Combining Geophysical and Direct Push Tools with Conventional Sampling

Developing a Comprehensive Conceptual Site Model
at a Former Dry Cleaner in El Sobrante, California

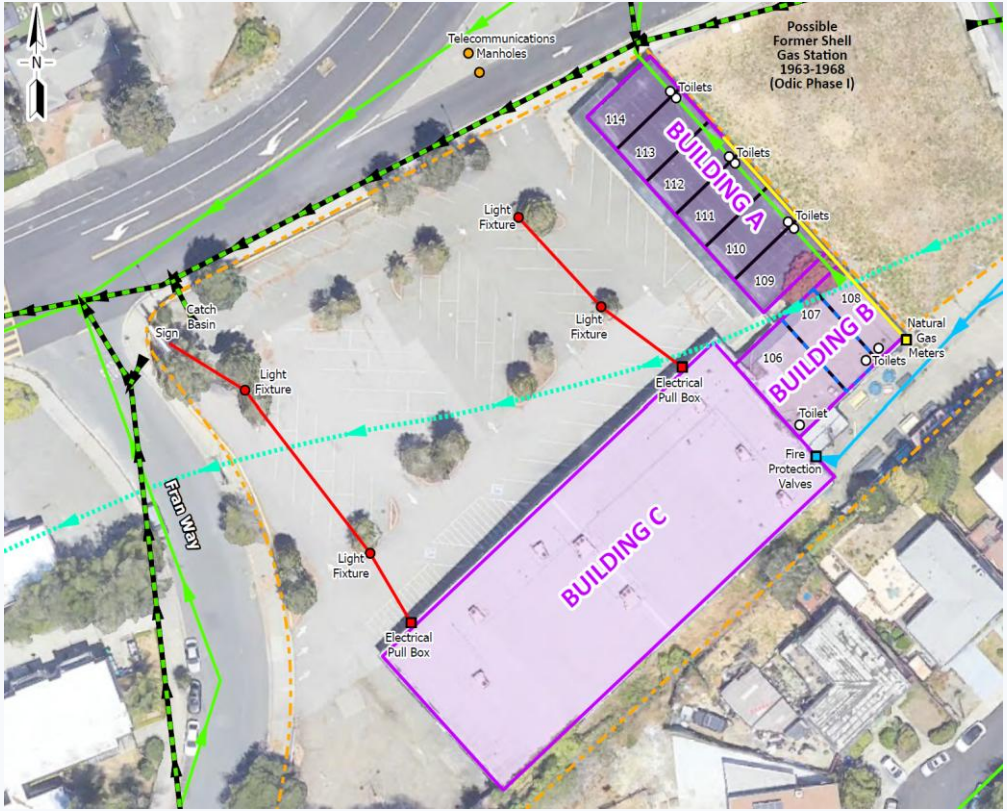
Technical Conference Presentation | June 2, 2026

TRINITY source group, inc.
Environmental Consultants

Site Background

Former Dry Cleaning Facility

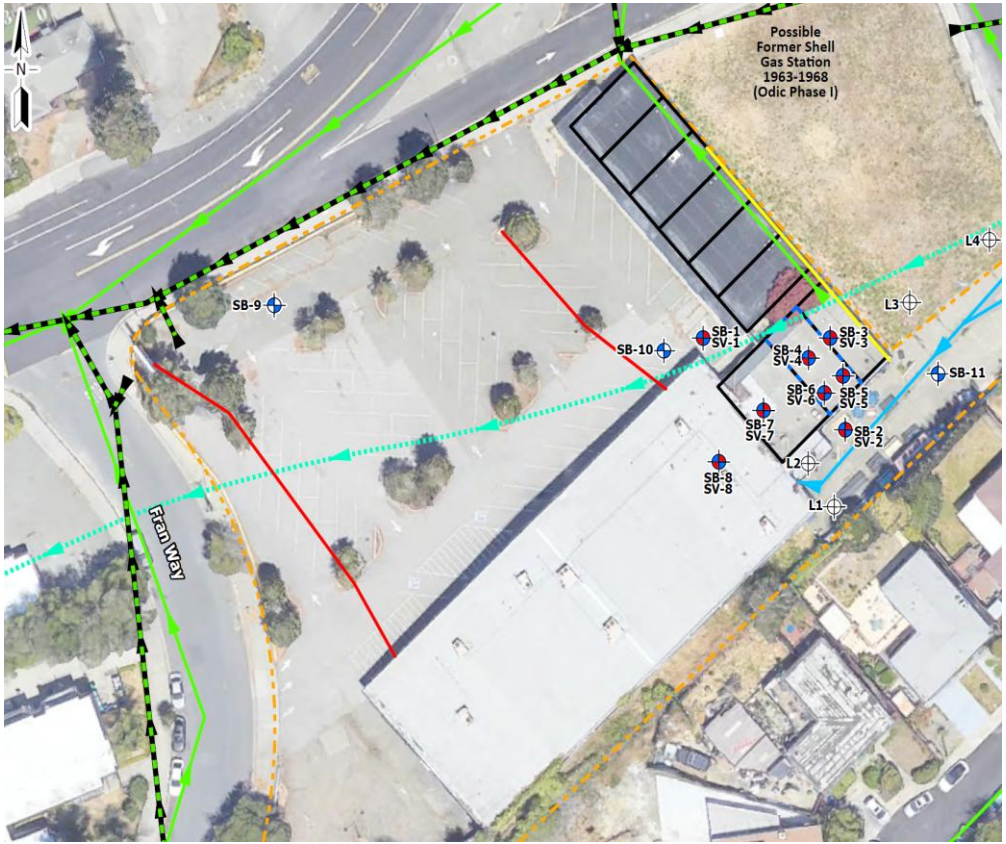
- 1.98 Acre Parcel Property with active operations from ~1975-1993
- Primarily tetrachloroethylene (PCE) with adjacent gas station ~1963-1973
- Non-Profit client purchased in 1996 and converted to Christian High School – Closed 2019
- Innocent landowner (ILO) defense under CERCLA
- California Department of Toxic Substances Control (DTSC) Equitable Community Revitalization Grant (ECRG) for investigation of $2.2 million
- Affordable housing brownfield redevelopment planned



Site Background Challenges

Investigation Challenges

- Complex heterogeneous geology
- Limited resources
- Mold and asbestos exposure concerns
- Vacant building security issues and illegal dumping
- ECRG funding limited to onsite investigation only; grant term 2-years
- Limited available data set – no monitoring wells
- Source area and possible sewer releases not well defined
- Need for refined conceptual site model (CSM)



Contaminants & Hydrogeology Before Geophysical Survey

Contaminants:

1

- PCE and daughter products
- 1,1,1,2-tetrachloroethane and 1,1,2-trichloroethane
- Some gasoline and diesel range organics

Media:

- **Soil**: Vadose zone with PCE up to 2,900 mg/kg; impacts to 20 feet (ft) below ground surface (bgs) (n = 11)
- **Groundwater**: PCE at 740 µg/L; TCE at 310 µg/L (n = 2)
- **Soil Vapor**: PCE up to 16,996,413 µg/m^3; TCE up to 646,605 µg/m^3 (n = 9)

Water Table:

3

- Groundwater first encountered 30 ft bgs; 9 and 15 ft bgs after drilling (confined)
- Flow direction to west, north-west from hillside towards intermittent Appian Creek
- Vicinity wells depth to water 4 to 21 feet deep
- Max depth explored 36 ft bgs

Geology:

4

- Upland valley (~180 feet AMSL); tectonically active
- Pliocene age unconsolidated alluvial and lacustrine deposits with volcanic ash/breccias.
- Moderately plastic silty clay

Paleochannel:

5

- Trending east to west; observed in ~1940 aerial photos; presumed contaminant flow path

Limitations of Conventional Sampling

Sparse Well Networks

Monitoring wells provide point-source data with large gaps between locations, missing heterogeneity, and flow paths

Vertical Averaging

Long-screened wells can blend concentrations across multiple zones, masking discrete contaminated intervals; soil PID readings are typically measured every 1-2 feet

Costly & Slow

Drilling, installation, permits and lab analysis cycles take weeks to months per characterization round

Incomplete Geology

Borehole logs at widely spaced points miss lateral variation in stratigraphy and preferential pathways; There is variability in logging procedures and observations; drilling limitations and refusal

