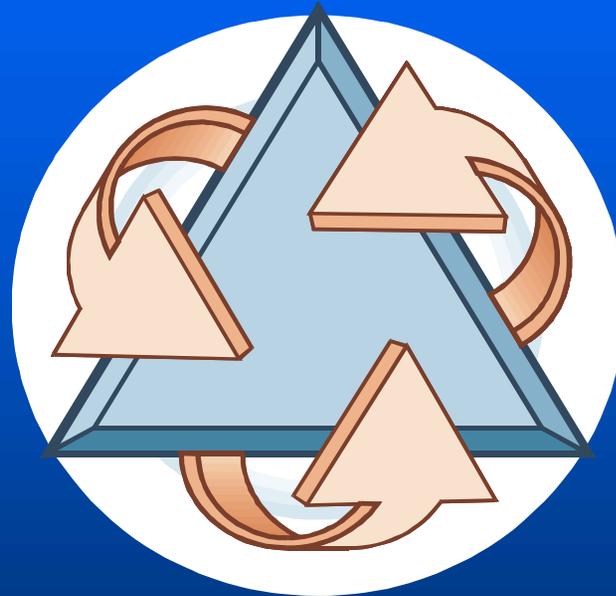


# **Triad Case Studies from the U.S. Army Corps of Engineers**

**Brad Call, Sacramento District  
Federal Remediation Technologies  
Roundtable General Meeting,  
Washington D.C. on December 1, 2003**

# The Triad Approach

**Systematic  
Project  
Planning**



**Dynamic  
Work  
Strategies**

**Real-time Measurement  
Technologies**

# Overview

## ■ Projects:

- Kauffman Minter – wash out.
- Moody AFB – oil/water separator.
- McCormick and Baxter – wood treatment.
- Fort Lewis – disposal yard.
- East Palo Alto – agricultural pesticides.

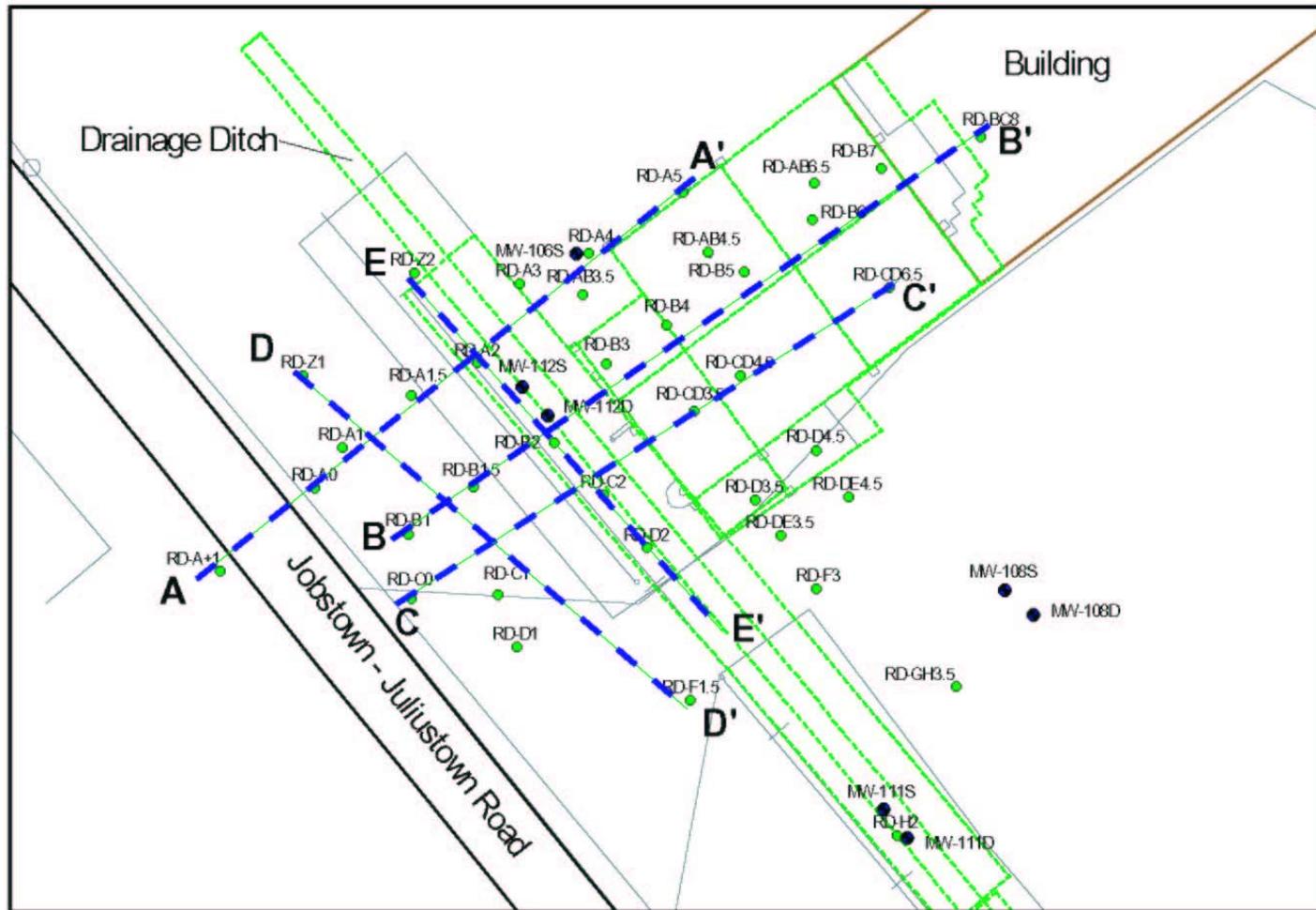
## ■ Summary

# Kauffman Minter (KM) SF Site

- Industrial Transportation Facility.
  - Tanker wash out areas/Wastewater lagoons.
- OU1 ROD
  - Contaminated sediments removal.
  - Monitoring shallow GW.
  - High levels of TCE/DCE was discovered in subsurface soils and groundwater ...acting as a continuing source of contamination.
- OU2 ROD to resolve issues.

