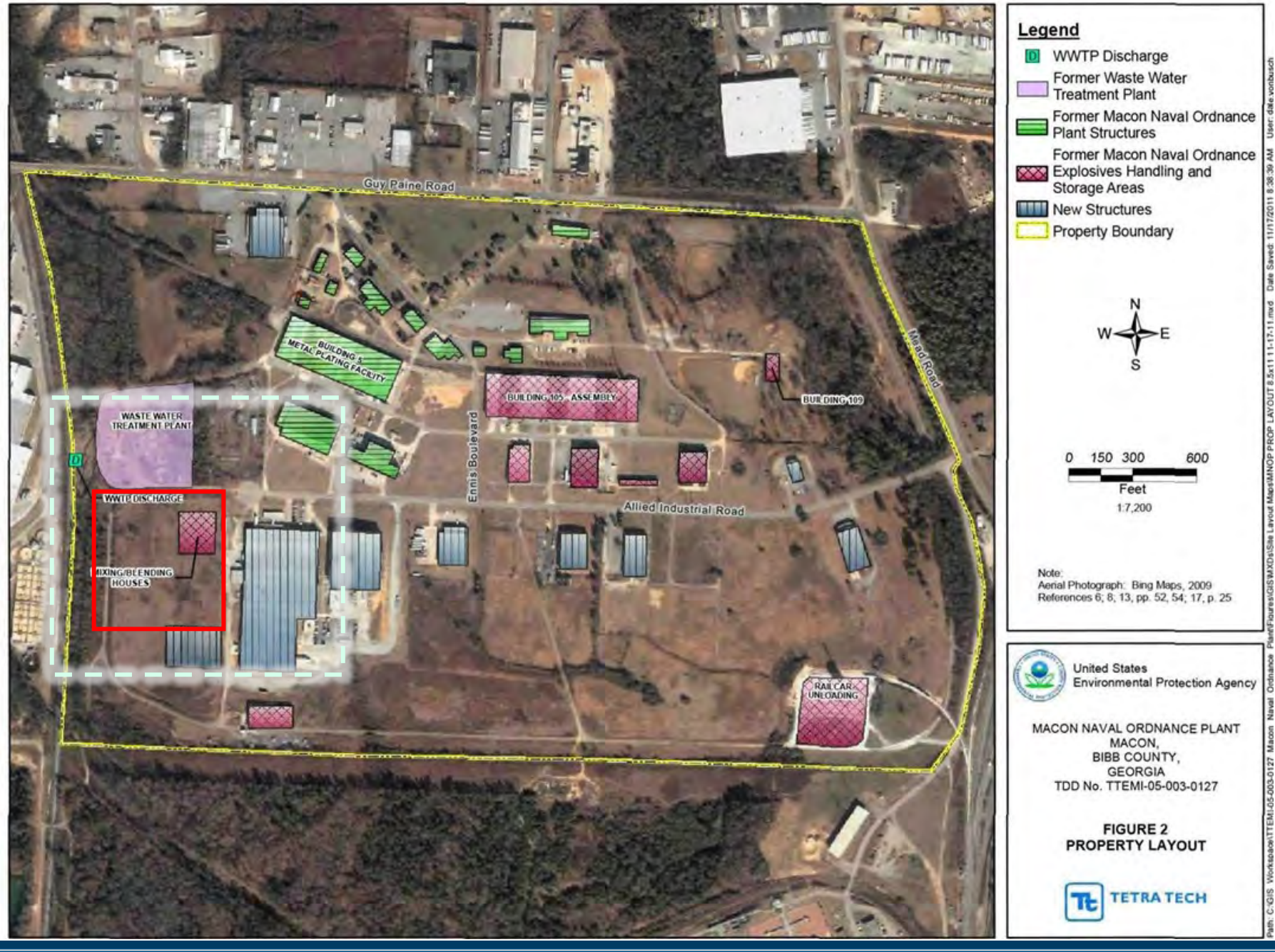
Case Study: Macon Naval Ordnance Plant (MNOP)

Background

- Former: Ordnance production operated by Navy 1941-1965
- Currently: industrial park with various tenants
- Problem: TCE plume with some DNAPL
- Potential sources: metal plating, transformer buildings, ASTs/USTs, stormwater outfall, sewage treatment plant, explosives handling