Data Integration Workflow

1

Geophysical Reconnaissance

ERI surveys map subsurface structure and identify anomalous zones across the site; results guide direct push investigations

2

Direct Push Investigation

MIHPT deployed at targeted locations identified in interim CSM to correlate anomalies with contaminant and lithologic data

3

Conventional Confirmation

Targeted wells, soil borings, and vapor probes installed at key locations

4

3D CSM Development

All datasets integrated into a comprehensive 3D conceptual site model for remedial design characterization

The Integrated Investigation Approach

Ultra-High Resolution Site Characterization (UHRSC)
Work Completed August 2024 to June 2025 (10 Months)

Geophysical Survey: Aestus' GeoTrax CSM+™

- Electrical Resistivity Imaging (ERI)
- 13 transect lines, 56 electrodes each
- Transect lines are 198 to 451 feet long
- Electrode spacing 1.10 to 2.50 meters
- Scanned 40 to 90 feet deep
- Professional XYZ Survey accuracy:
    - Horizontal - 3 mm ± 0.5 ppm
    - Vertical - 10 mm ± 1.0 ppm

Direct Push Tools MIHPT

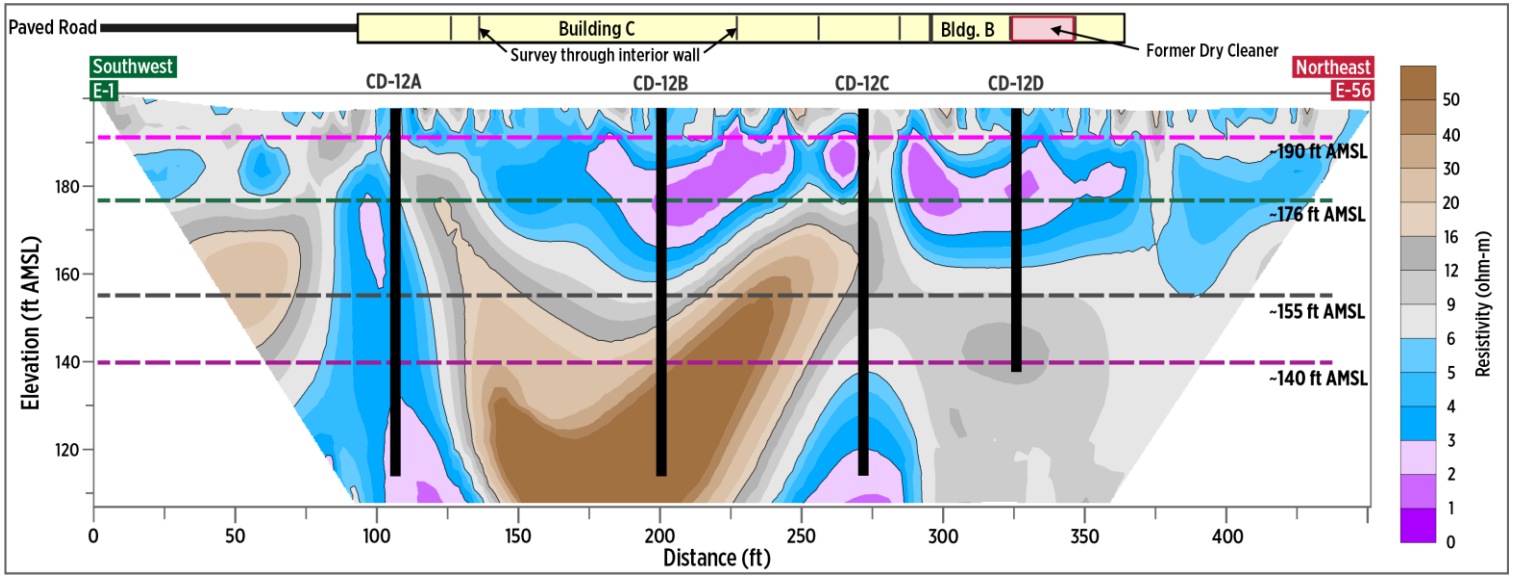
- Membrane Interface Probe Hydraulic Profiling Tool (MIHPT)
- 26 MIHPT borings
- Advanced 6-42 feet deep
- 9 confirmation borings advanced

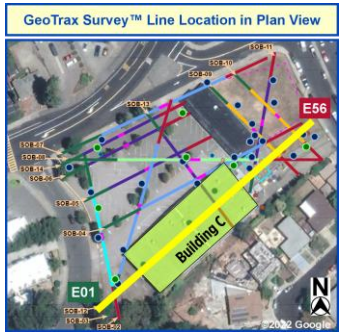
Conventional Sampling

- 86 Passive soil gas (PSG) Samples
- 16 Active soil gas samples
- 8 Grab-groundwater samples
- 7 Shallow monitoring wells
- 99 Soil Samples
- Analyses: TPH, VOCs, Geochemical, microbial signature compounds and field parameters

GeoTrax Survey™ (ERI) Interim Report

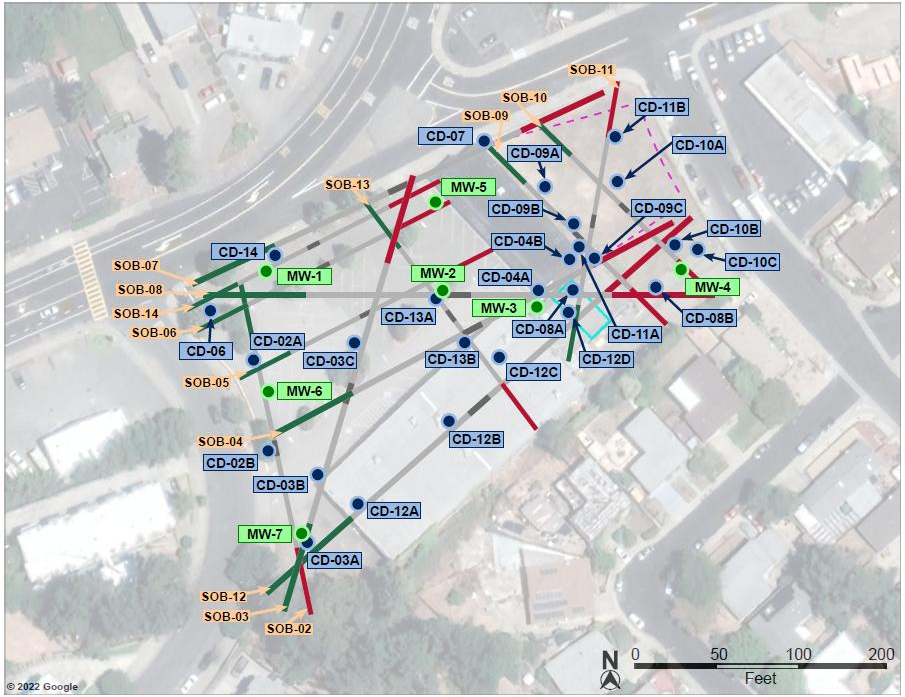
- Produced 28 priority-ranked **confirmation drilling locations (CDs)** to biopsy electrical anomalies
- Highly conductive site – typical of fine-grained geology, high GW EC, weathered contaminants, and microbial activity
- Paleochannel and a potential syncline observed in the electrical data as conductive features *(shown later)*
- 4 horizontal electrical contacts interpreted across the site (shown below)
- Complex hydrogeology; anisotropic groundwater flow suspected





ERI Transects Target Confirmation Locations

MiHPT and soil borings / permanent monitoring wells installed based on integrated results of ERI and sampling data



Legend

Electrode 1 — Electrode 56

As-Built GeoTrax Survey™ Locations

Instrument Location at Center of Dark Grey Box

Full depth of trapezoidal shaped image exists in center zone; partial depth in green and red zones

Former Dry Cleaner, Approximate

Former Shell Gas Station Property, Approximate

Confirmation Drilling Locations

CD-06 — MiHPT Locations, As-Built Oct.-Nov. 2024

MW-1 — Monitoring Well Locations, As-Built Jan. 2025

Aestus
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Not to Scale Unless Specified	
Drawn/QC By: AML/MPM	
Approved By: SMF	
Date: 06-25-2025	
Project No.: 24-111-50	

