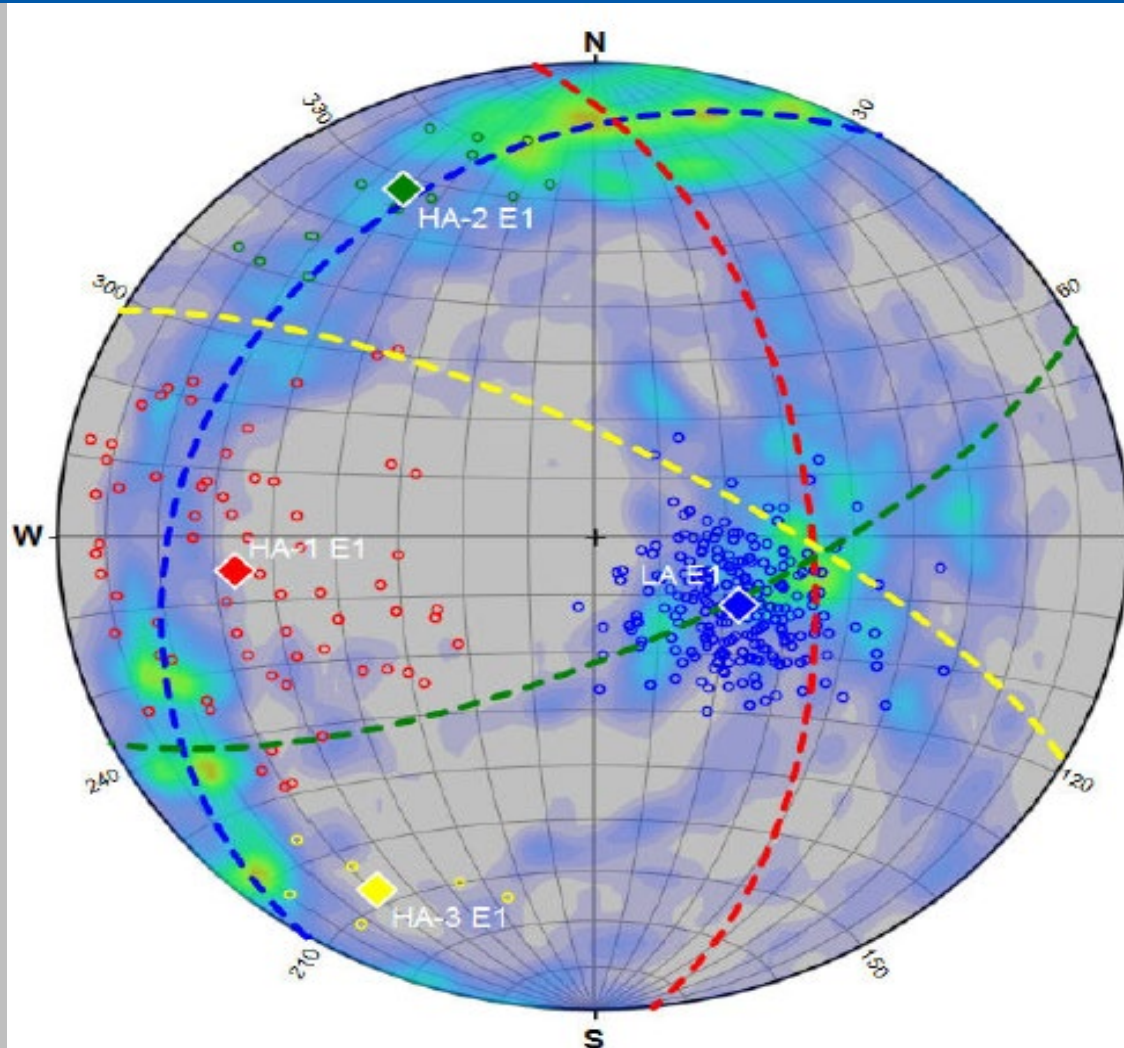


Optimizing an In Situ Thermal Remedy via Pre-Remedial Investigation at a Formerly Used Defense Site in Rhode Island



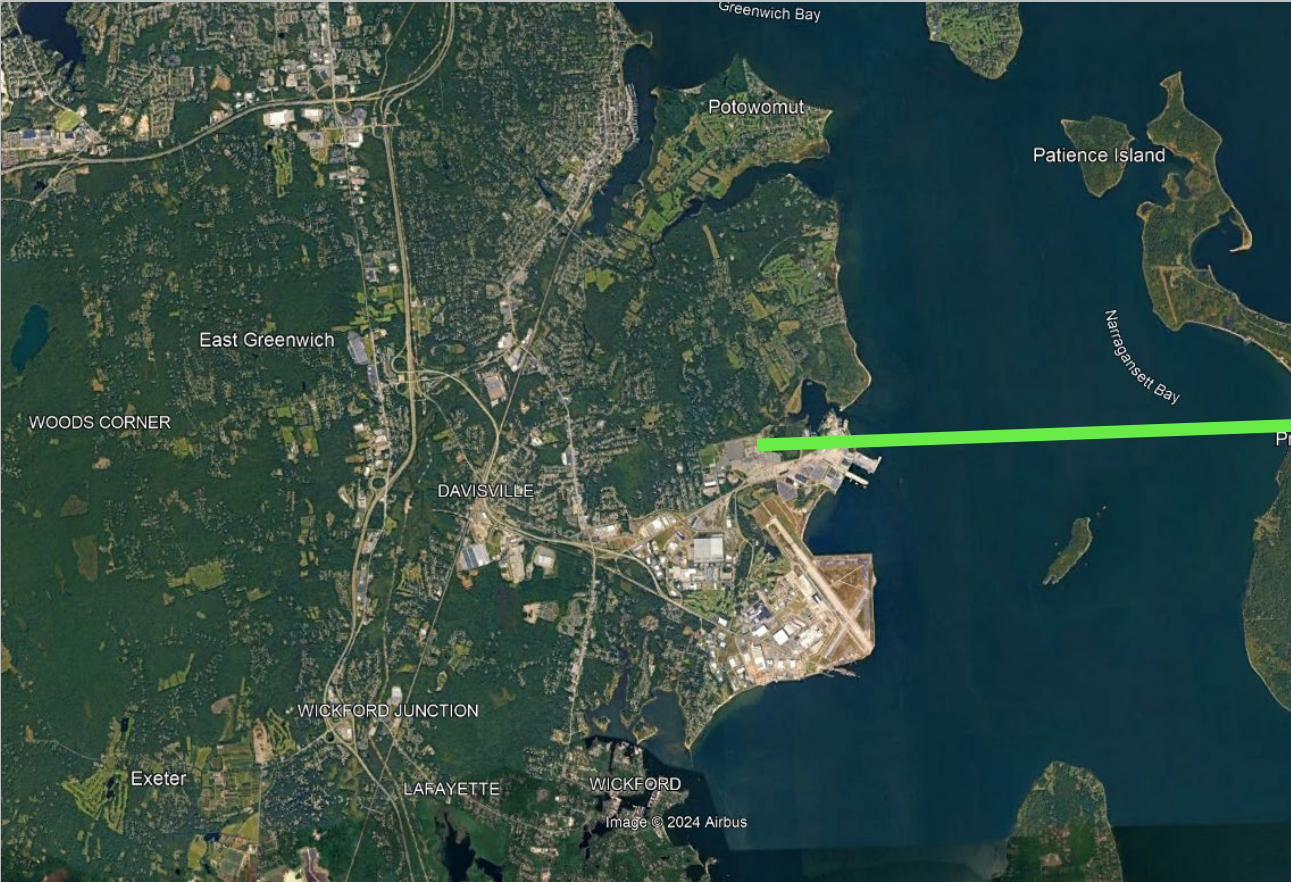
**EA Engineering, Science,
and Technology, Inc., PBC**