Photo by Google Streetview

MNOP site

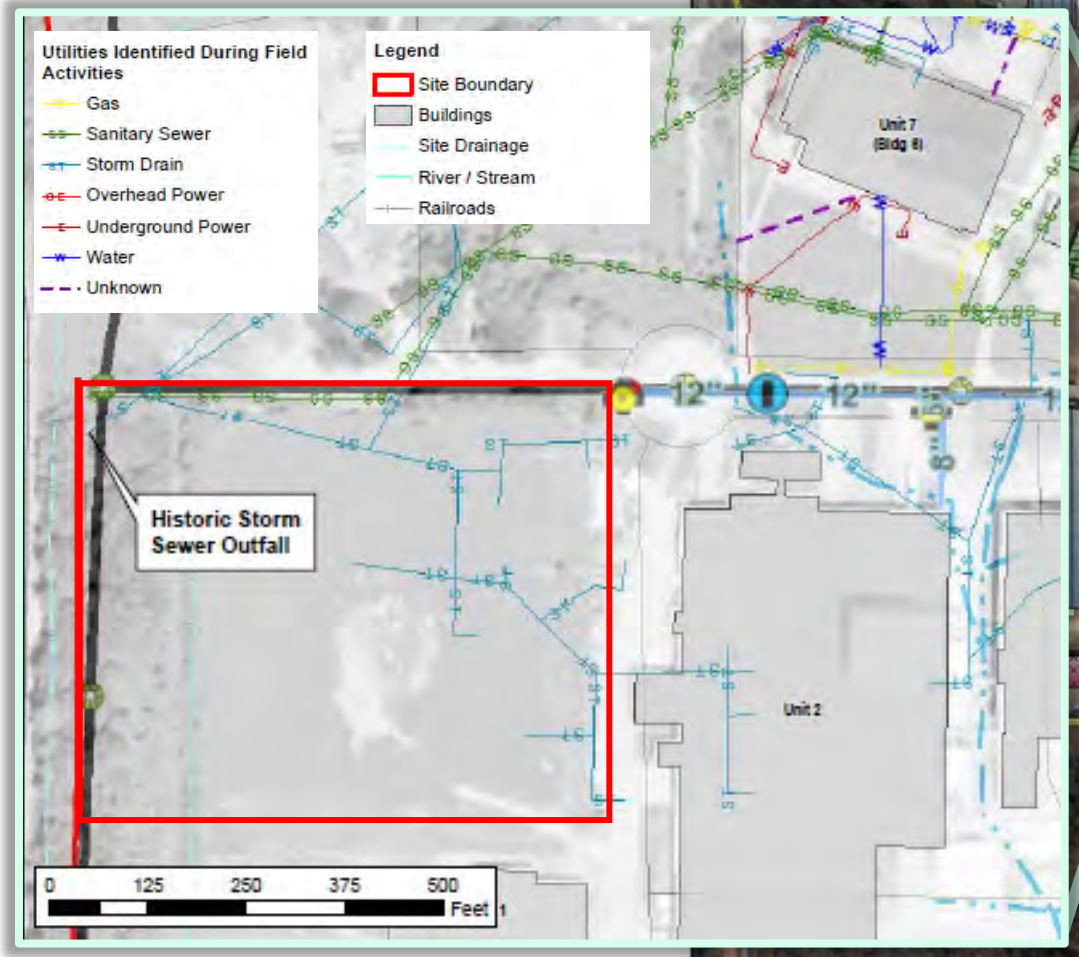


All maps pulled from reports provided by EPA Regional Lead.

Source: TetraTech

MNOP site

Source: ERM



Legend
- WWTP Discharge
- Former Waste Water Treatment Plant
- Former Macon Naval Ordnance Plant Structures
- Former Macon Naval Ordnance Explosives Handling and Storage Areas
- New Structures
- Property Boundary

N
W E
S

0 150 300 600
Feet
1:7,200

Note:
Aerial Photograph: Bing Maps, 2009
References 6; 8; 13, pp. 52, 54; 17, p. 25