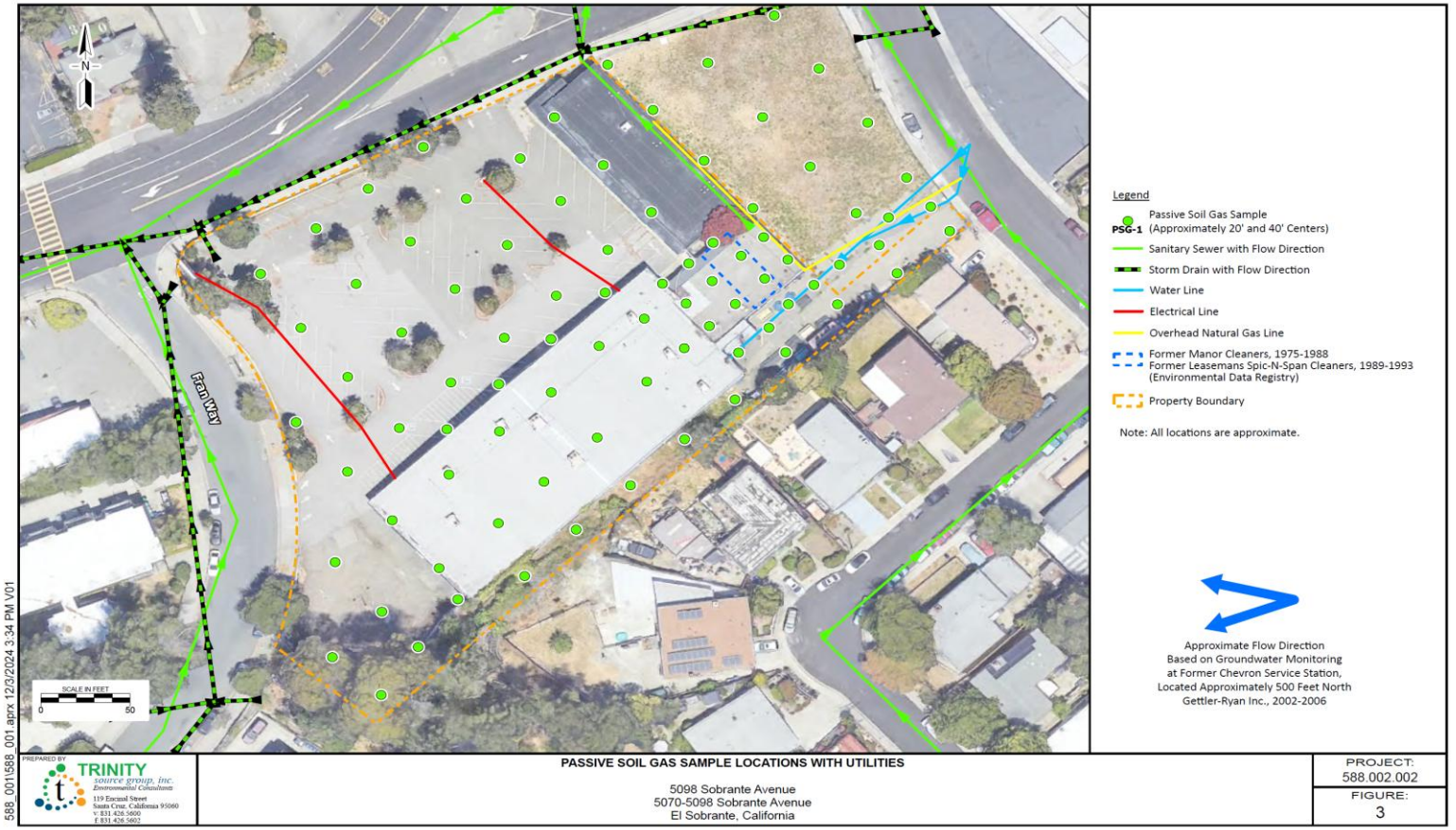
MIHPT and Soil/Groundwater Confirmation Drilling Locations
5098 Sobrante Avenue Site
El Sobrante, California, USA

FINAL REPORT (STEP 5 OF 5)

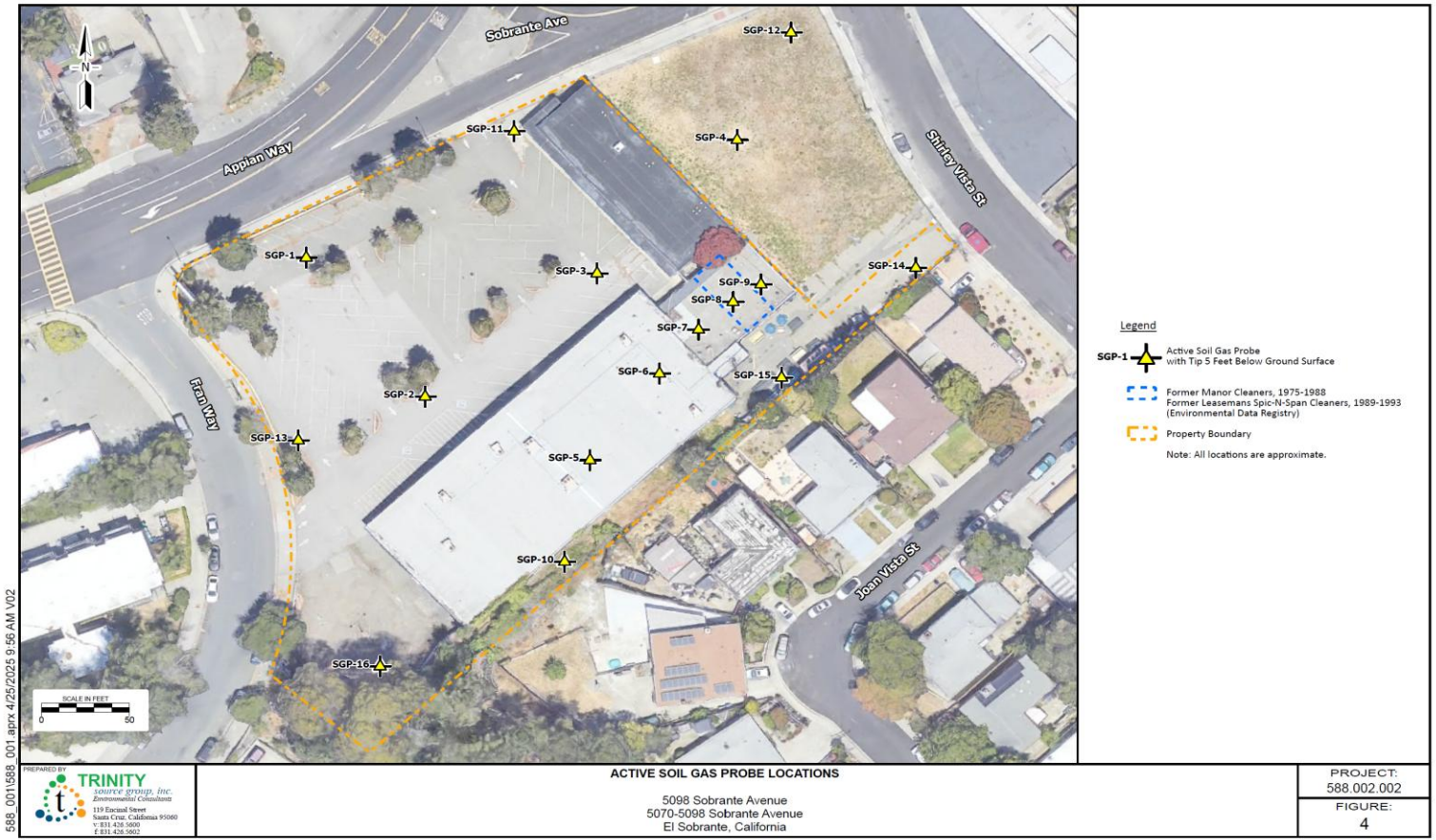
Prepared For: TRINITY source group, inc. Environmental Consultants

