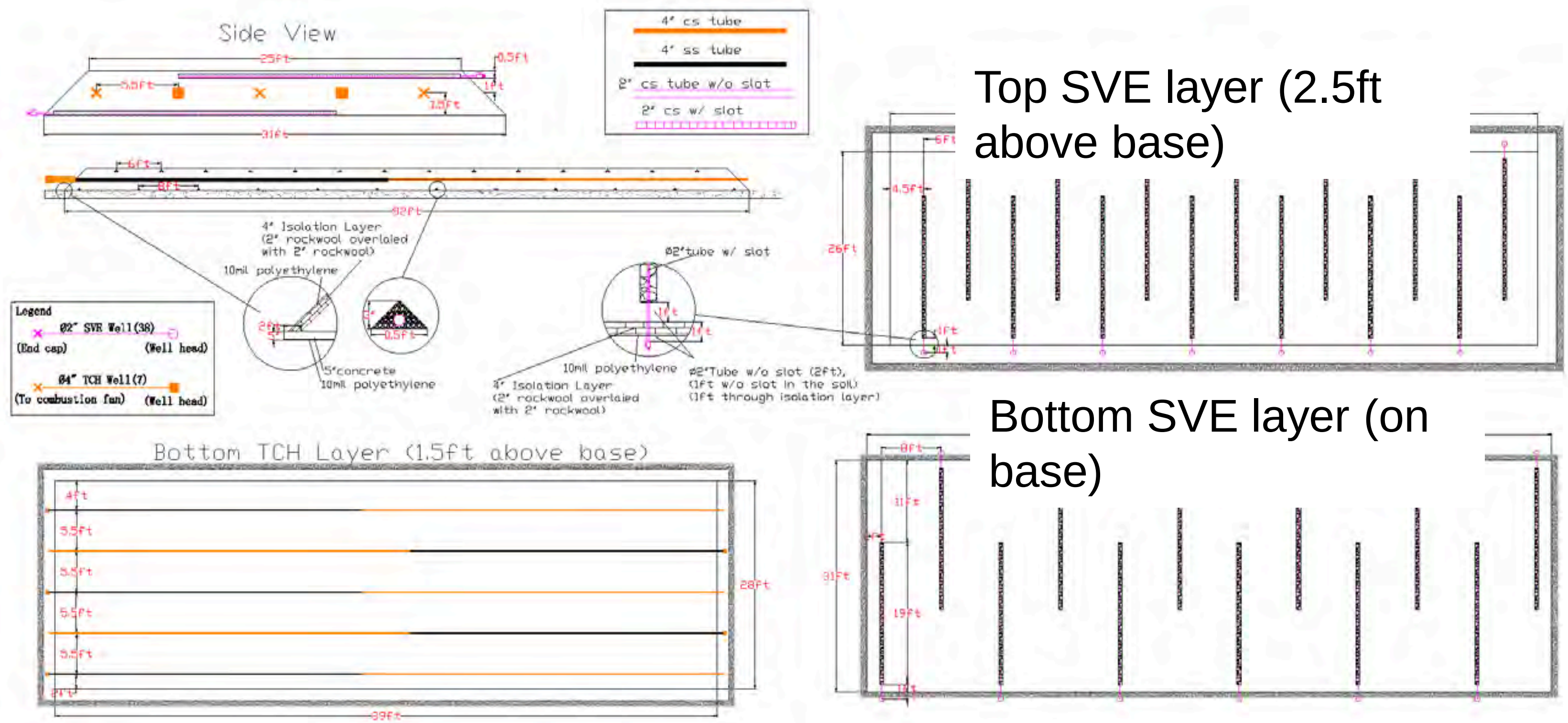
ESTD pile design detailed drawing



ESTD Pile Design

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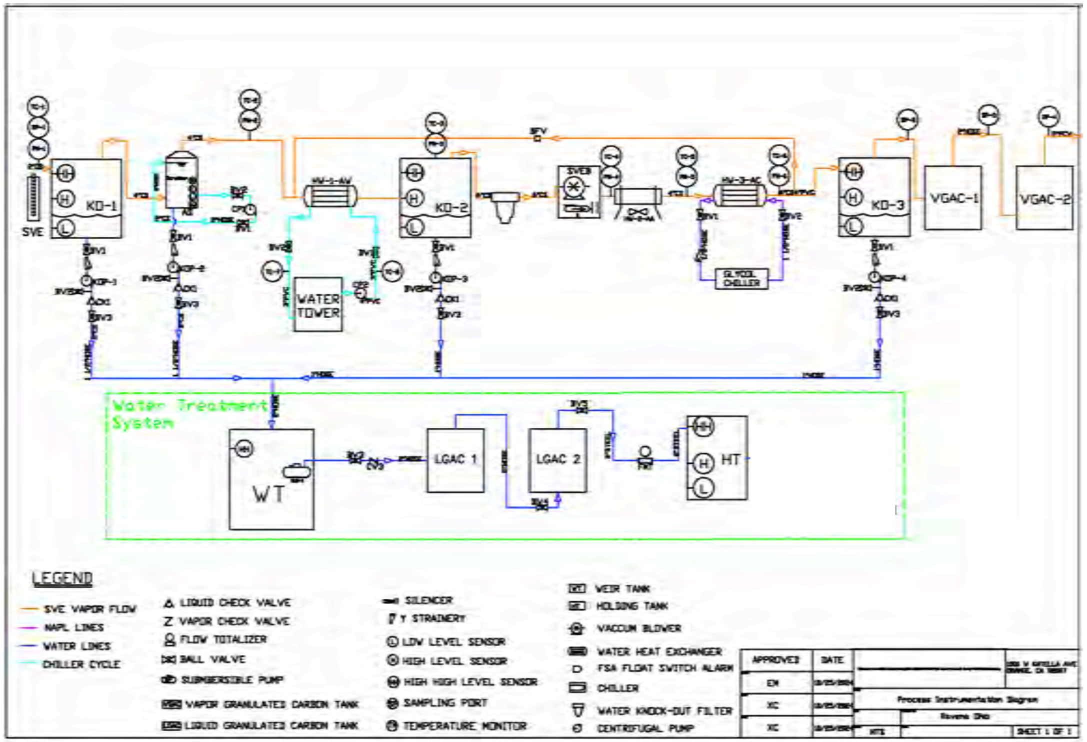
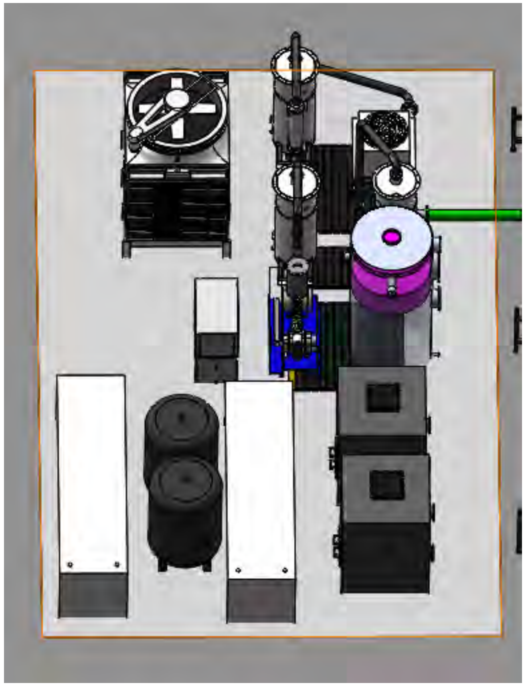
ESTD pile vapor treatment system





ESTD Pile Design