Prepared for:
DCHWS East 2026
Philadelphia, PA, 6 March 2026

Prepared by:
Scott Grant, MSES, QEP
PR-58 Deputy Project Manager

PR-58 Nike Missile Battery and Disaster Village Training Area

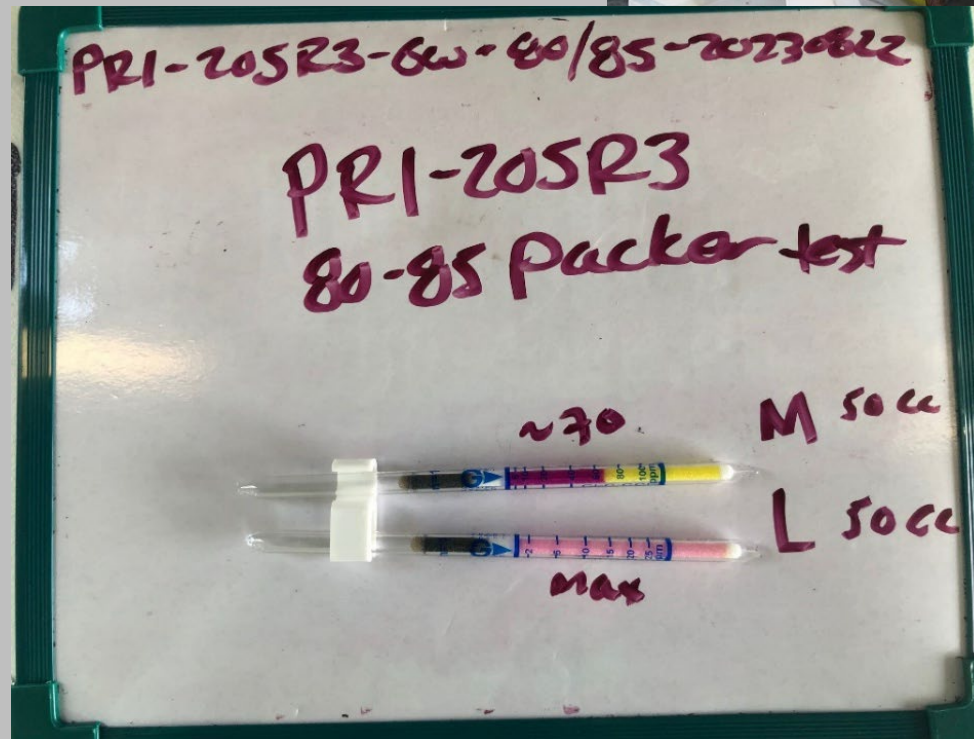
- North Kingstown, RI



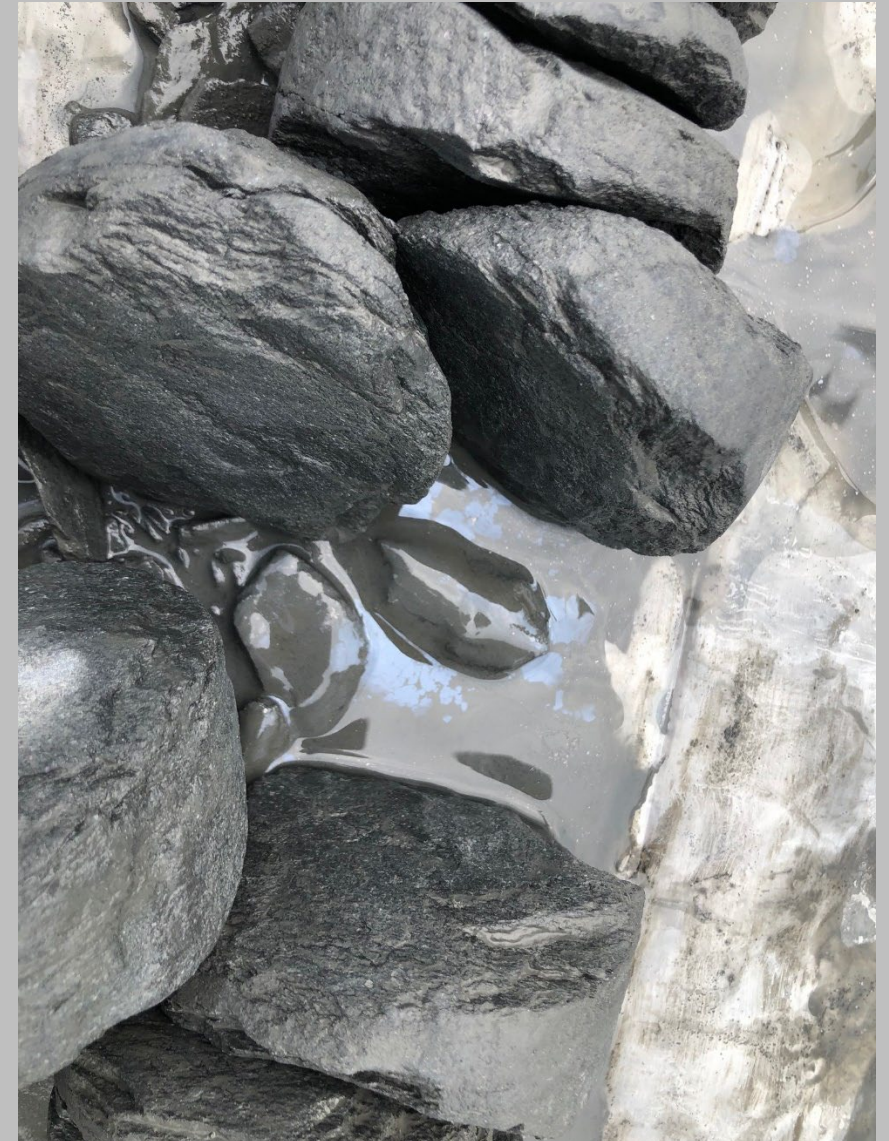
COLOR-TEC SAMPLING/SCREENING

Execution

- Adaptive management decision model (AMDM) used
- Real time screening of soil and groundwater samples via AQR Color-Tec®
- Use Color-Tec results as a screening tool for analytical submission
- Isoflow sampling with single and double packers
- Geophysical logging