FIGURE
PV-2

PSG Locations



SVP Locations



CD Analytical Suite

Sample Media	Analyte	Suggested Analysis Method (or equivalent)
Air	VOC Screening of cores	PID
	Methane Screening of cores	FID
Soil	Standard Client Analysis (plus below listed items if NOT already included)	Standard Client Analysis
	Soil EC	Lab Recommended
	VOCs, including Chlorinated Solvents, BTEX	EPA Method 8260B (full list)
	TPHg (C4-C12)	EPA Method 8260B
	TPHd (C13-C28)	EPA Method 8015 Modified
	TPH (C29-C44)	EPA Method 8015 Modified
Groundwater	Standard Client Analysis (plus below listed items if NOT already included)	Standard Client Analysis
	VOCs, including Chlorinated Solvents, BTEX	EPA Method 8260B (full list)
	TPHg (C4-C12)	EPA Method 8260B
	TPH (C13-C28 and C29-C44)	EPA Method 8015 Modified
	Lead	EPA Method 6010B
	Fuel Fingerprinting	If NAPL Present
	Total Organic Carbon	SM 5310C
	Nitrate	EPA Method 300.0
	Chloride	EPA Method 300.0
	Sulfate	EPA Method 300.0
	Total Sulfide	SM 4500
	Ammonia as N	SM 4500
	Ferric Iron	Calculation
	Ferrous Iron	Sm 3500
	Total Iron	EPA Method 6010B
	Major Ions (Ca, Mg, K, Na)	EPA Method 6010B
	Alkalinity as CaCO3	SM 2320B
	Alkalinity- Bicarbonate	SM 2320B
	Alkalinity- Carbonate	SM 2320B
	Alkalinity- Hydroxide	SM 2320B
	Total Dissolved Solids (TDS)	SM 2540C
	Ammonia as Nitrogen	EPA Method 350.3
	Dissolved Gasses GC (Methane)	Method 3810/RSK175 Modified (Headspace)
	Biodegradation Mechanisms	CENSUS - Total EBAC (by Microbial Insights Lab)
Groundwater	**Field Parameters**	**Instrument**
	Dissolved Oxygen (DO)	DO Probe [1]
	Oxidation Reduction Potential (ORP)	ORP Probe [1]
	Water Temperature	Temperature Probe [1]
	pH	pH Probe [1]
	Electrical Conductivity[2]	Conductivity Probe [1]
	Water Level	Electric water level indicator
	LNAPL/DNAPL Thickness	Interface Probe

Integrated CSM Results

- Correlation between electrical resistivity anomalies and VOC impacts
- Reduced uncertainty compared to traditional approaches

MIHPT

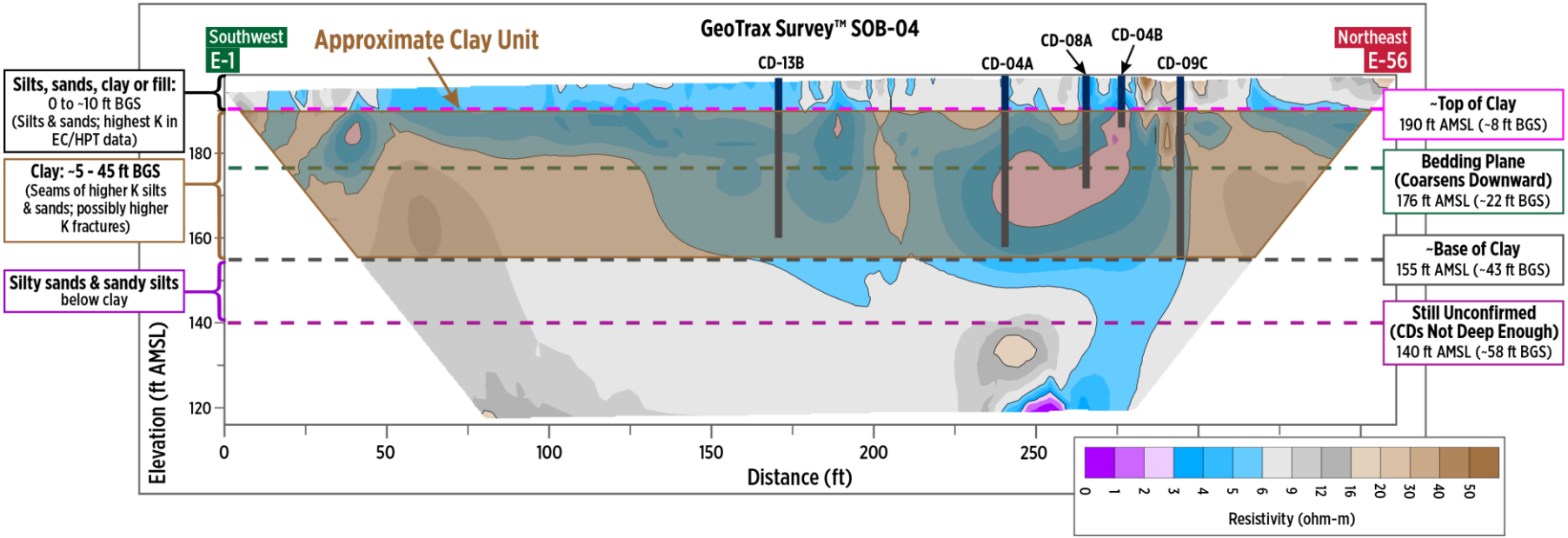
- 9 out of 26 MiHPT borings had XSD/PID response; confirmation soil samples correlated with responses
- Highest permeability 0-10 feet bgs from EC/HPT data (silts, sands, clay or fill material)
- Lowest permeability 5-45 feet bgs from EC/HPT data (Clay)
- Data used to define top and bottom of clay interval correlated with 190-feet AMSL ERI data

Confirmation Drilling

- Vertical and horizontal impacts were confirmed
- No measurable DNAPL found
- 29 out of 100 active/passive soil gas samples were above screening levels
- Key preferential flow paths identified
- Clay depocenter identified/confirmed
- Confirmation of hypothesized syncline fold axis
- Aquifer state and potential bioactivity

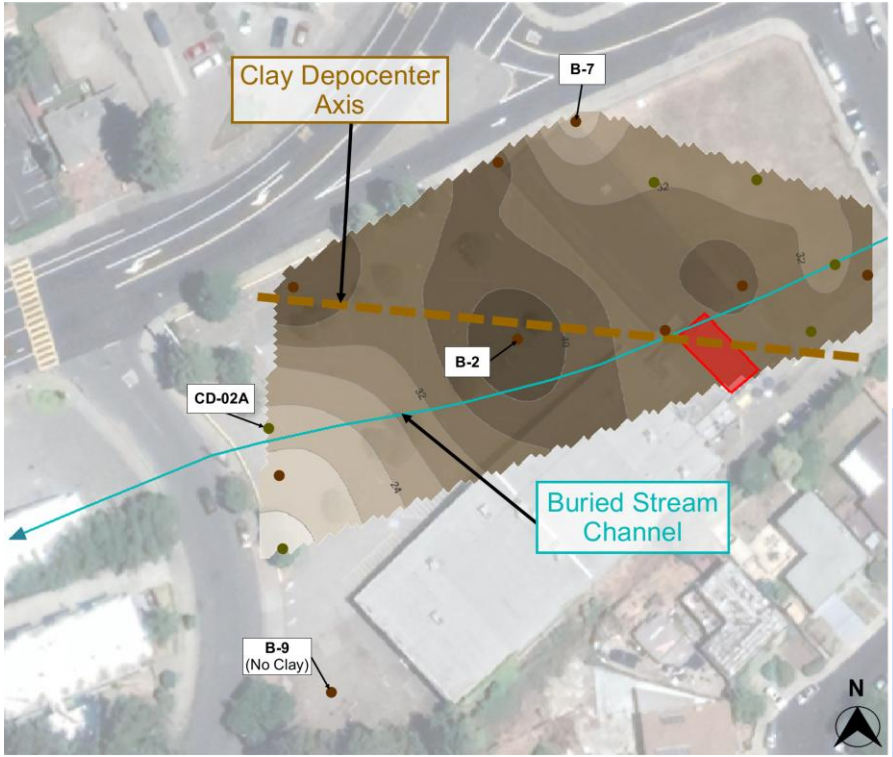
Horizontal Electrical Contacts

- 4 generalized horizontal electrical contacts observed across the site
- 140 feet AMSL contact not defined but likely a geologic change (bedrock)



Modeled Clay Unit

- **Clay depocenter** identified – 43 feet thick in the center of the site (**B-2**)
- Top of clay 6 feet deep dipping 3.5% to the west; correlated with 190 feet AMSL electrical contact
- Bottom of clay shallows sharply (15.2%) to SW and 11.6% to NE; roughly correlated with ERI anomalies