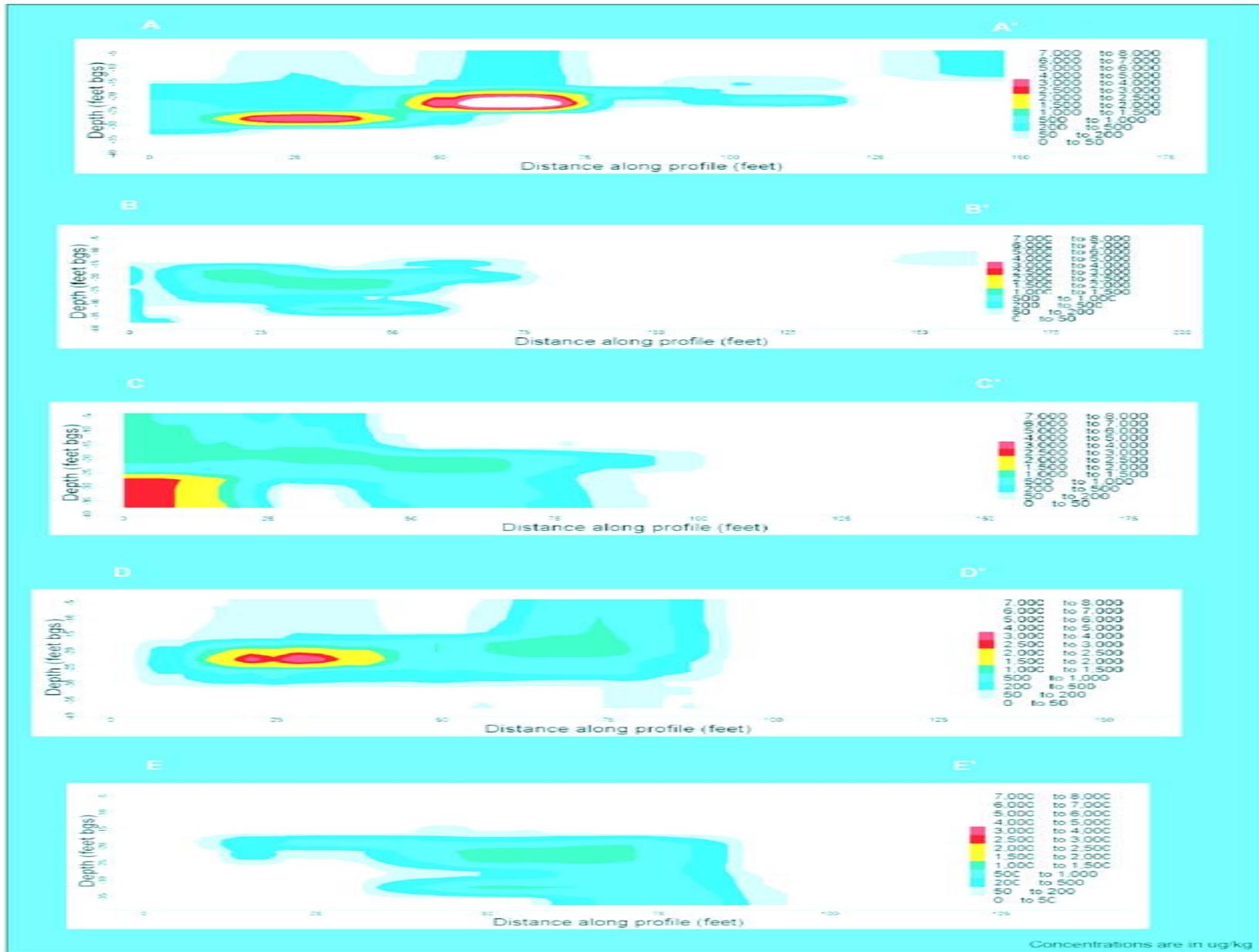
# KM SF Site – OU2 ROD

- Established Insitu Chem-Oxidation for soils.
- Triad Approach used for Pre-Design Study:
  - **Systematic Planning clarified goals: Remediate residual soils contaminated > 1000 ppb TCE or DCE.**
  - **Refine CSM with FAM: DPT sampling platform with Onsite GC/PID (mod. 8021B) provided high density of soil data for TCE and DCE.**
  - **Dynamic Strategy: Real-time VOC data used to direct further sampling and determine extent of contamination.**
- Data from 170 soil samples confirmed 3 areas where soil remediation required.



**A—A'** Line of geochemical profile presented in figures 3-4 and 3-5

**Figure 3-3**  
**Geochemical Profile Location Map**  
 Kauffman and Minter Superfund Site,  
 Burlington County, New Jersey  
**CDM**



Note: Profiles A-A', B-B' & C-C' trend SW-NE  
 Profiles D-D' & E-E' trend NW-SE  
 Refer to Figure 3-3 for profile location map.