United States Environmental Protection Agency

MACON NAVAL ORDNANCE PLANT
MACON,
BIBB COUNTY,
GEORGIA
TDD No. TTEMI-05-003-0127

FIGURE 2
PROPERTY LAYOUT

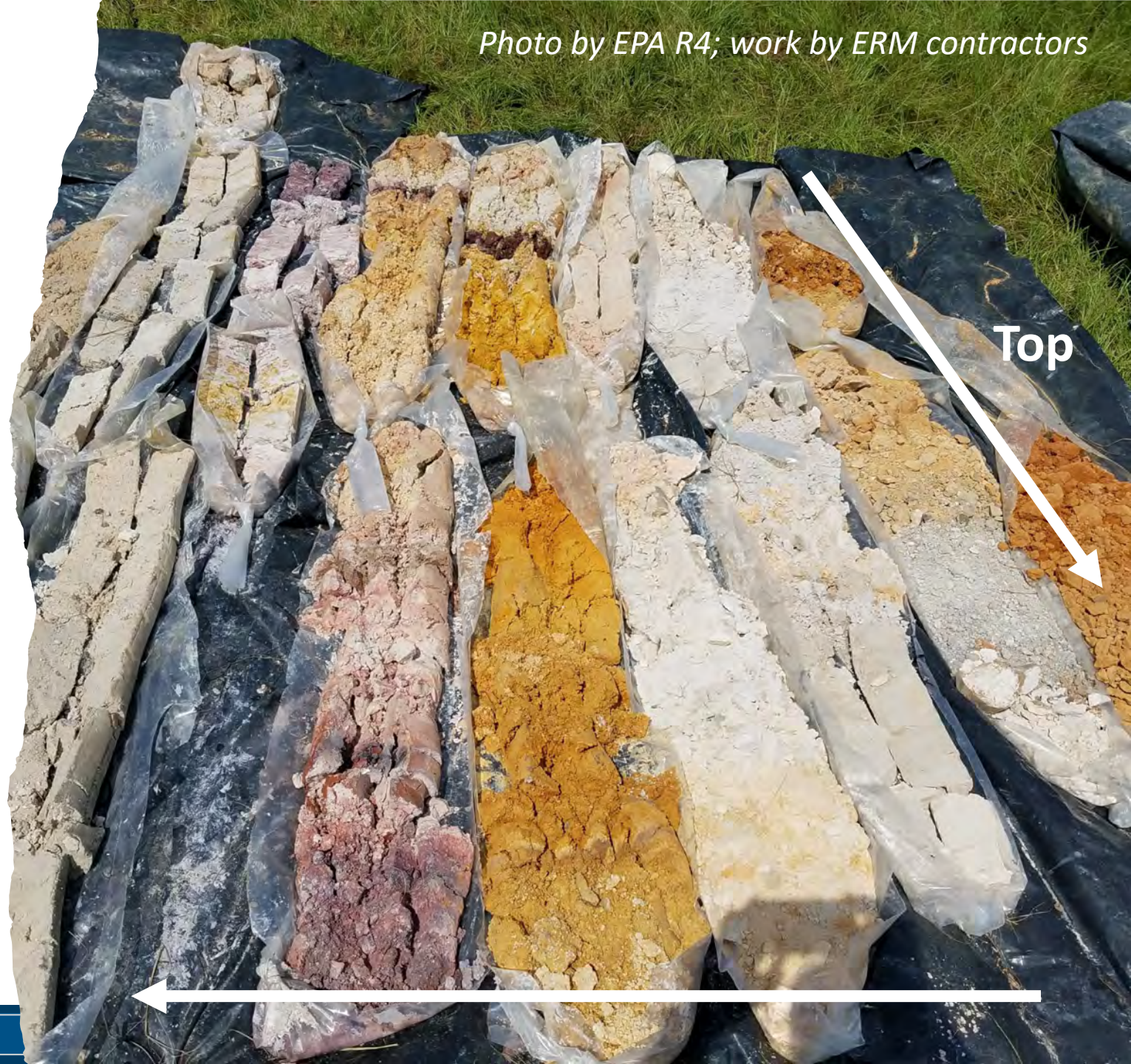
TETRA TECH

Geology

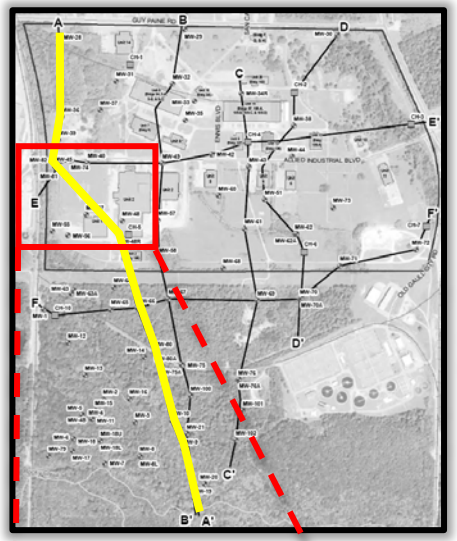
- Upper silt and clay
- Upper gravel
- Micaceous sand, silt, and clay
- Discontinuous clay
- Sands and silty sands

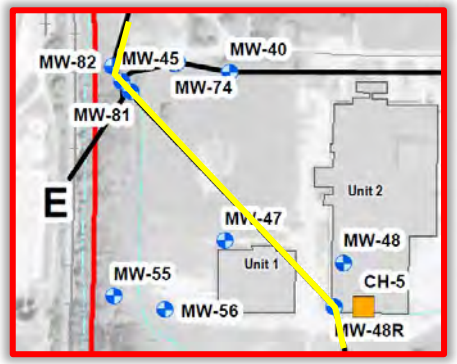
  (top of water-table aquifer)
- Clay confining unit