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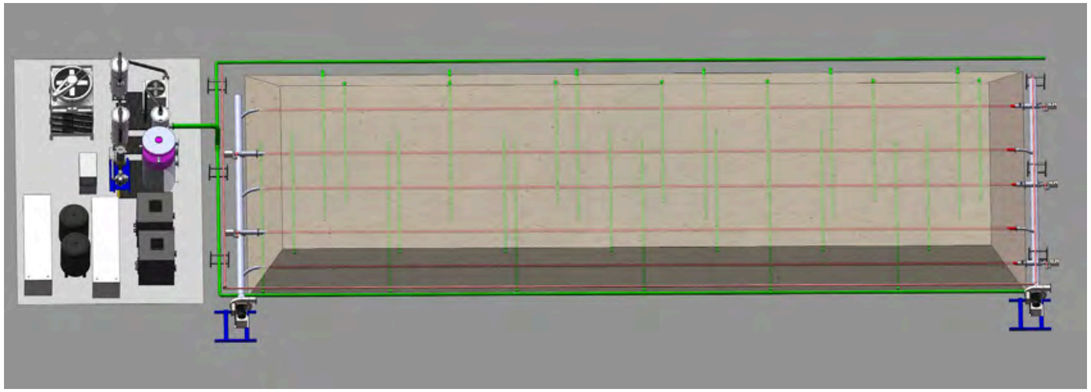
ESTD pile 3D Design drawings



ESTD pile as build

ESTD Pile Construction

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Pile Construction Sequencing

(1) Area the soil pile will be built upon must be cleared and be somewhat level prior to construction.