PRE-REMEDIAL INVESTIGATION (PRI)



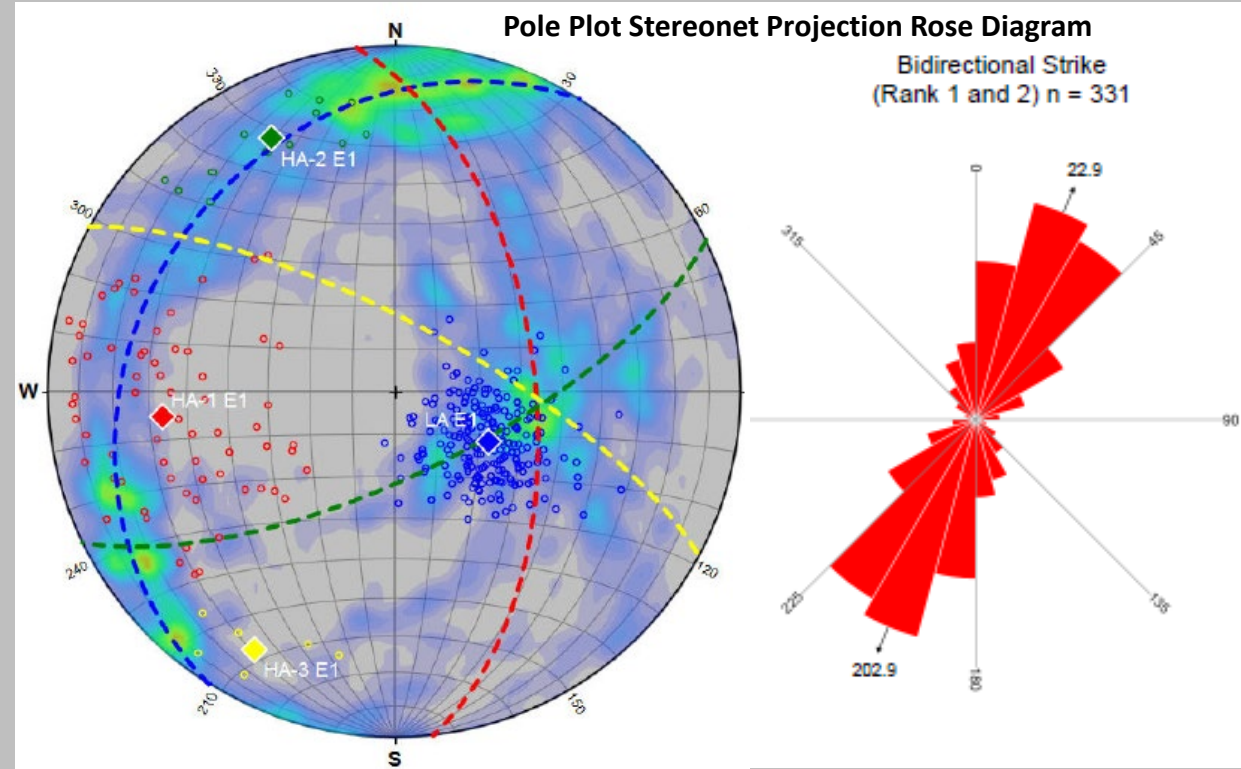
Geophysical Logging

Geophysical Logging Results

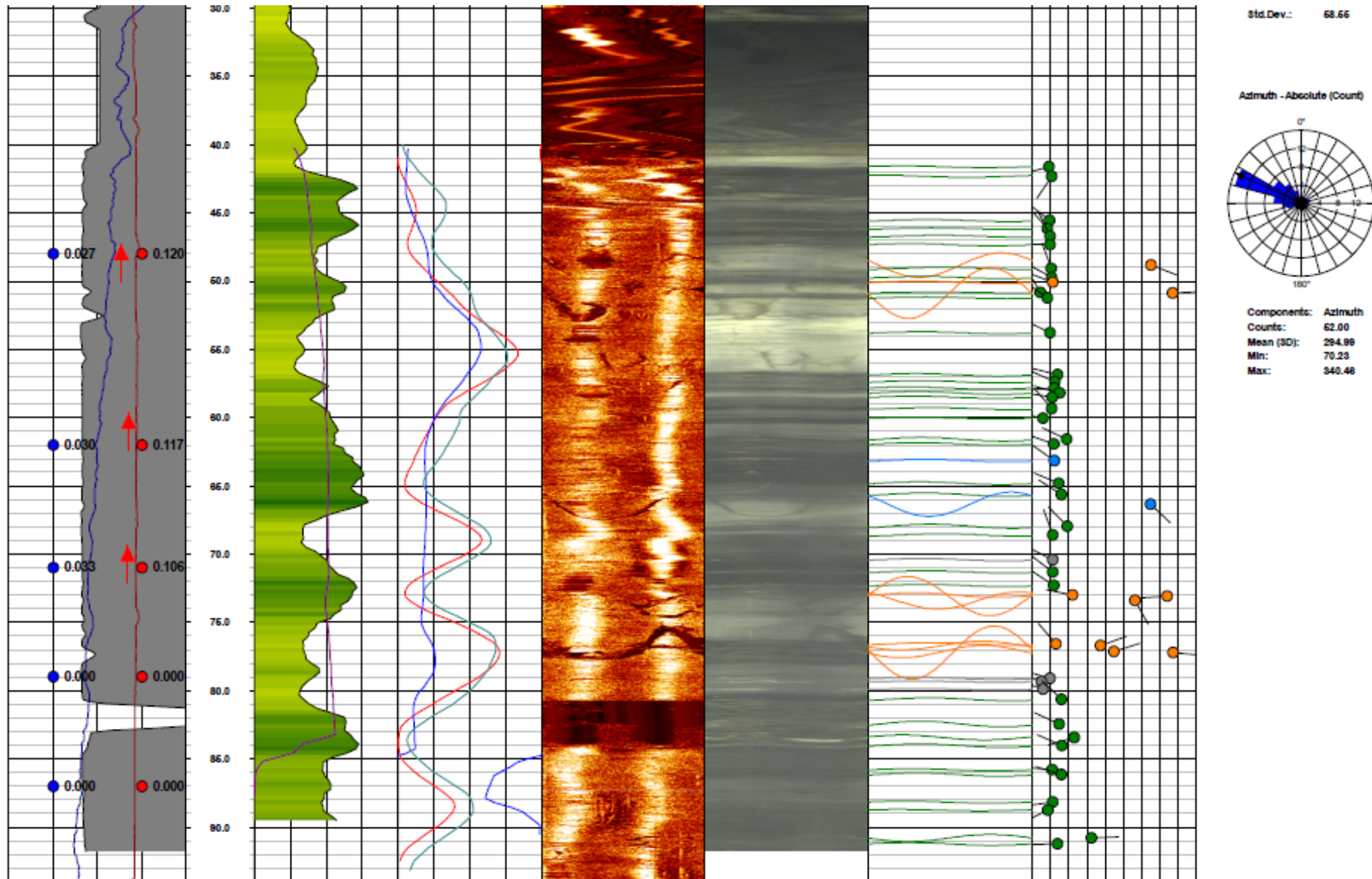
- Fracture intersection orientations represent vectors of increased hydraulic conductivity
- On a sitewide scale, bulk flow facilitated by network of intersections
- DNAPL is generally expected to have a vertical flow component while dissolved phase likely follows a more horizontal flow component
- Major vertical intersection angle at 6 ° from north and 10 ° from horizontal