**Figure 3-5**  
**Trichloroethene Soil Concentration Profile**  
 Kauffman and Minteer Superfund Site,  
 Burlington County, New Jersey  
**CDM**

# Moody AFB – Bldg 758

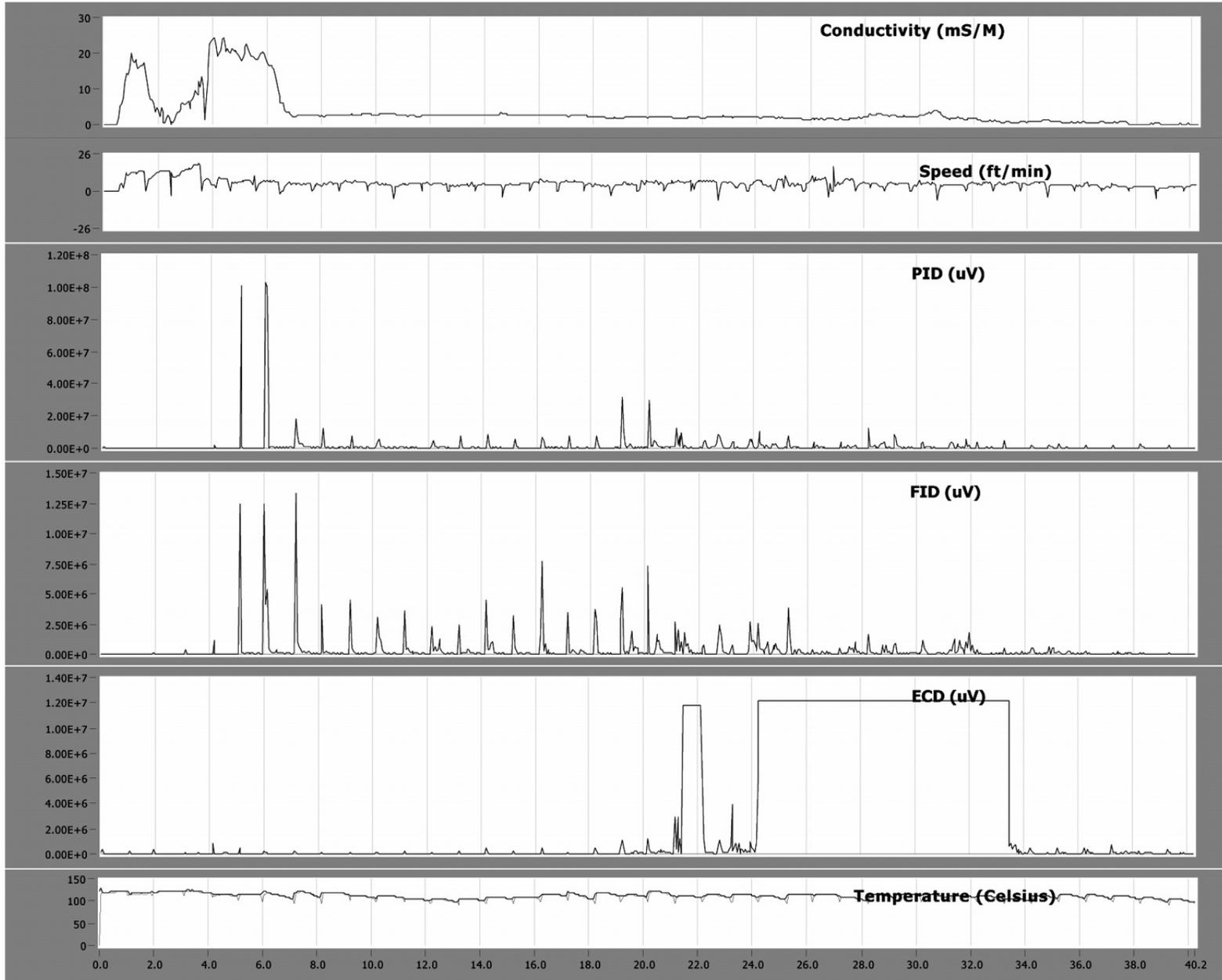
- Former Oil/Water Separator and Waste Oil Tank:
  - Wastes received from wash rack/jet repair areas.
  - Contaminants of Concern were fuel and solvents.
  - Removed in October 2000.
  - Post excavation sample showed detection of TCE at 3000 ppm in subsurface soils!
- Main source of uncertainty associated with the variability in soil stratigraphy and the impact this has on contaminant fate/transport.