  (bottom of water-table aquifer)
- Tuscaloosa Aquifer



Geology





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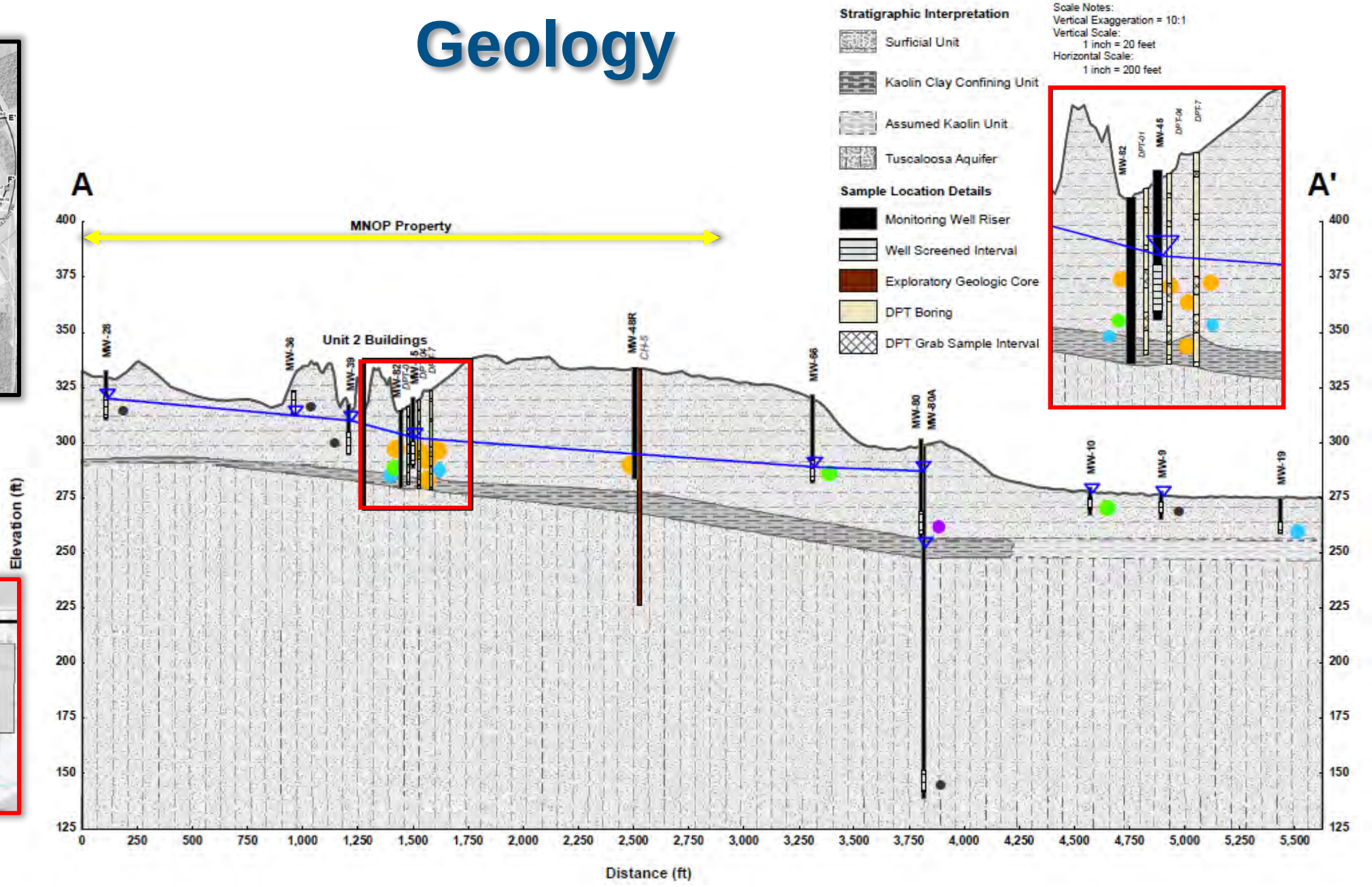

Previous Data

Source: ERM

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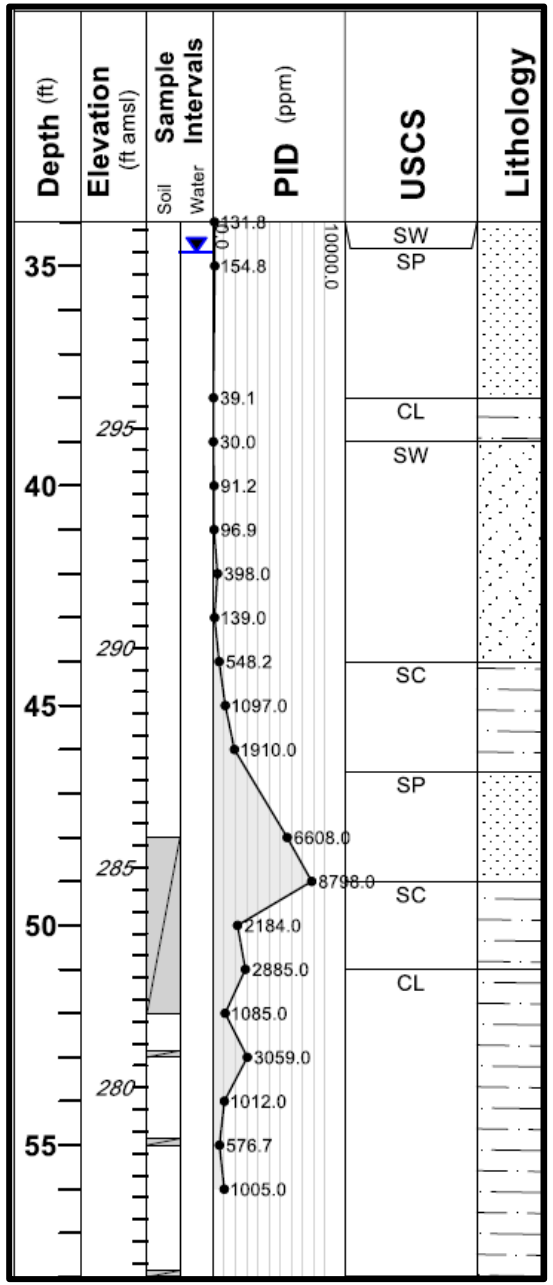