Fracture Sets Identified During PRI

Feature Set	Dip Angle	Strike	Dip Azimuth
Low Angle	25.4°	212.2°	302.2°
High Angle 1	56.6°	353.6°	83.6°
High Angle 2	70.2°	64.1°	154.1°
High Angle 3	73.8°	298.4°	28.4°



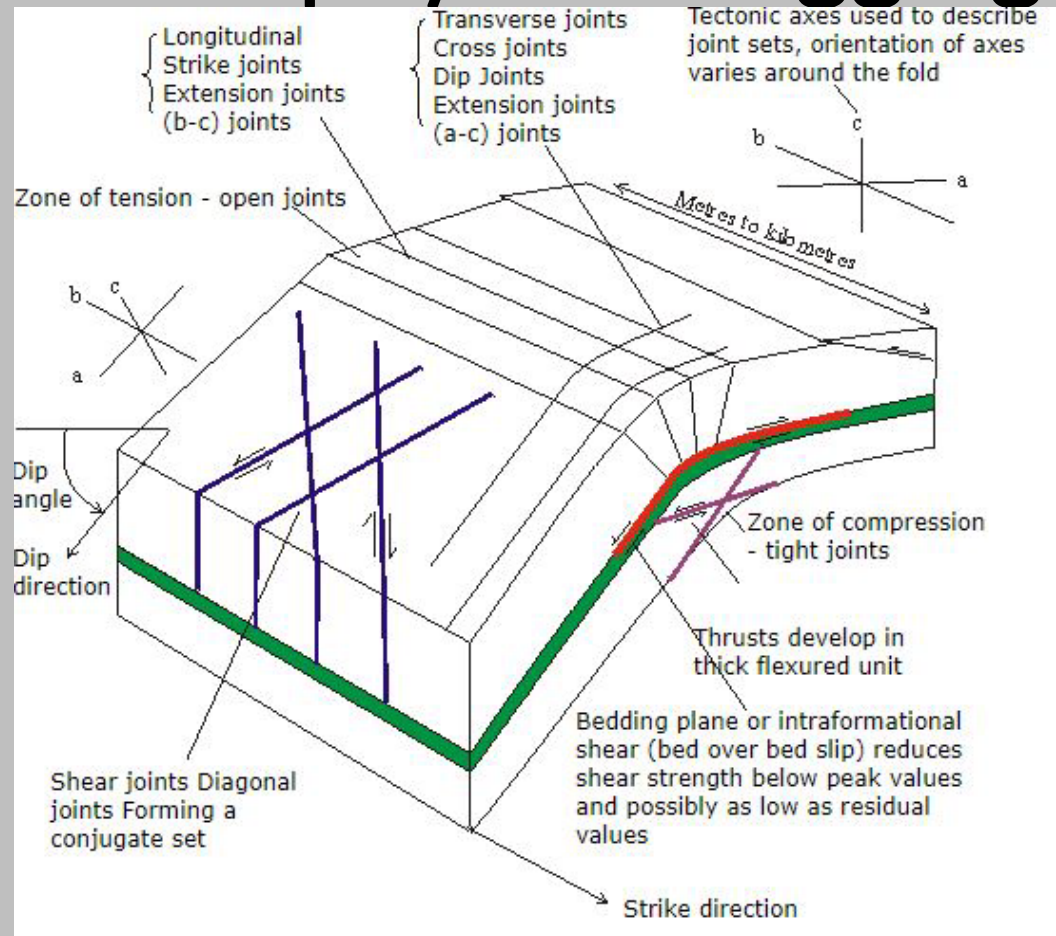
Geophysical Logging at PRI-205R3



Importance of Geophysical Logging at PR-58

Results

- Fracture planes are orders of magnitude more permeable and transmissive than the background bedrock matrix
- Intersection of vertical and horizontal major fractures are the areas of contaminant transport and interest
- Matches known geology of the region and gentle folding/shear joints/tension correlates fairly well
- Zone of tension along strike joints



Projection with regional geology resembling anticline/syncline folding of the bedding