# Moody AFB – Bldg 758

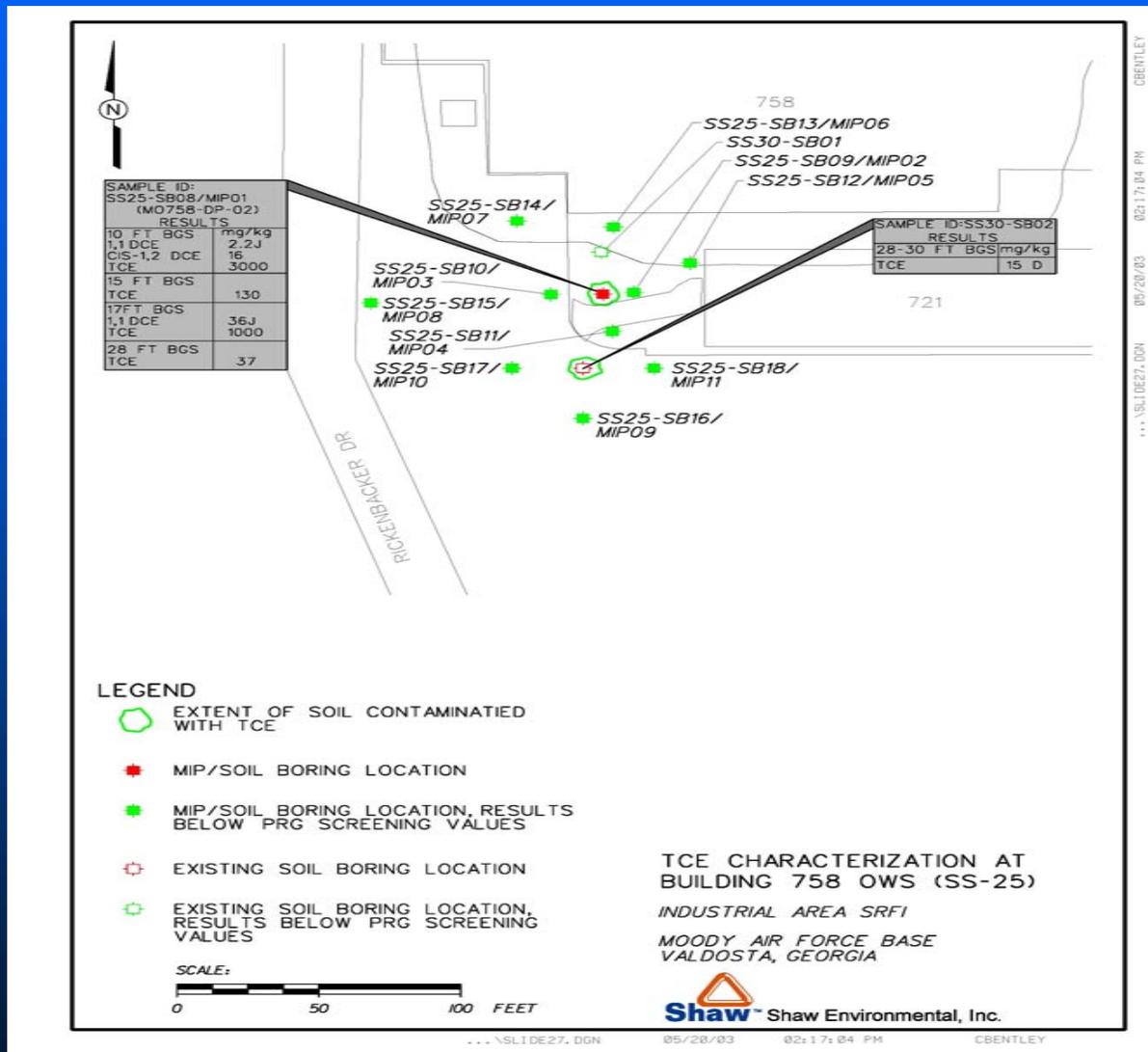
- Triad Approach used to evaluate extent of contamination and remediation options:
  - **Systematic Planning established goals: Remediating soil concentrations above Region IX Industrial PRGs.**
  - **Refine CSM with FAM: DPT sampling platform configured with MIP (Membrane Interface Probe), an electrical conductivity detector, and 3 chemical detectors (PID, FID, ECD). Data sets link the soil stratigraphy and presence/absence of contamination.**
  - **Dynamic Strategy: Soil conductivity shows preferential F/T pathways, chemical data used to direct sampling for offsite analyses and determine contamination extent.**
- Data from 8 MIP borings and sample data confirmed 2 areas where soils require remediation. <sup>9</sup>