← Water level

Sand

Clay

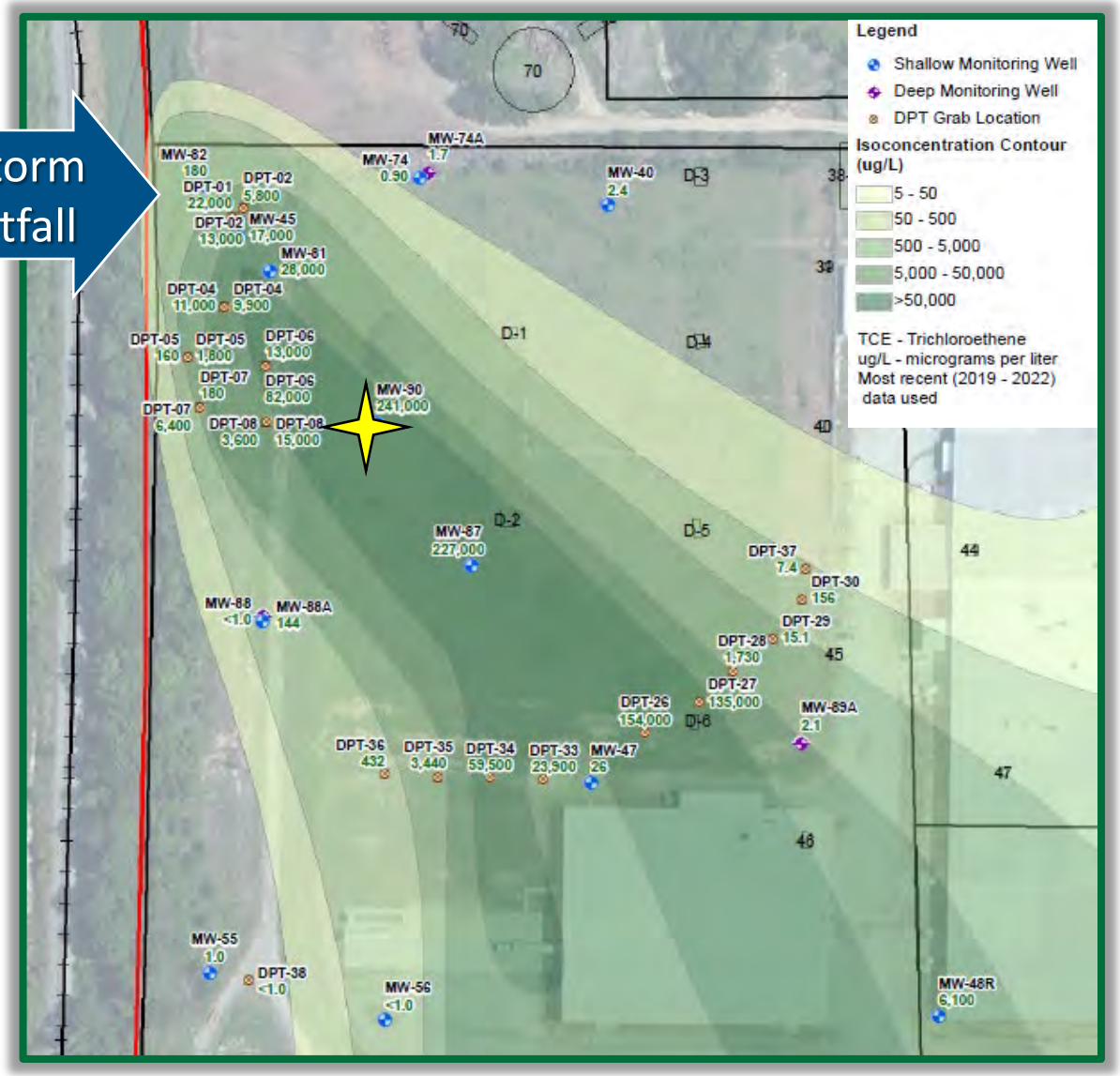
Sand

PID = >8,000 ppm

↖ Clay (confining unit)

Source: ERM

TCE concentrations in GW (ERM)