Clay Thickness Map

Aestus, feet
Contour Interval (CI): 4 feet

Legend

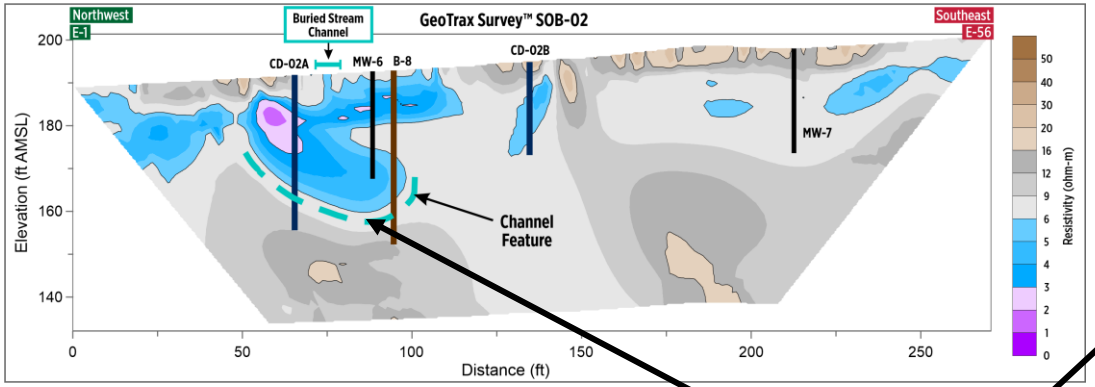
- Former Dry Cleaners
- Clay Depocenter Axis
- Buried Stream Channel

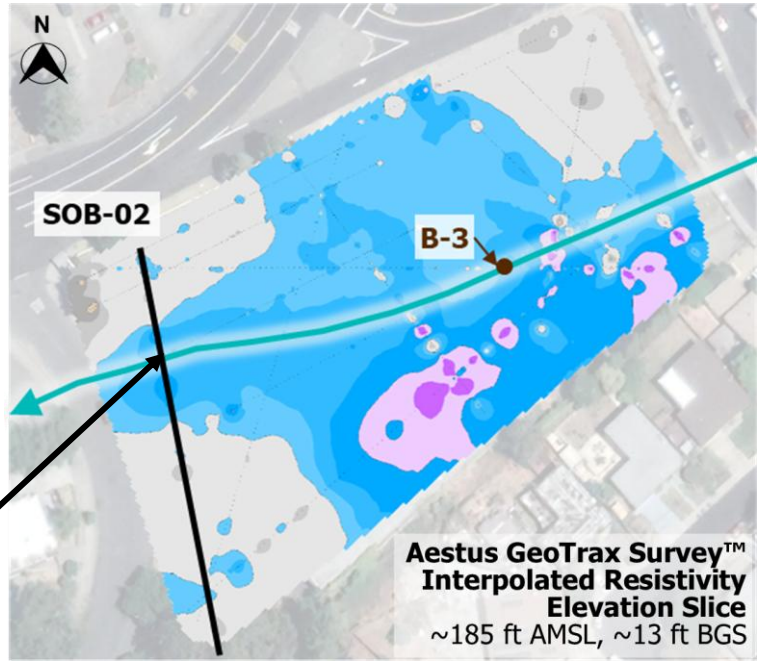
Clay Thickness Map Modeling Points

- "CD" MiHPT Location (Oct.- Nov. 2024)
- "B" Soil Boring Location (Dec. 2024 - Jan. 2025)

Paleochannel

- Identified **buried paleochannel** - electrically conductive above GW table at 8 feet bgs; 13 feet bgs greatly apparent; indiscernible at 33 feet bgs
- Likely backfilled with re-worked native soil during building construction
- Boring **B-3** contained sands, weathered gravels, rootlets, and wood fragments

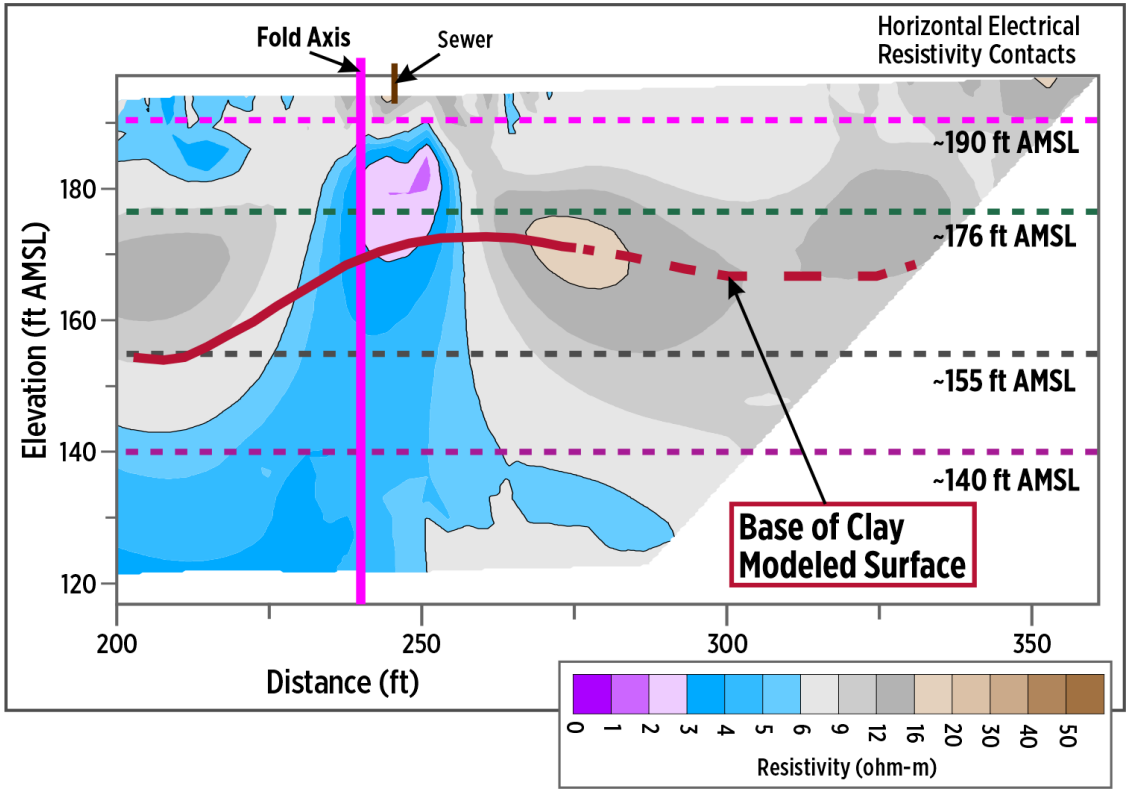




Buried Stream Channel

Syncline

Electrically conductive feature correlates with a regionally mapped syncline axis



Flowpaths

1 Clay Depocenter Flow Path

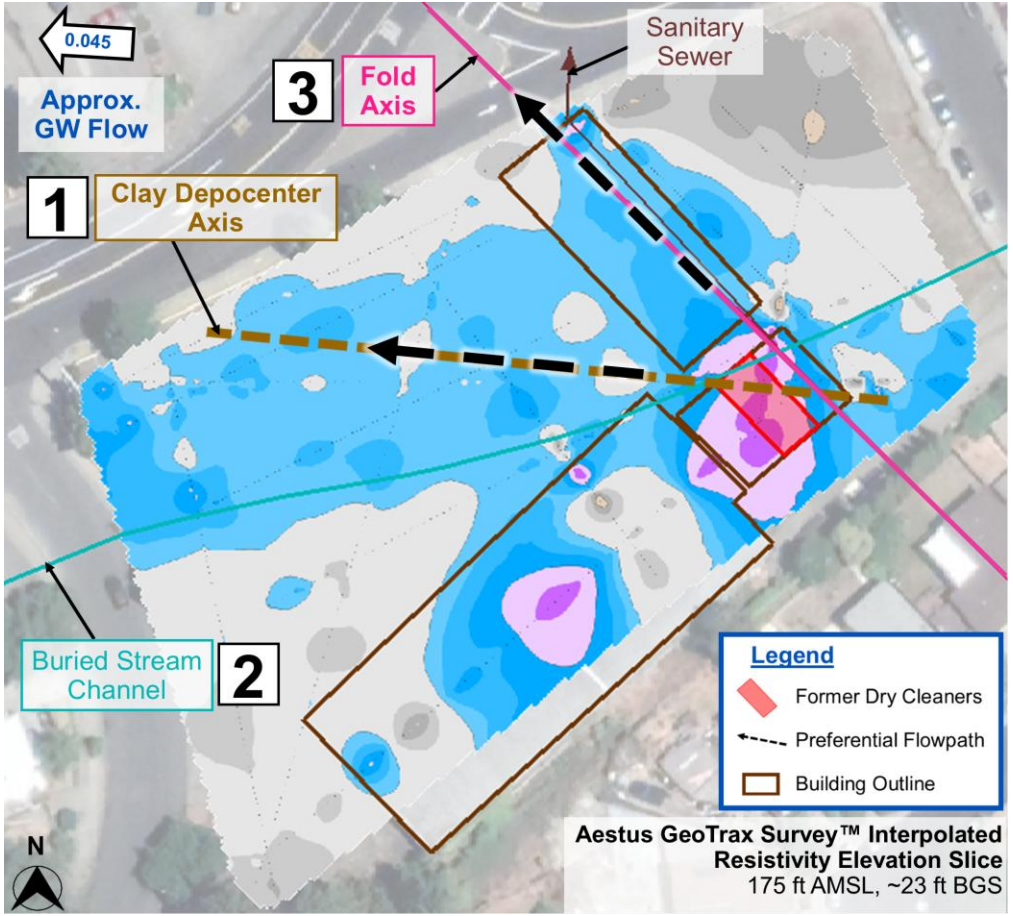
Controls shallow GW flow to WNW, likely due to clay fractures, low plasticity, coarser grained lenses (EC logs); limits downward GW flow