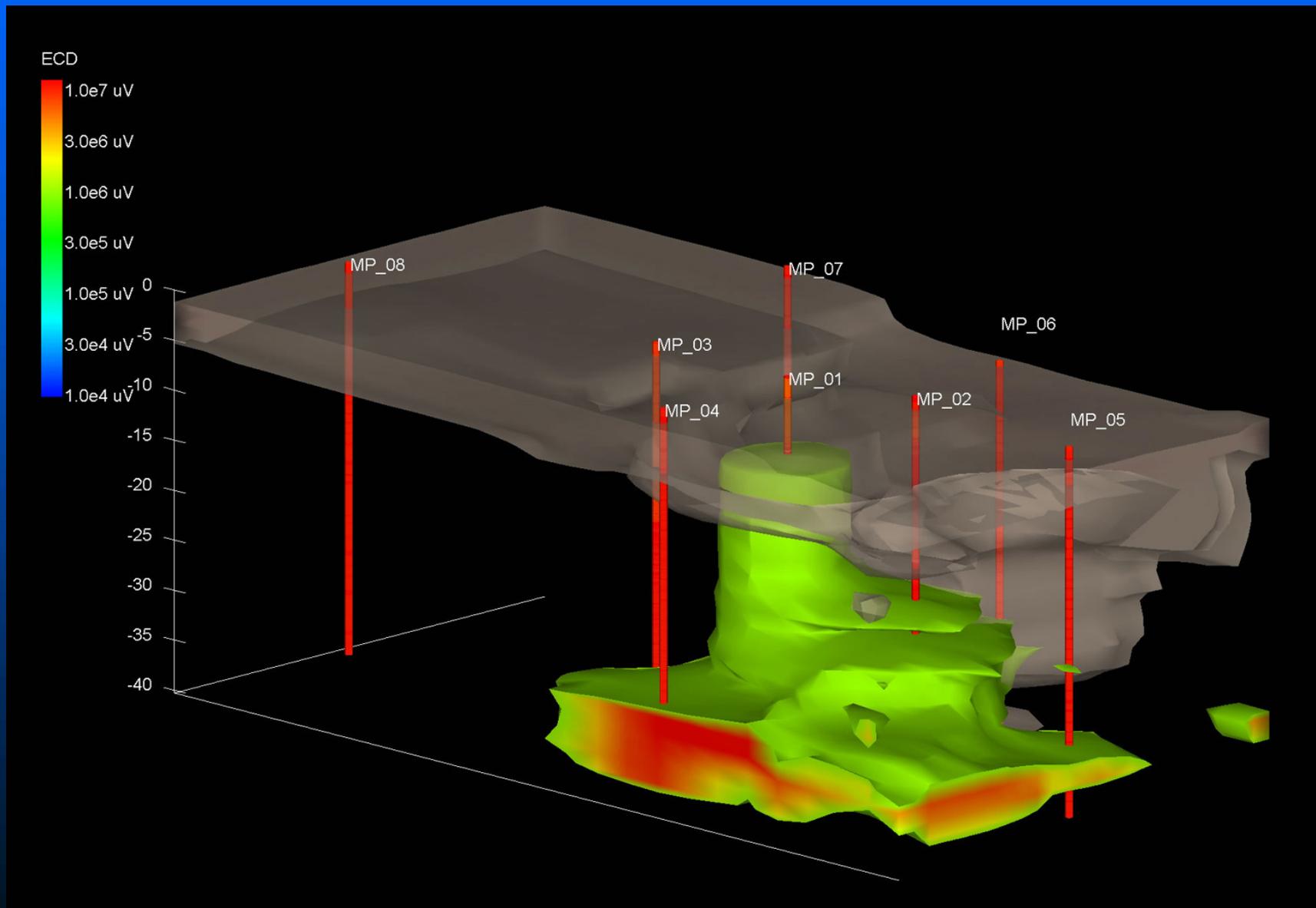
Log: H:\SHAW\2003\Moody AFB\MIP Logs\



# Building 758 MIP Boring Location Map



# Building 758 3-D MIP Data Visualization



# McCormick and Baxter Superfund Site

- Operated as a Creosoting Company from 1942 – 1991
- Contaminants of Concern from the Preservatives (Creosote, PCP, Cu, Cr, As, Zn) and Solvent Carriers (kerosene, diesel, butane, ether)
- Nonaqueous Phase Liquid (NAPL) present acting as Source Material
- Main Source of Uncertainty associated with the Variability in Soil Stratigraphy and its impact on Source Material Distribution

# McCormick and Baxter Superfund Site

- Triad Approach used to evaluate extent of contamination and remediation options.
  - Systematic Planning established goals:
    - » Determine the NAPL type (physical and chemical characteristics).
    - » Vertical/horizontal distribution of NAPLs.
    - » Determine soil stratigraphy (type, thickness, heterogeneity).
    - » Presence of manmade structures that may impact application of remedial technologies.

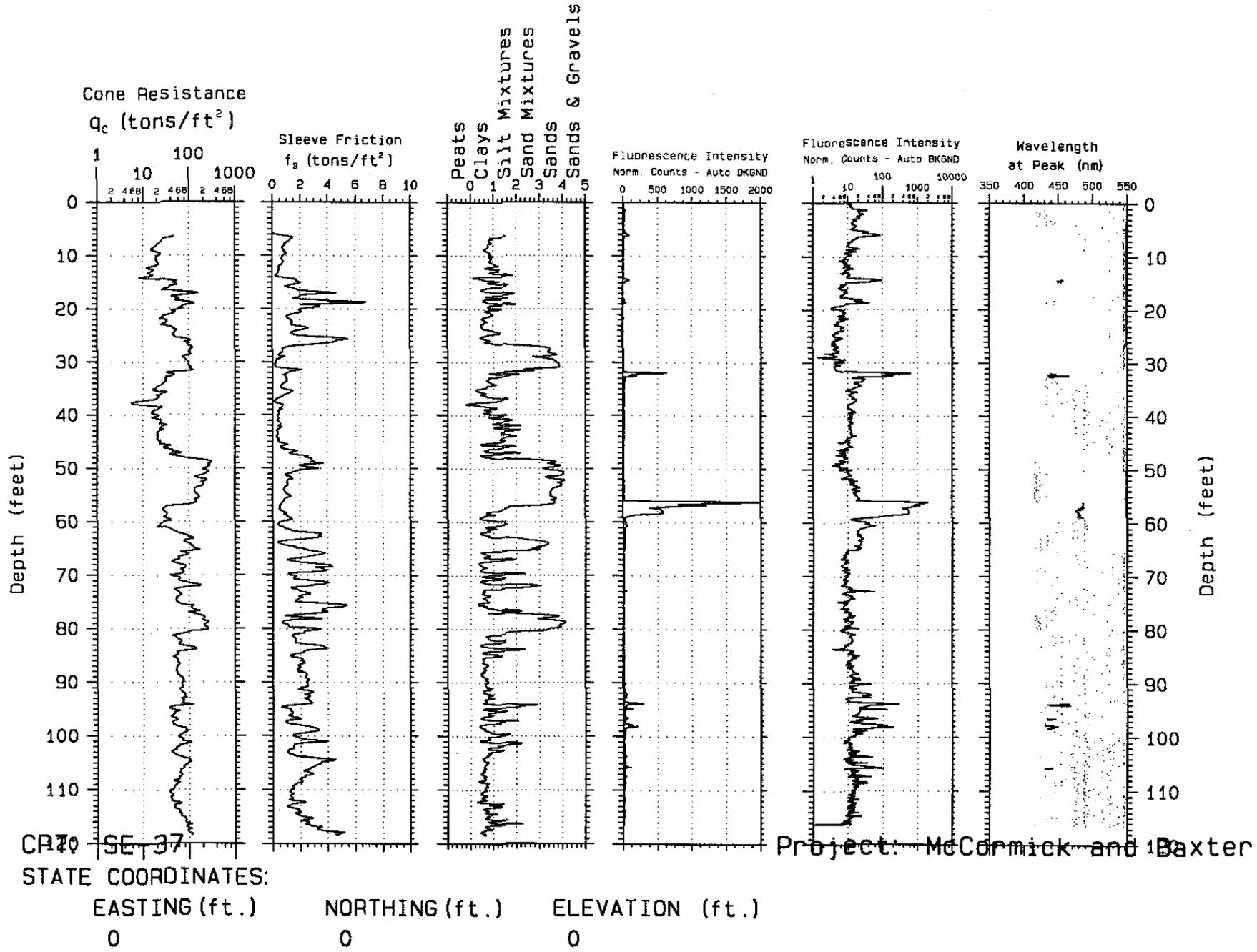
# McCormick and Baxter Superfund Site

- Triad Approach continued:
  - Refine CSM with several FAMs:
    - » **SCAPS Truck configured with a cone penetrometer tip and LIF (Laser Induced Fluorescence) sensor.**
    - » **Onsite IR TRPH Analyses.**
    - » **Field Laboratory analyzing:**
      - **PCP by GC/ECD.**
      - **TPH fingerprint by GC/FID.**
    - » **FLUTE ribbon sampler for NAPL detection.**