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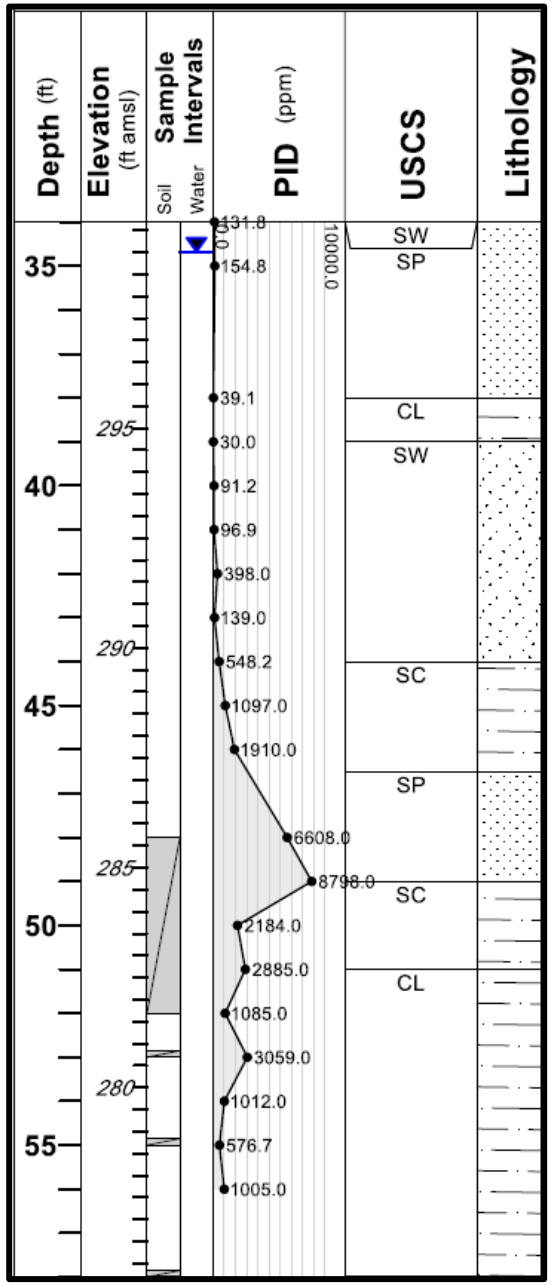

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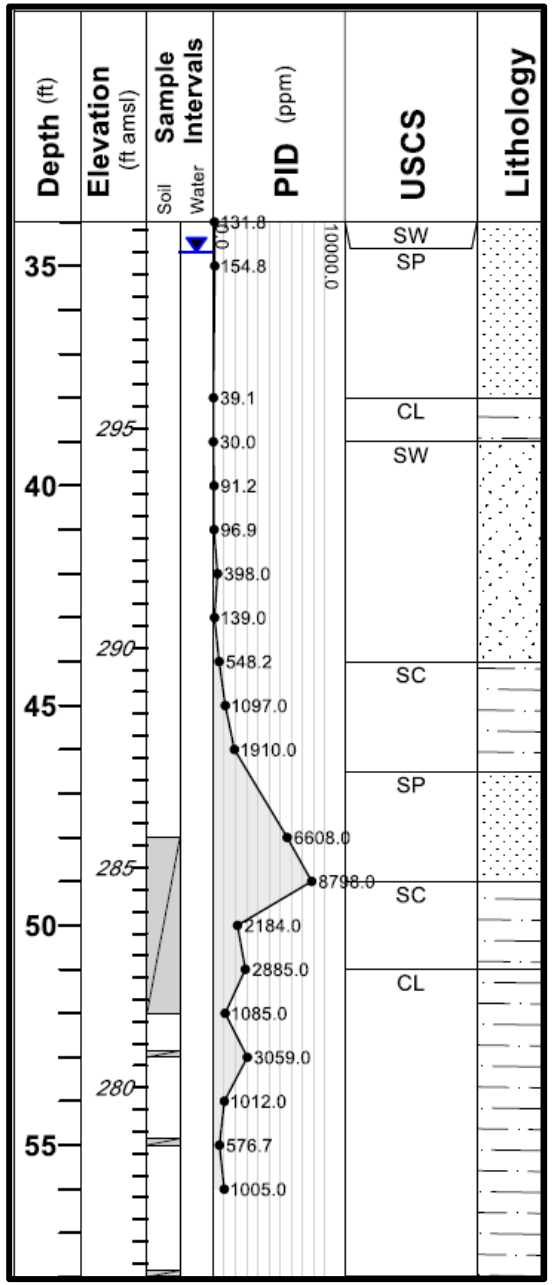