2 Paleochannel Flow Path

Not a primary shallow and deep groundwater flow path due to the clay depocenter

3 Syncline Fold Axis Flow Path

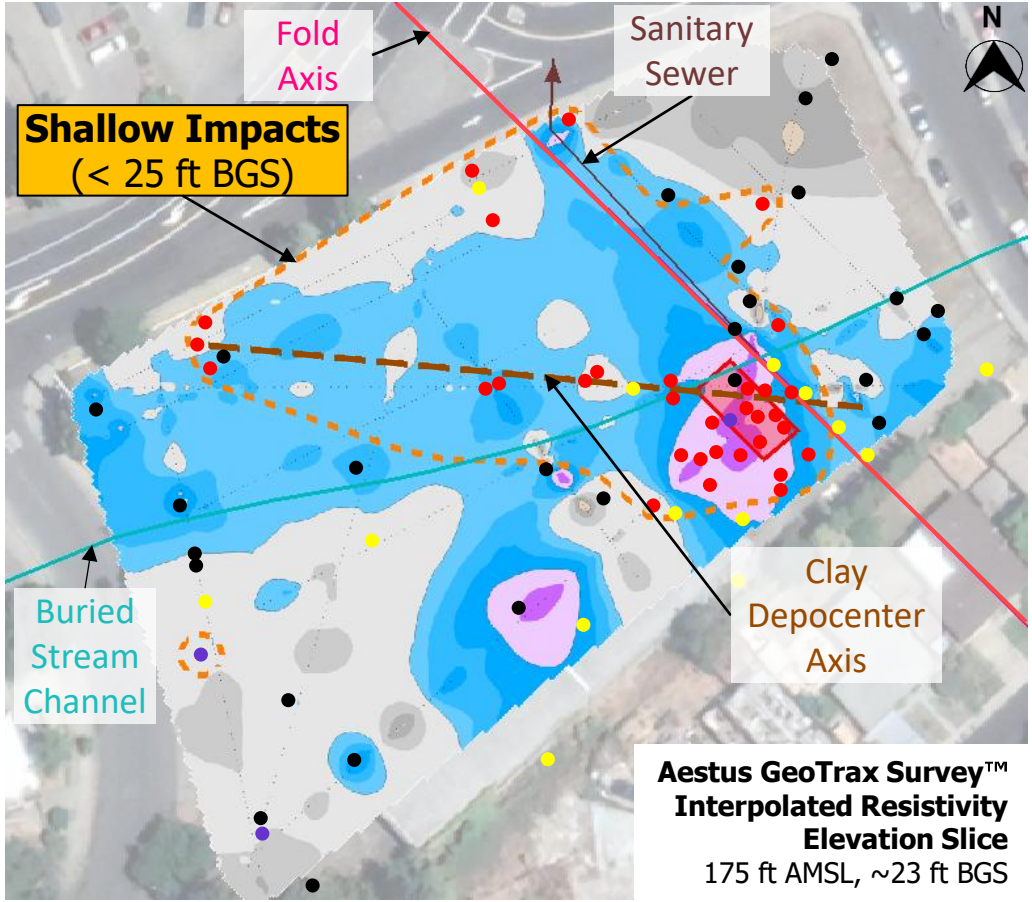
Preferential deep groundwater flow to the NNW due to anisotropy (gravelly clays along fold axis)



Zones of Impacts

1 Shallow Impacts (0-25 ft bgs)

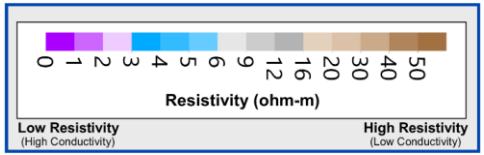
- ~32,000 ft²; 30,000 yd³



Aestus GeoTrax Survey™ Interpolated Resistivity Elevation Slice
175 ft AMSL, ~23 ft BGS

Legend

- Former Dry Cleaners
- Soil and/or GW Above Standards (and soil gas above 1 mg/m³)
- Interpreted MiHPT CVOC Response
- Soil Gas Above Standards for PCE (and below 1 mg/m³)
- Non detect for CVOCs



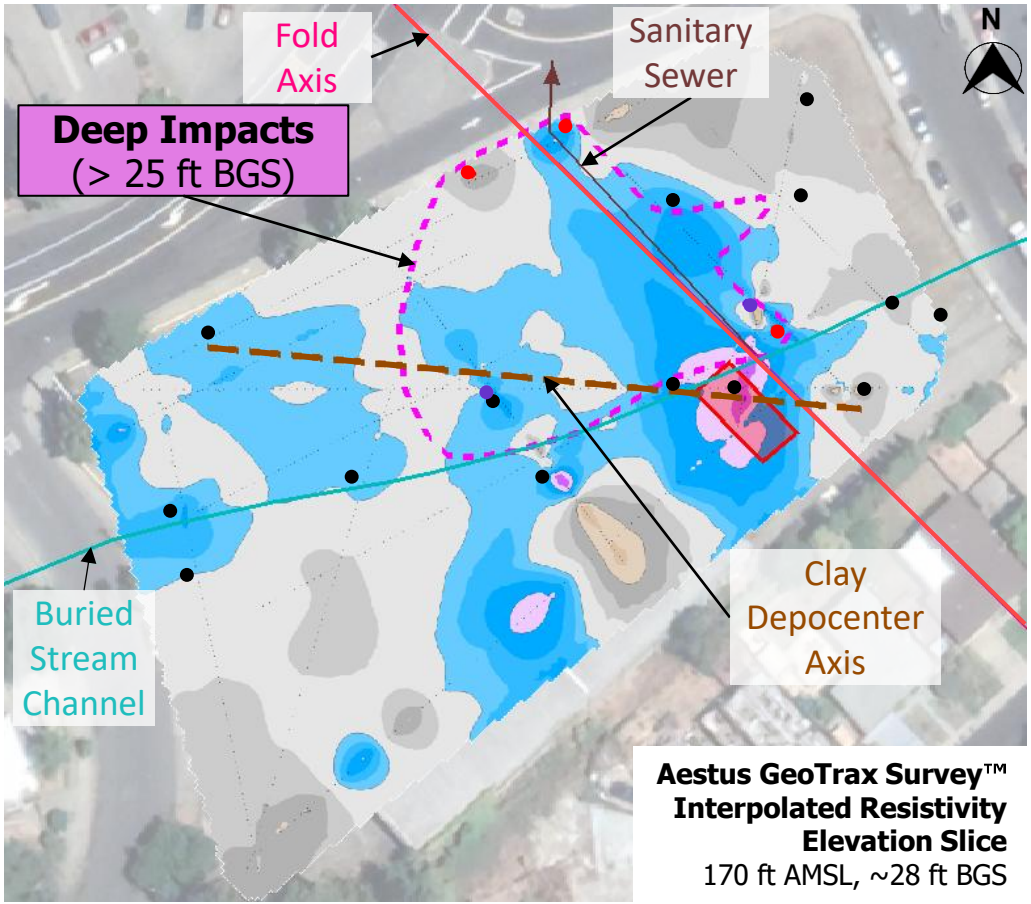
Zones of Impacts

1 Shallow Impacts (0-25 ft bgs)

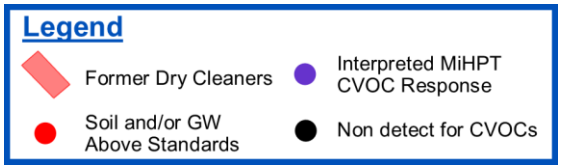
- ~32,000 ft²; 30,000 yd³

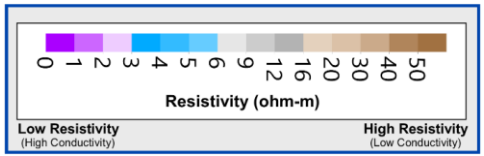
2 Deep Impacts (25-50 ft bgs)