https://environment.uwe.ac.uk/geocal/totalgeology/fig3/fig3_12.htm

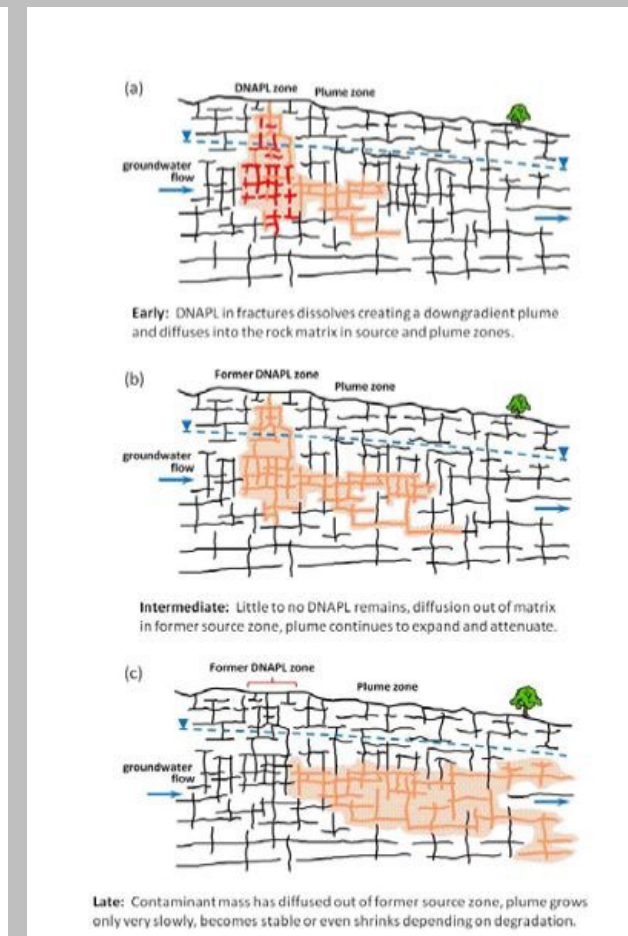


Illustration of conceptual stages of source zone and plume evolution for chlorinated solvents in fractured sedimentary rock
 Parker, et al, 2011. Nature of Organic Solvent Source Zones and Plumes in Fractured Sedimentary Rock. April

Executing the Supplemental PRI (SPRI) - Field Results and AMDM Alter Initial Plan

- Before SPRI

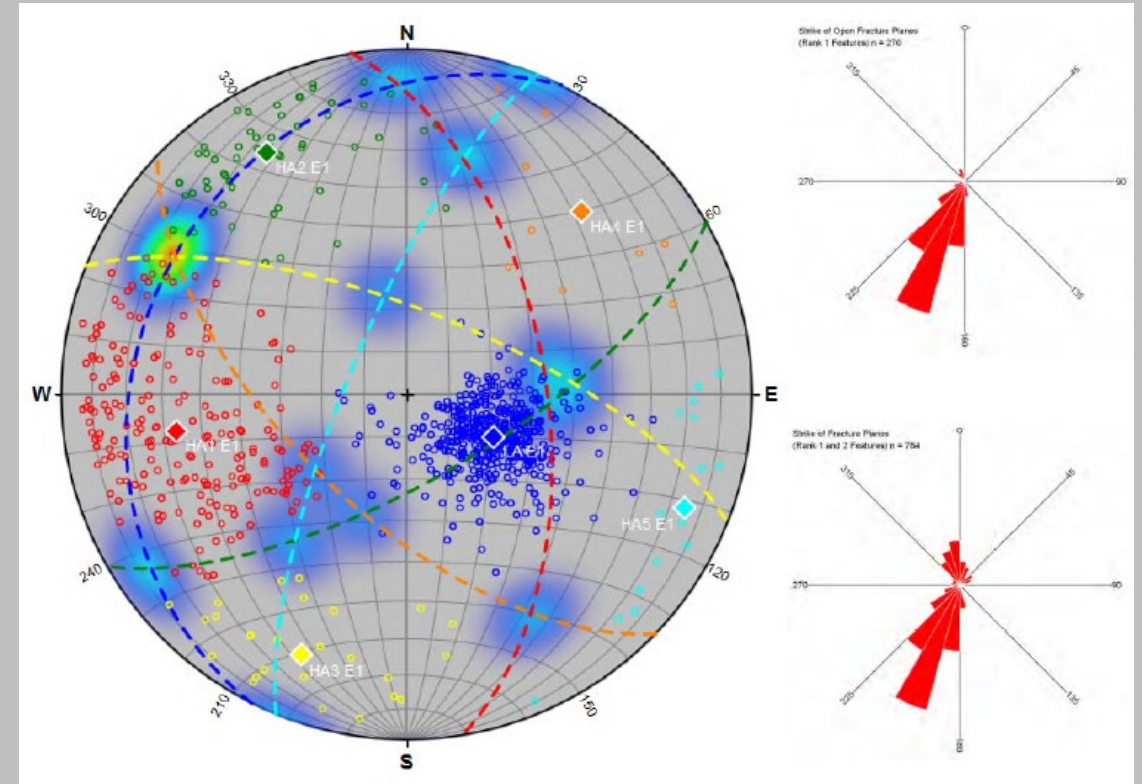
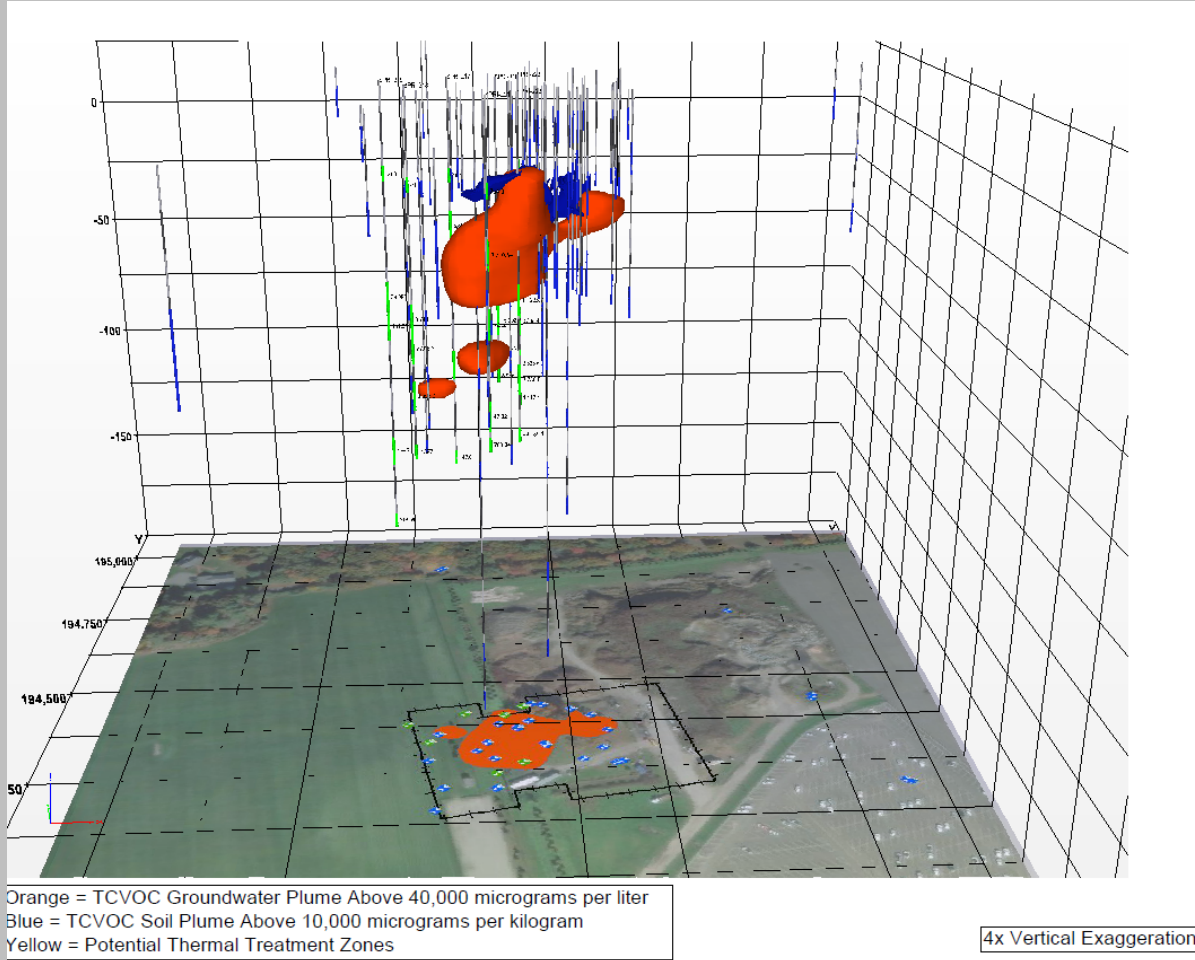