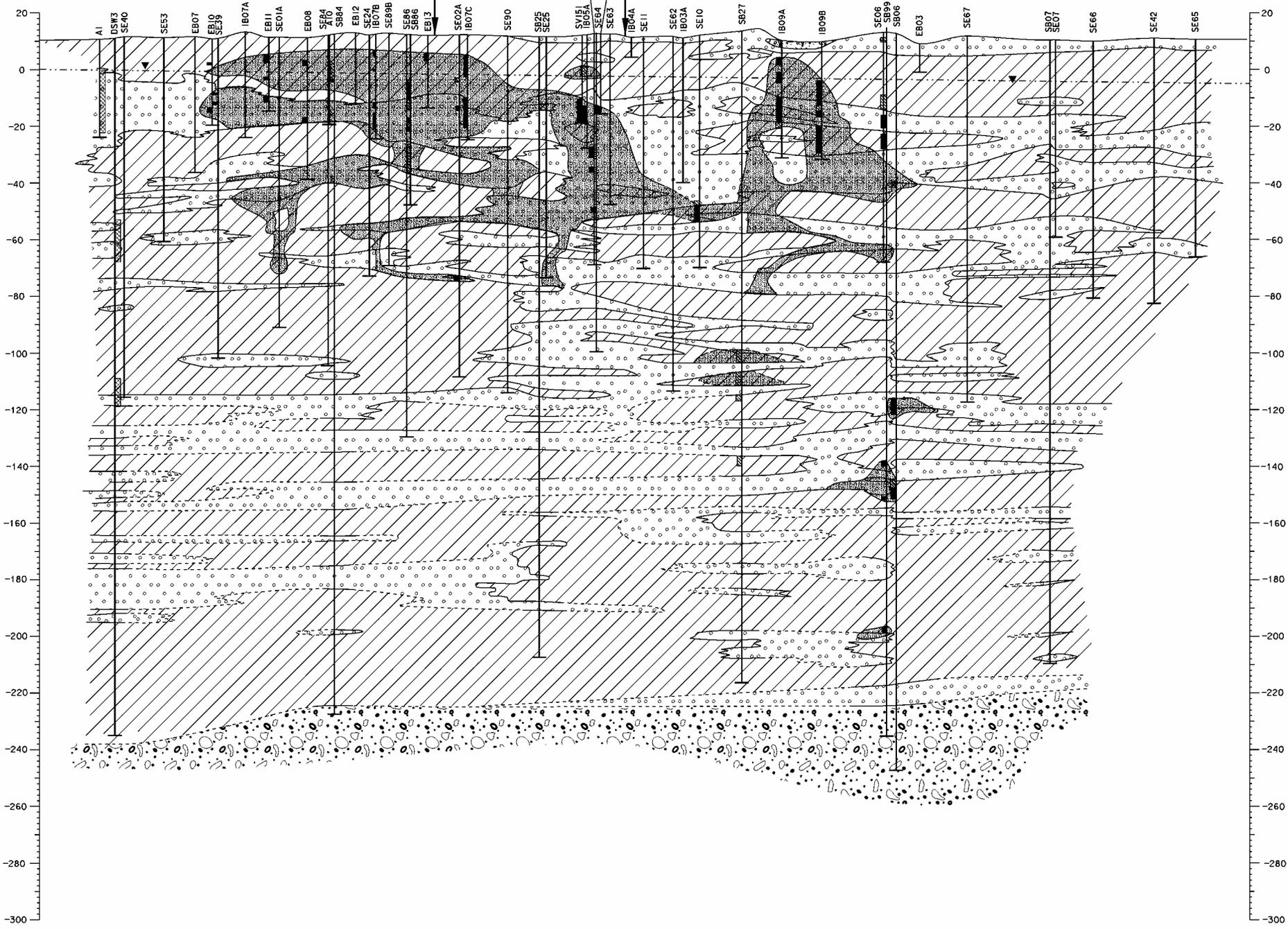
# McCormick and Baxter Superfund Site

- Triad Approach continued:
  - Dynamic Strategy:
    - » Cone penetrometer showed soil stratigraphy.
    - » Field observations / LIF data used to evaluate presence of NAPL / fuel PAHs, and directed sampling for definitive analyses (onsite TRPH, PCP, and TPH fingerprinting).
    - » Offsite samples taken for a broader chemical and physical characterization.
  - Communications: posting site information and data on a Internet-based transfer site.