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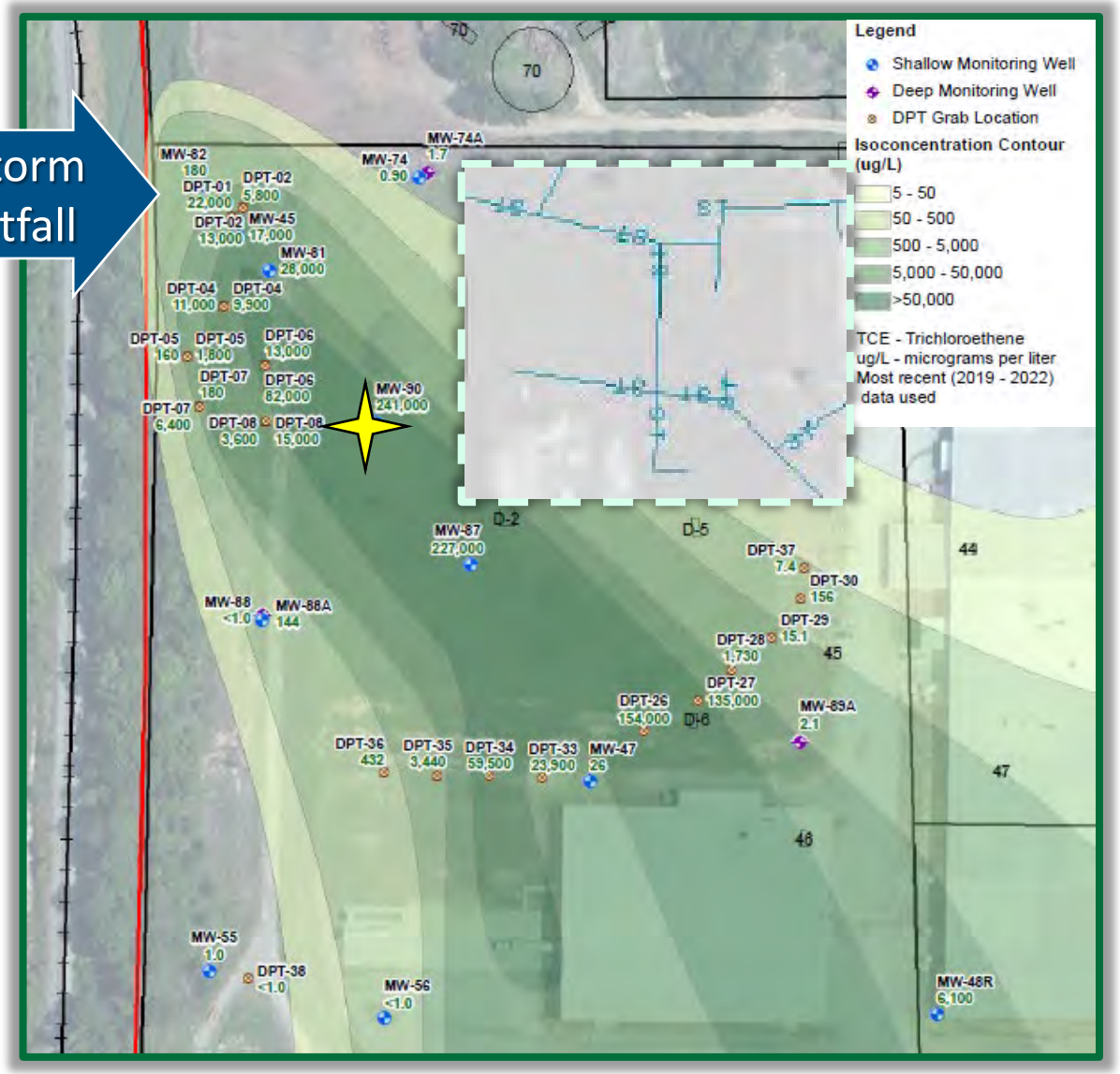

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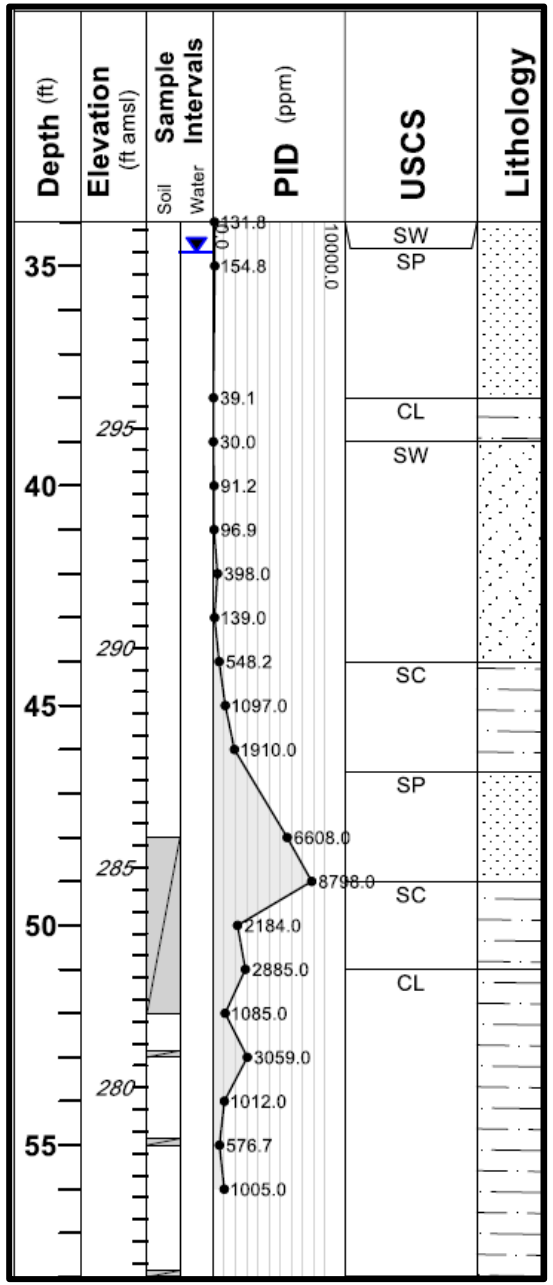