- During/after SPRI



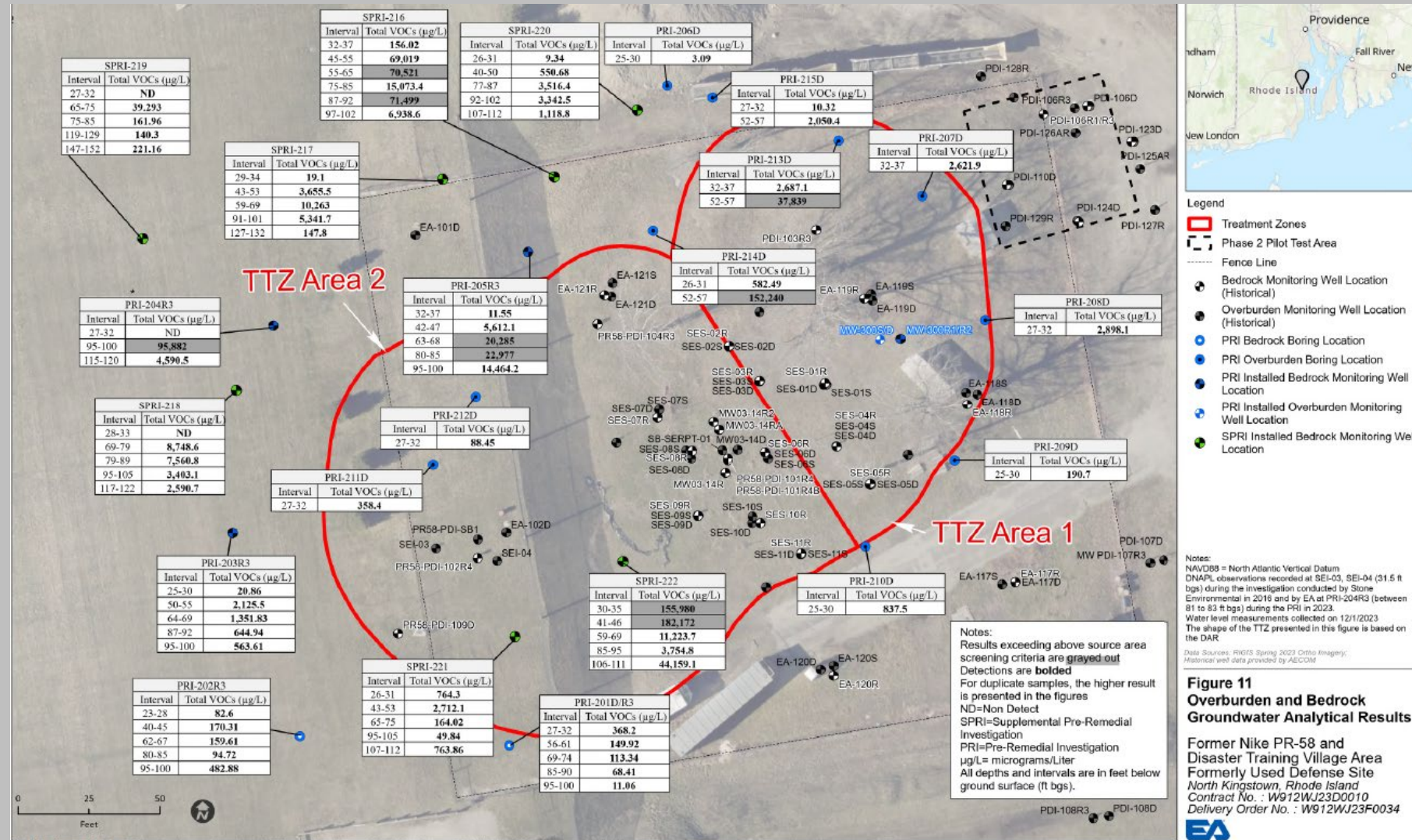
Executing the Supplemental PRI

- Confirm local geology/fracture planes/strike/dip



Results from the SPRI

- Fully delineated horizontal and vertical extent of CVOCs to 70 ppm in GW, 10 ppm in soil
- Use results to inform ISTR options, areas, treatment goals, costs