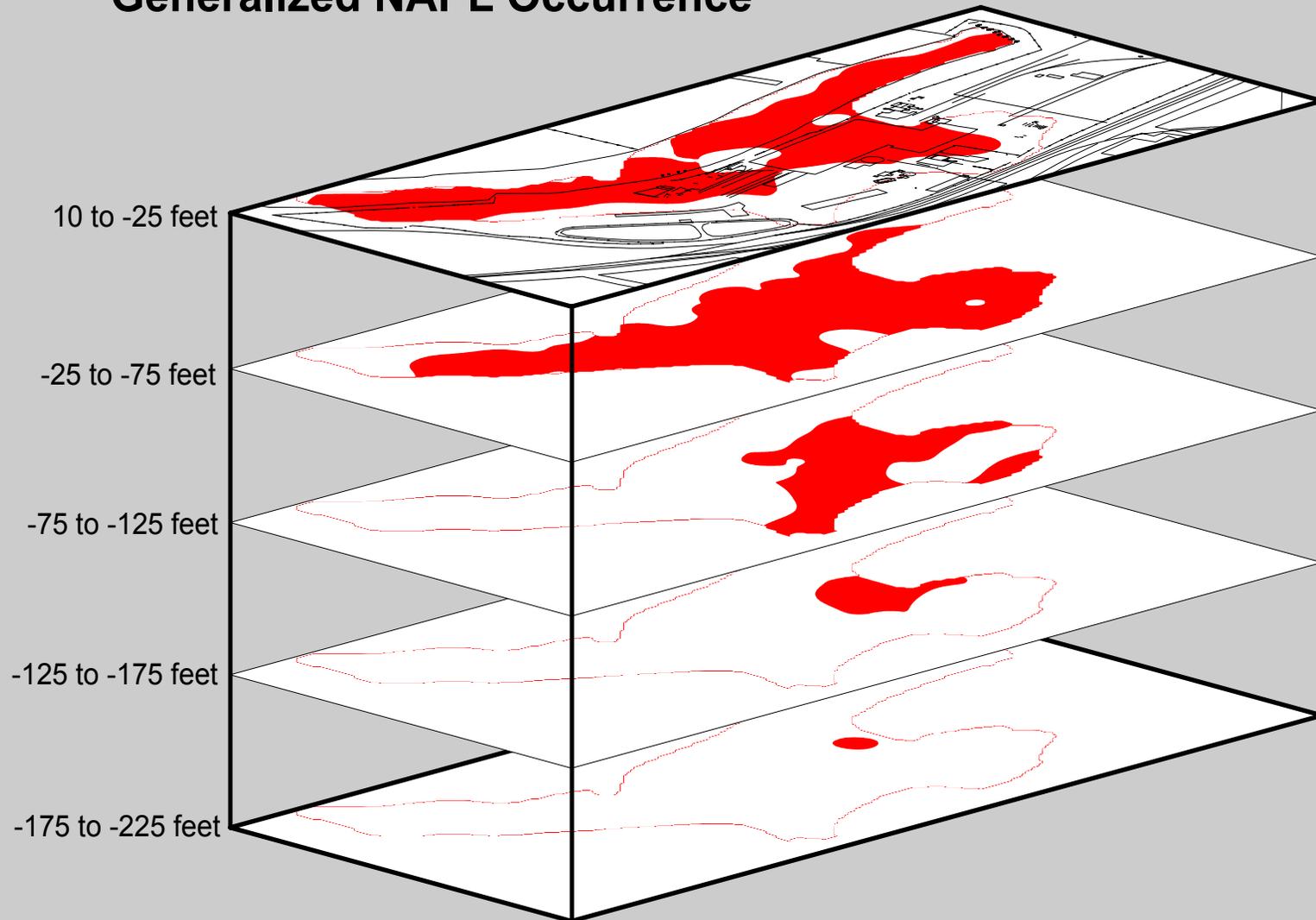
# CPT based SOIL CLASSIFICATION



ELEVATION (feet NVD88)



## Generalized NAPL Occurrence



# Ft. Lewis East Gate Disposal Yard

- Logistics Center mission was vehicle maintenance from 1946 to 1970s.
- Wastes received included spent fuels and solvents.
- Drummed wastes were noted as buried, or bulk liquids poured directly into trenches and subsequently burned and/or buried.

# Ft. Lewis East Gate Disposal Yard

- Funding constraints mandated 2 phases.
- Triad approach used during both phases:
  - Phase I (1998-99):
    - » **Determine extent of contamination and Support data needs to complete an EECA.**
    - » **Buried Drums found mandated Interim Removal Action.**
  - Phase II (2000-2001):
    - » **Designed to collect support data for remedial action alternative chosen.**

# Ft. Lewis East Gate Disposal Yard

- Triad approach used to evaluate extent of contamination and remediation options
  - **Systematic Planning established Phase I goals:**
    - » Determine the NAPL present and acting as a contaminant source (i.e., TCE) to GW.
    - » Estimate vertical/horizontal extent of NAPL.
    - » Determine soil stratigraphy (type, thickness, heterogeneity) and hydrogeology characteristics.

# **Ft. Lewis East Gate Disposal Yard**

- **Phase I Triad approach continued:**
  - **Refine CSM with various techniques:**
    - » **Aerial photography.**
    - » **Geophysical methods (EM-61).**
    - » **Soil gas survey.**
    - » **Exploratory trenches.**
    - » **Direct push groundwater sampling.**
    - » **Onsite GC analysis.**