- ~17,000 ft²; 16,000 yd³



Aestus GeoTrax Survey™ Interpolated Resistivity Elevation Slice
170 ft AMSL, ~28 ft BGS





Zones of Impacts

1 Shallow Impacts (0-25 ft bgs)

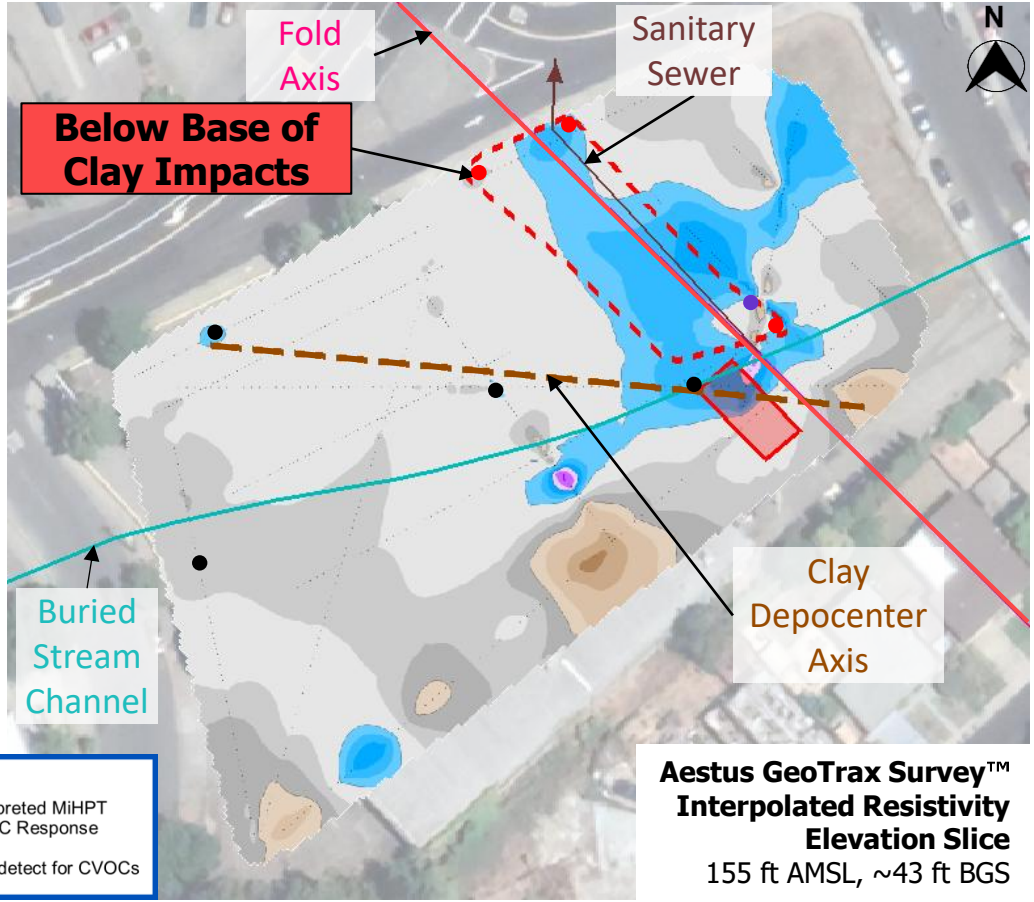
- ~32,000 ft²; 30,000 yd³

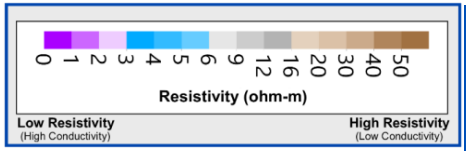
2 Deep Impacts (25-50 ft bgs)

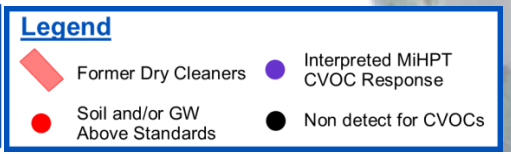
- ~17,000 ft²; 16,000 yd³

3 Impacts Below Base of Clay (25-45 ft bgs)

- ~6,000 ft²; 4,500 yd³

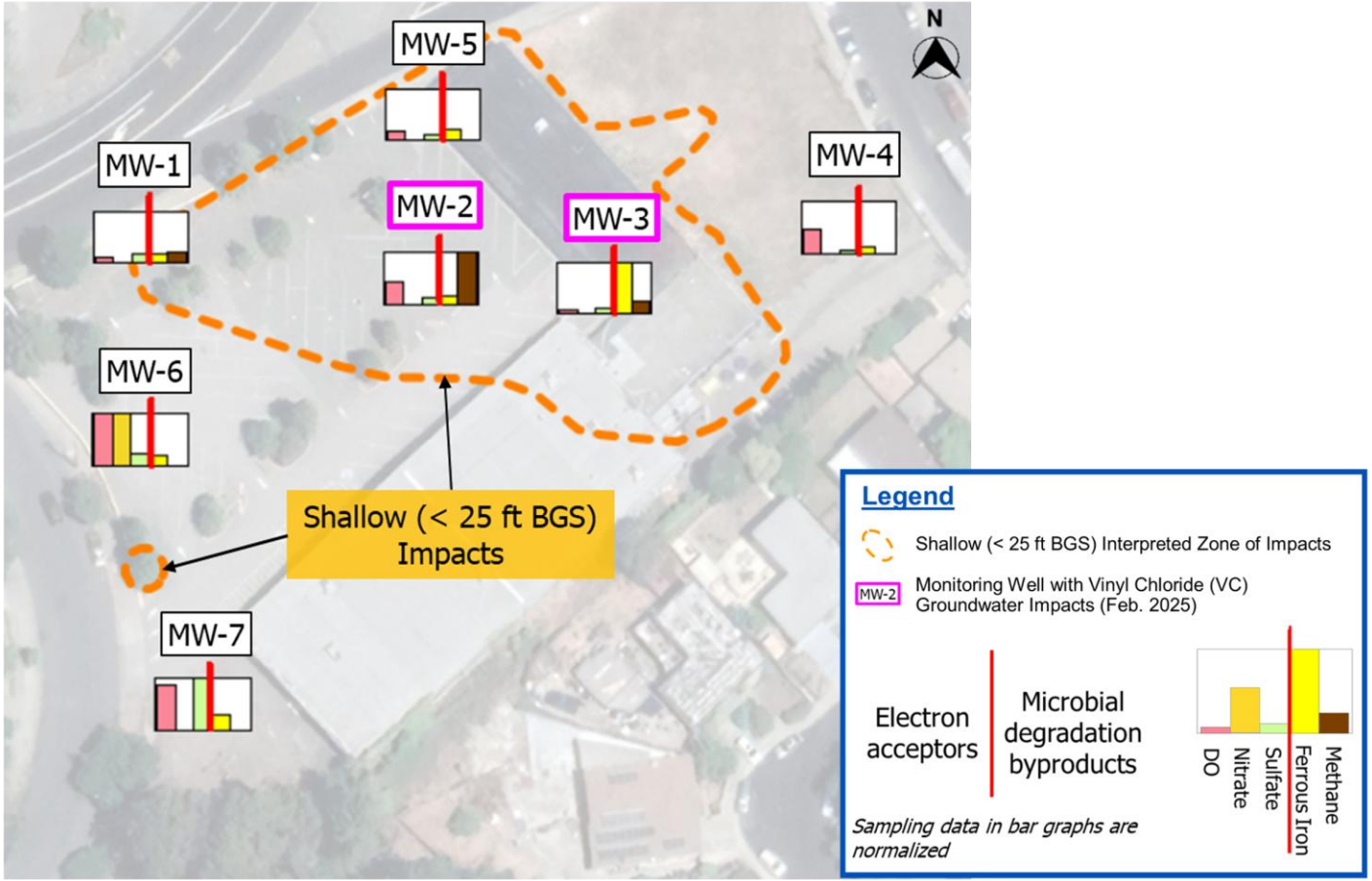






Aestus GeoTrax Survey™ Interpolated Resistivity Elevation Slice
155 ft AMSL, ~43 ft BGS