Post-SPRI Optimization Memo

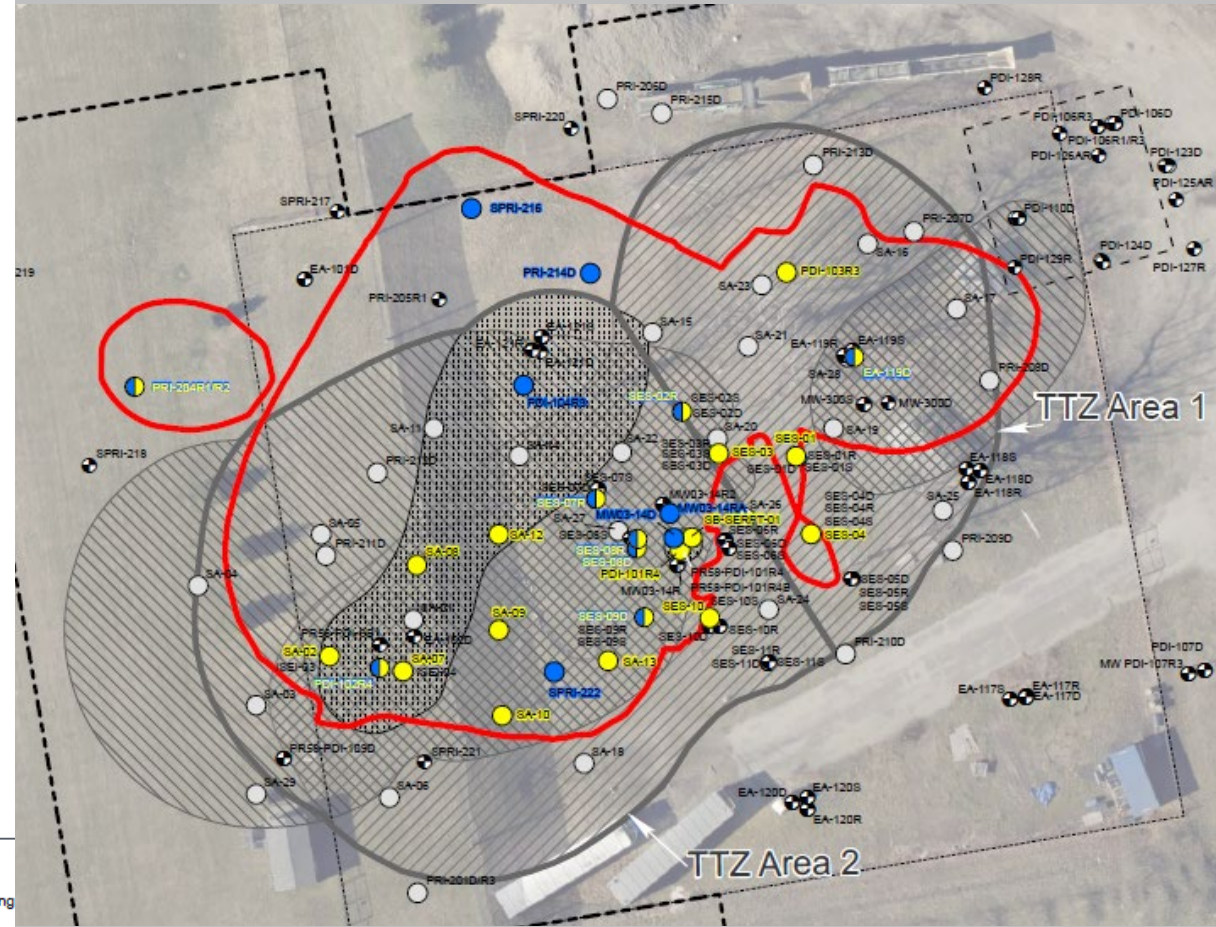
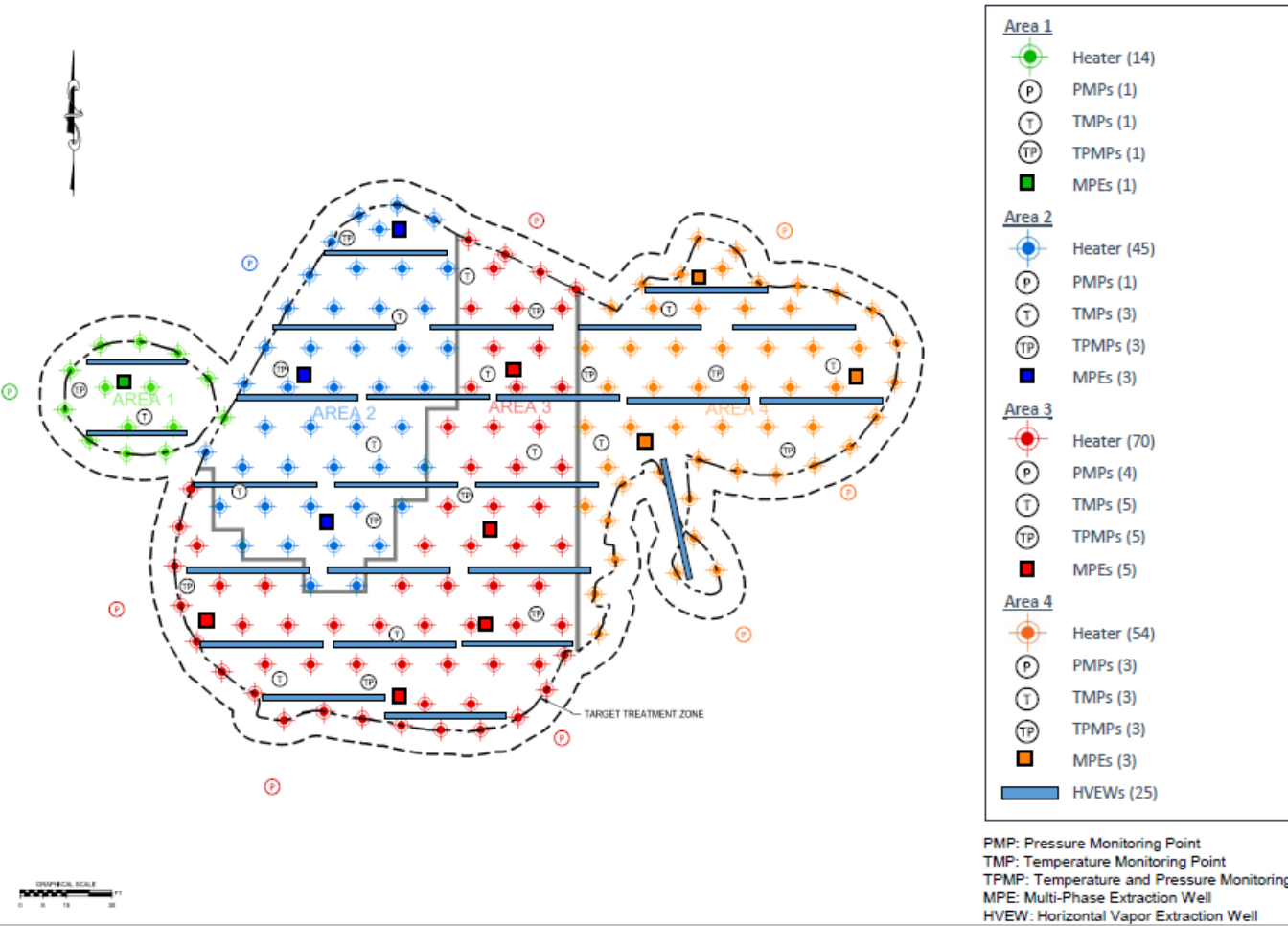
Table 5: Treatment Scenarios and Rough Order of Magnitude Cost Estimate Ranges