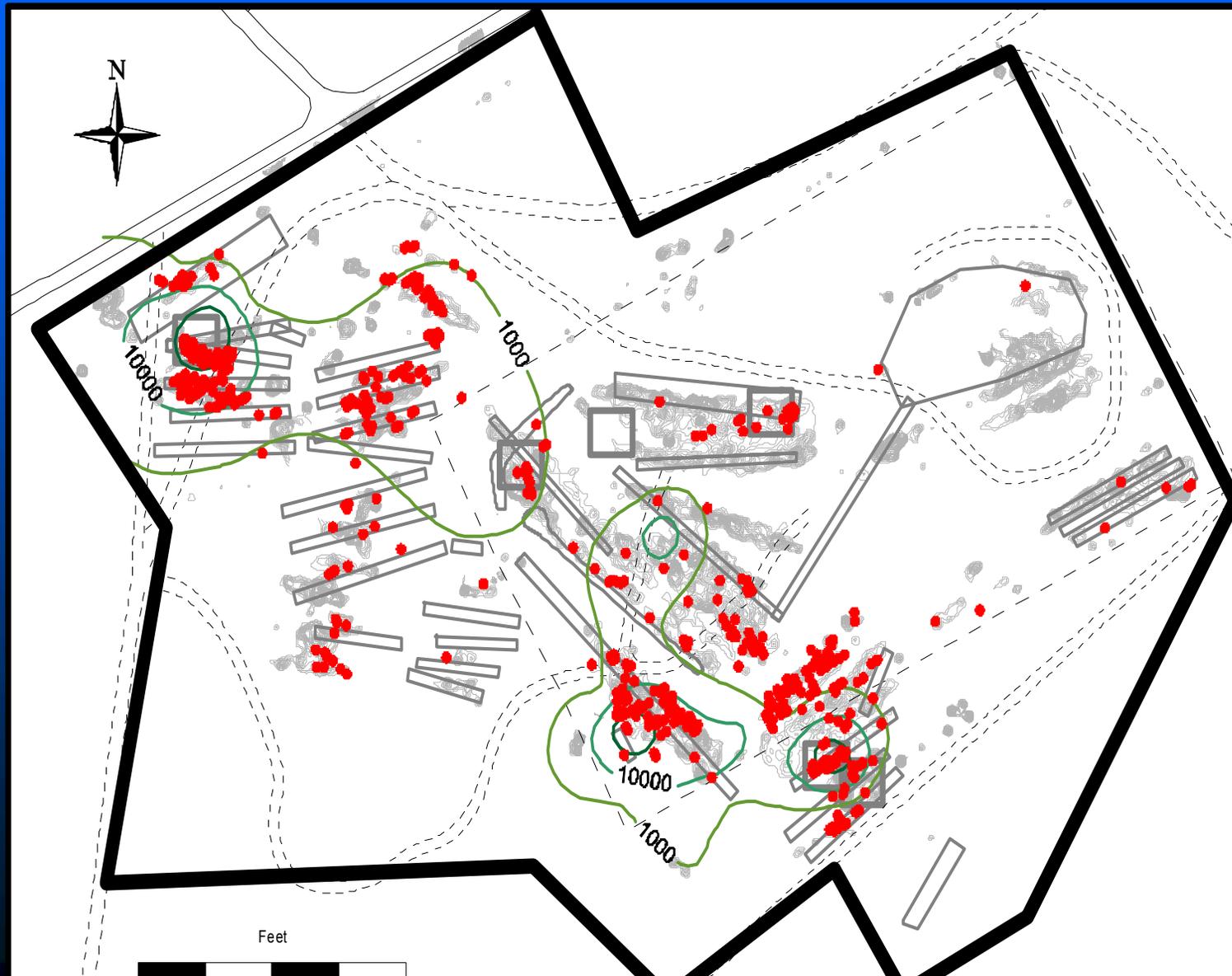
# Ft. Lewis East Gate Disposal Yard

- Phase I Triad Approach continued:
  - Dynamic Strategy:
    - » **Aerial photos used to locate potential trenches/pits.**
    - » **EM survey clarified trenches containing metal debris.**
    - » **Soil gas sampling used to distinguish potential NAPL sources and direct locations for exploratory trenches.**
    - » **Exploratory trenches clarified the nature of the buried waste and debris.**
    - » **GW sampling were used to determine if NAPL was present and it's approximate extent.**
    - » **Real-time TCE data used to direct further sample locations and determine extent of contamination.**

# Ft. Lewis EGDY-EECA

- Purpose: to evaluate remedial alternatives to accelerate cleanup and reduce overall costs.
- Preferred alternative:
  - Optimize P&T system.
  - Remove source area drums.
  - Thermal treatment of NAPL contaminated source soils and groundwater.

# Results of Drum Removal (red) and Presence of NAPL (gray)



# East Palo Alto

- Brownfields – 5 parcels (~1 acre).
- Former flower production – 1910 to 1950.
- Pesticides:
  - DDT
  - cyclodienes
- Residential redevelopment – restoration costs a critical factor.



# East Palo Alto

- Triad Approach application:
  - Systematic Planning: CSM postulated application residue or mixing areas. PRGs/ESLs used for action levels.
  - Real-Time Measurement: Immunoassay paired with EPA 8081 for collaborative data set.
  - Dynamic Strategy: Soil samples collected initially from 3 depths at each location, field analysis guided vertical/horizontal delineation.

# East Palo Alto

- Soil samples:
  - 78 locations, multiple depths
  - analyzed in the field
    - » Envirogard DDT
    - » RaPID Assay Cyclodiene
  - QC lab samples – good agreement
- Findings – CSM correct - no mixing areas but low levels of dieldrin and other pesticides – development can proceed with proper soil management.



# Triad Case Studies Perspective

- Focus on Site Characterization/Source Identification.
- Small/simple site examples:
  - Helps find that “Needle in a haystack.”
  - Able to provide coverage necessary to assure regulators and public the CSM is accurate.
- Large/complex site examples:
  - Helps determine “How Much is there and Where.”
  - Support surgical removals / waste segregation.

# Triad Case Studies Conclusion

- Proper Systematic Planning is the foundation to applying the Triad Approach correctly and receiving the most benefit.
- Triad application is independent of project size or complexity.
- Triad can ensure adequate data is available to support ongoing fieldwork, CSM development, and final project decisions while managing major sources of uncertainty.