Electron Acceptors & Microbial Degradation

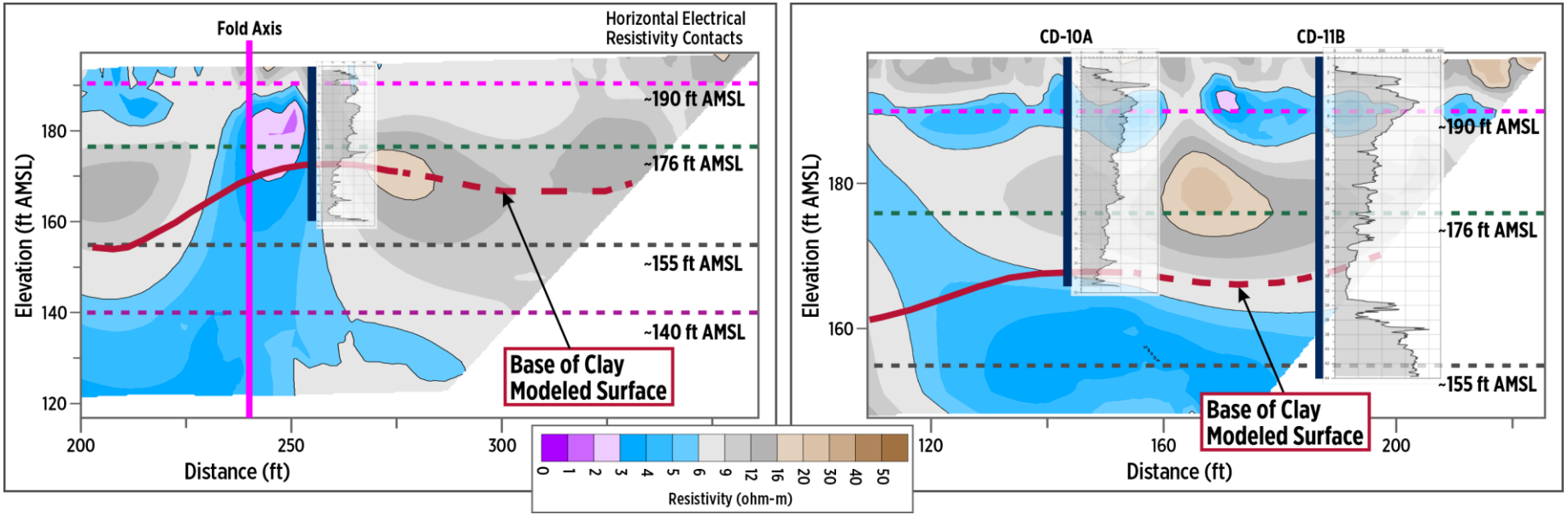


Data Correlation & Integration Assurance

MIHPT EC Correlation with ERI

MIHPT EC

Electrical Resistivity

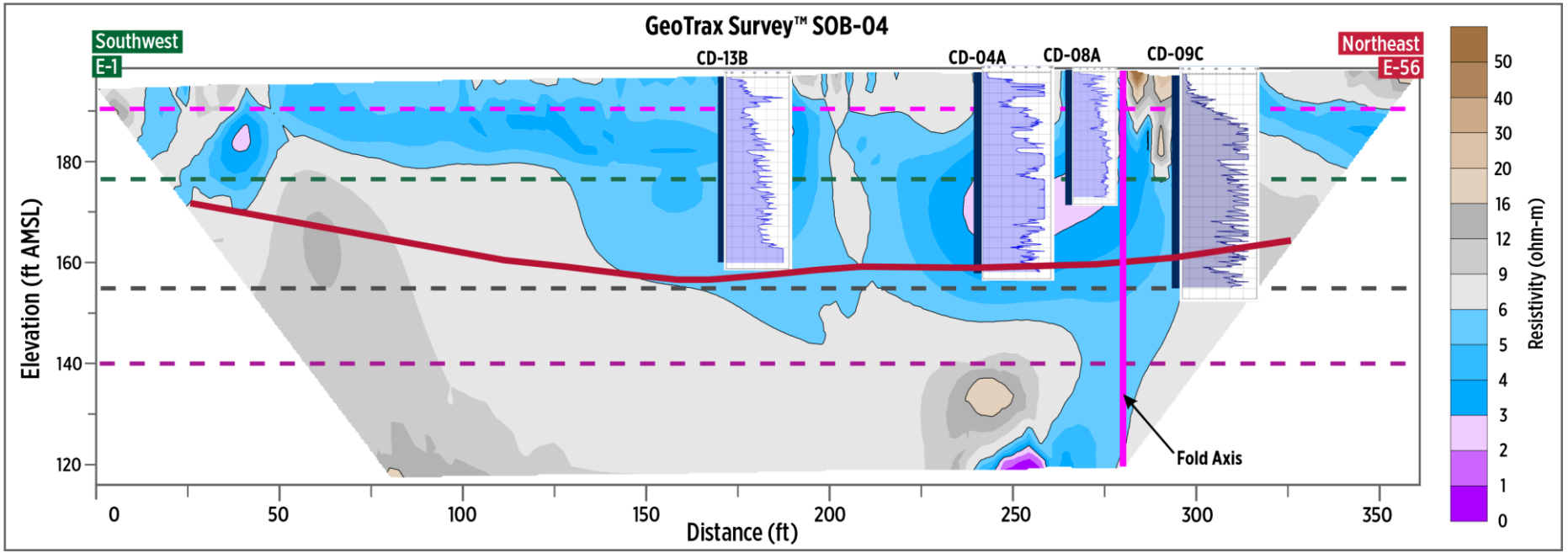


Data Correlation & Integration Assurance

HPT correlation with ERI

MIHPT HPT

Electrical Resistivity



Remediation Implications

Refined Cleanup Strategy

- Target remediation at confirmed impacted zones rather than broad application areas
- Design injection networks using HPT permeability data combined with ERI data for optimal amendment delivery
- Focus biostimulation in zones where natural degradation is already active
- Install deeper monitoring wells to track migration below previously monitored intervals

Cost & Performance Benefits

- Reduced number of monitoring wells needed — targeted placement guided by UHRSC data
- Fewer remediation cycles — precise targeting avoids treating non-impacted zones
- Accelerated cleanup timelines through better-informed remedy selection
- Lower long-term monitoring costs with optimized well network

Conclusions & Next Steps

Key Takeaways

- Integrating geophysical, direct push, and conventional methods produced a CSM far more detailed than any single approach
- ERI identified previously unknown groundwater flow paths and anisotropic flow and confirmed deeper migration — critical updates missed by wells alone
- MiHPT provided co-located contaminant and permeability data at centimeter-scale resolution, revealing preferential pathways supplemented by conventional sampling
- The refined CSM enabled targeted remediation design, reducing costs and improving performance expectations

Recommended Next Steps

1. Implement targeted remediation of source area(s) and dissolved shallow groundwater plume
2. Find grant resources for offsite investigation and remediation
3. If funding is available, conduct post-remediation ERI surveys to assess treatment effectiveness

Summary Video: Aestus' 3D Model

Acknowledgements

- Trinity Source Group, Inc., Brady Nagle – Senior Project Manager
- Central Assembly Church of Richmond, Wyatt Ptak –ECRG Manager
- Aestus, LLC, Todd Halihan, Stuart McDonald, and Samantha Frandsen
- DTSC – Anthony Rosas – DTSC ECRG Manager
- California SF Bay Regional Water Quality Control Board – Jacob Henry, PG

TRINITY source group, inc. Environmental Consultants

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DTSC Department of Toxic Substances Control

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