Treatment Scenarios	Phase 1 Volume (CY)	Phase 2 Volume (CY)	Phase 1 Cost (Dollars, in Millions)	Phase 2 Cost (Dollars, in Millions)	Total Cost (Dollars, in Millions)
Treatment Scenario 1 (20 mg/L, 2 mg/kg) Two Phases (Required)	66,687	58,446	17.0 - 21.2	15.5 - 20.3	32.6 - 42.3
Treatment Scenario 2 (40 mg/L, 10 mg/kg) One Phase	76,518	N/A	N/A		18.5 - 24.1
Treatment Scenario 2 (40 mg/L, 10 mg/kg) Two Phases (Optional)	33,288	76,518	11.5 - 14.9	10.8 - 14.0	22.3 - 28.9
Treatment Scenario 3 (70 mg/L, 10 mg/kg) One Phase	46,072	N/A	N/A		14.2 - 18.3
Treatment Scenario 3 (70 mg/L, 10 mg/kg) Two Phases (Optional)	20,871	46,072	8.5 - 11.1	7.8 - 10.2	16.4 - 21.3

Post-SPRI Optimization Memo

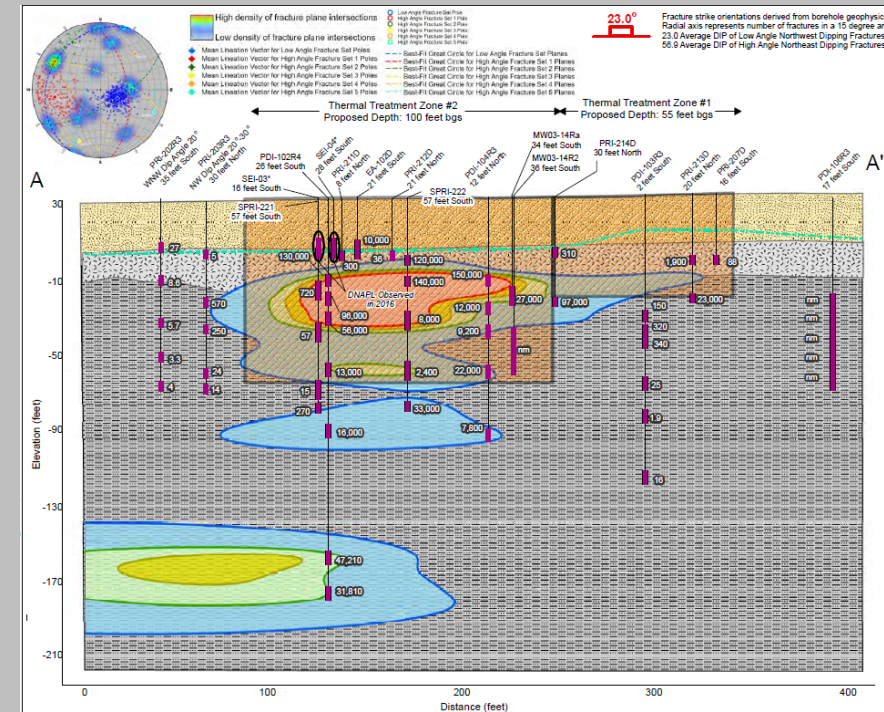
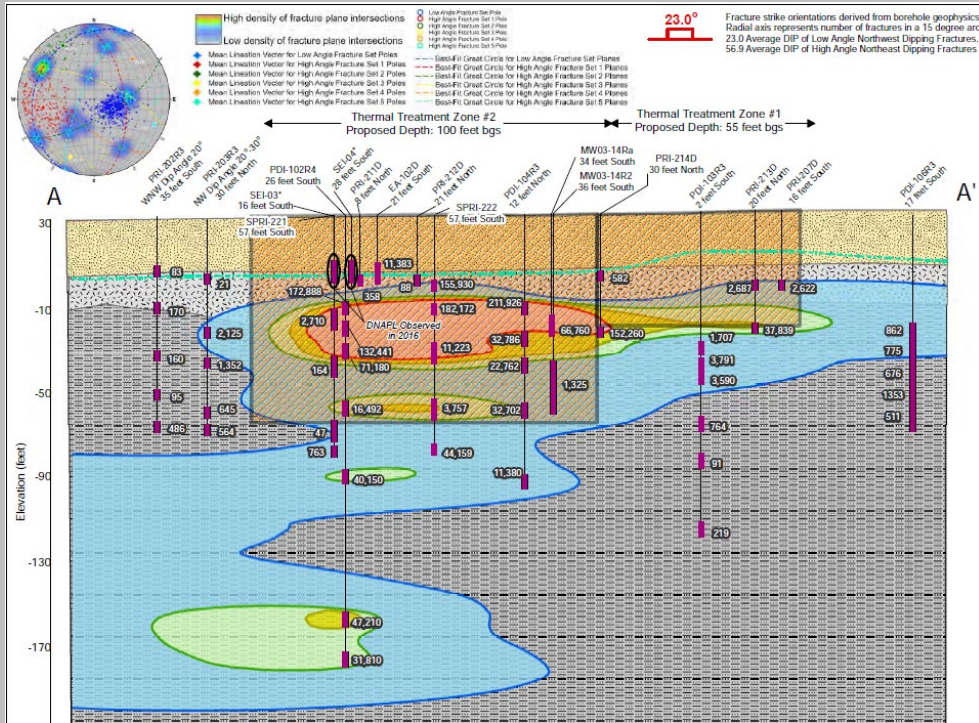
Treatment Scenarios	Treatment Areas (ft ²)			Treatment Depth (ft bgs)	Treatment Volume (cy)		Impacted Volume (cy)
Treatment Scenario 1 (20 mg/L, 2 mg/kg)	Area 1	21,041	40,999	0 – 100	77,928	125,133	125,314
	Area 2	7,703		0 – 70	19,970		
	Area 3	12,256		0 – 60	27,235		
Treatment Scenario 2 (40 mg/L, 10 mg/kg)	Area 1	1,468	26,321	0 – 100	5,438	76,518	76,439
	Area 2	6,941		0 – 90	23,136		
	Area 3	10,990		0 – 80	32,564		
	Area 4	6,921		0 – 60	15,380		
Treatment Scenario 3 (70 mg/L, 10 mg/kg)	Area 1	361	18,572	0 – 100	1,336	46,072	46,065
	Area 2	356		0 – 90	1,186		
	Area 3	14,155		0 – 70	36,698		
	Area 4	3,700		0 – 50	6,852		

Post SPRI Optimization Memo



Conclusions

- Good subcontractors are very valuable during complex field investigations
- Building/reaching consensus is valuable
- Always be consulting



- Confirm design parameters through pre-design investigation(s)
- “closing data gaps” - let the data be the guide
- Frequent and collaborative client interaction via AMDM

THANK YOU TO THE PROJECT DELIVERY TEAM!

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