(2) A foundational drainage layer was placed along the base of the pile to insulate the pile from the ground to prevent heat loss from the pile, and to drain liquids from the bottom of the pile. A layer of crushed rock on top of the concrete is generally used, with slotted steel piping placed as drainage through the crushed rock.

ESTD Pile Construction

Pile Construction Sequencing

(3) An excavator placed the soil onto the concrete, one section at a time. Each layer must be done one at a time to allow for the heating pipes and SVE pipes to be placed into the pile.

ESTD Pile Construction

Pile Construction Sequencing



(4) The excavator was used to place the heating wells onto the dirt after the first layer was placed. The excavator lifted the pipes up using a spreader bar.

ESTD Pile Construction

Pile Construction Sequencing

(5) After the first row of heating pipes has been placed, more contaminated soil is placed on top of the heating pipes.

ESTD Pile Construction

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Pile Construction Sequencing

- (6) After the construction has been completed, insulation material(s) must be placed along the sides and top of the pile to mitigate heat loss to the atmosphere.
- (7) Once the insulation has been placed, supplemental material may be placed on the outside of the pile to limit precipitation from infiltrating the pile, cooling the soil.

ESTD Pile Construction

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Vapor Treatment System Set Up

ESTD Pile Construction

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ESTD Project As-Build

Pile As-Build

Vapor Treatment System As-Build

ESTD Pile Operation

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Daily Site Logs for on-site data record

Ravena Site MONITORING

Technician:		Date:		Start Time	
Condition:		Temperature:		End Time	

Vapor Treatment System			
ID	Location	Vacuum (inHg or psi)	Temperature (°C)
PM-1/TC-1	KO-1		
PM-2/TC-2	HW-1-AW		
PM-3/TC-3	KO-2		
PM-4/TC-4	HW-2-AA		
PM-5/TC-5	HW-3-AC		
PM-6/TC-6	KO-3		

Utilities	
Vapor Flow Meter (cfm)	
Discharge Water (gallons)	
Electricity (kWh)	
Propane (gal)	
Time Collected	

PID Readings		Equipment Check	
Ambient (ppmv)		Blower	
SP-1/INS (ppmv)		Chiller	
SP-2/CIN (ppmv)		Fans	
SP-3/CMID (ppmv)		GACs	
SP-4/COUT (ppmv)		Pumps	
Time Collected		Water Tower	
		Holding Tanks	

TCH Status			
Well Number	ON/OFF	Well Number	ON/OFF
TCH 1		TCH 4	
TCH 2		TCH 5	
TCH 3			

TMP Data	
TMP 1	
Depth (feet)	Temperature (°C)
Top (3ft)	
Middle (2ft)	
Bottom (0ft)	
TMP 2	
Depth (feet)	Temperature (°C)
Top (3ft)	
Middle (2ft)	
Bottom (0ft)	
TMP 3	
Depth (feet)	Temperature (°C)
Top (3ft)	
Middle (2ft)	
Bottom (0ft)	

Field Notes:

Weekly Report Summary Table

ITEM	number	COMMENT
General Operational Parameters		
Actual Days of Operation (days)	XX	Startup on XX/XX/2024
Actual Days of Heater Operation (days)	XX	Actual heating days
Planned Total Heating Days	68	Expected end date is XX/XX/2024
% of Project Completion	XX%	Based on Heating Days
Electrical Usage (kWh)	XX	electrical meter readings (Dated to XX/XX/2024)
Natural Gas Usage (MMBTU)	XX	Based on gas meter readings (Dated to XX/XX/2024)
Average/Maximum T (°C)	XX/XX	Based on TPMP data output on XX/XX/2024
Average Vapor Extraction Rate (CFM)	XX	Flow in Vapor Treatment System (During Reporting Period)
Total Volume water discharged (gal)	XX	From discharge (Dated to XX/XX/2024)
Total VOC Mass Removed (lbs)	XX	Mass removal is calculated based on the sampling data (Dated to XX/XX/2024)
Vapor inlet temperature (°C)	XX	TI-1 Reading (During Reporting Period)

- Collect and analyze confirmation soil samples from the treatment pile to confirm the CUG for benzo(a)pyrene has been met

- Use the treated soil pile as backfill for the excavation