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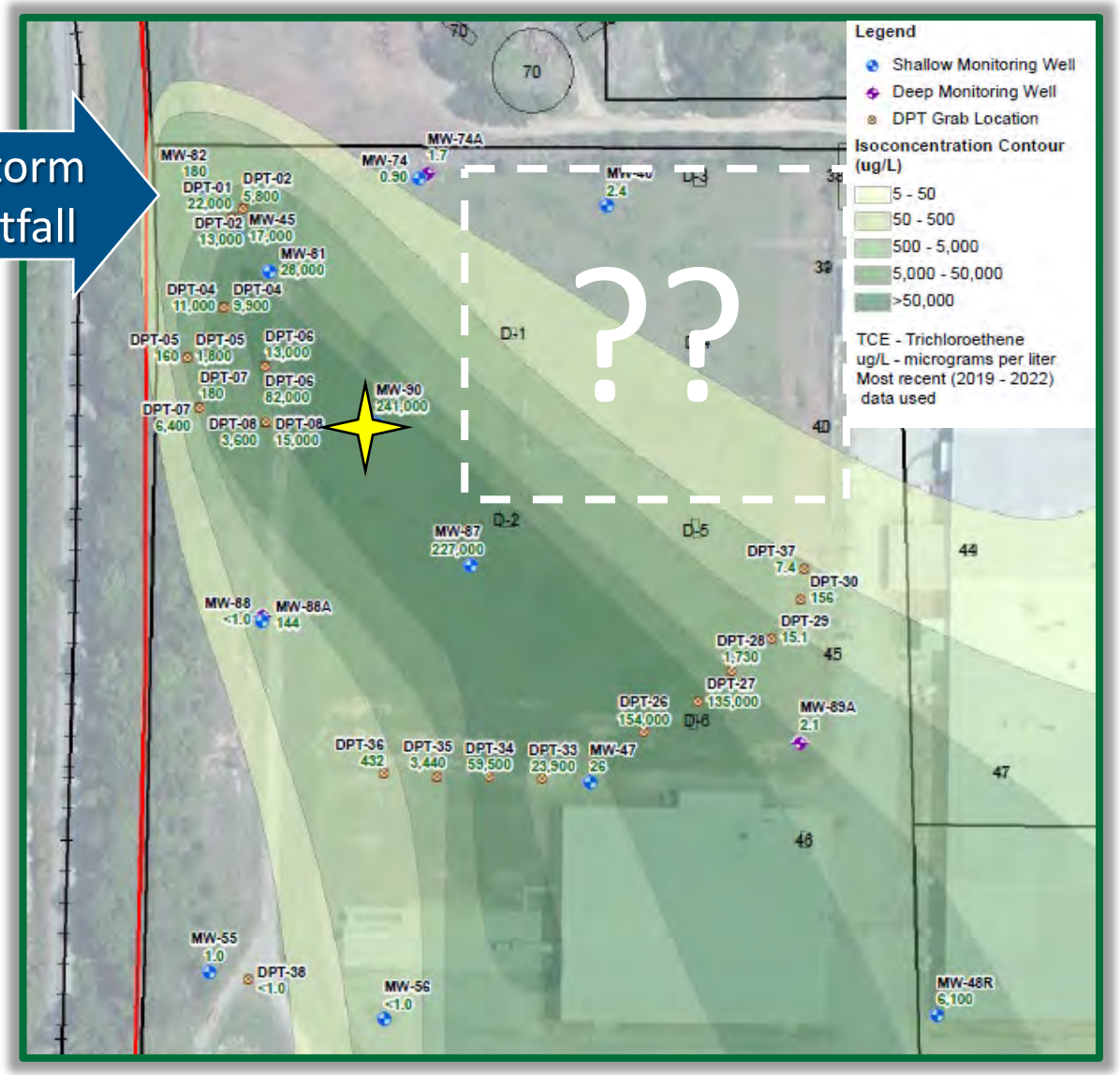


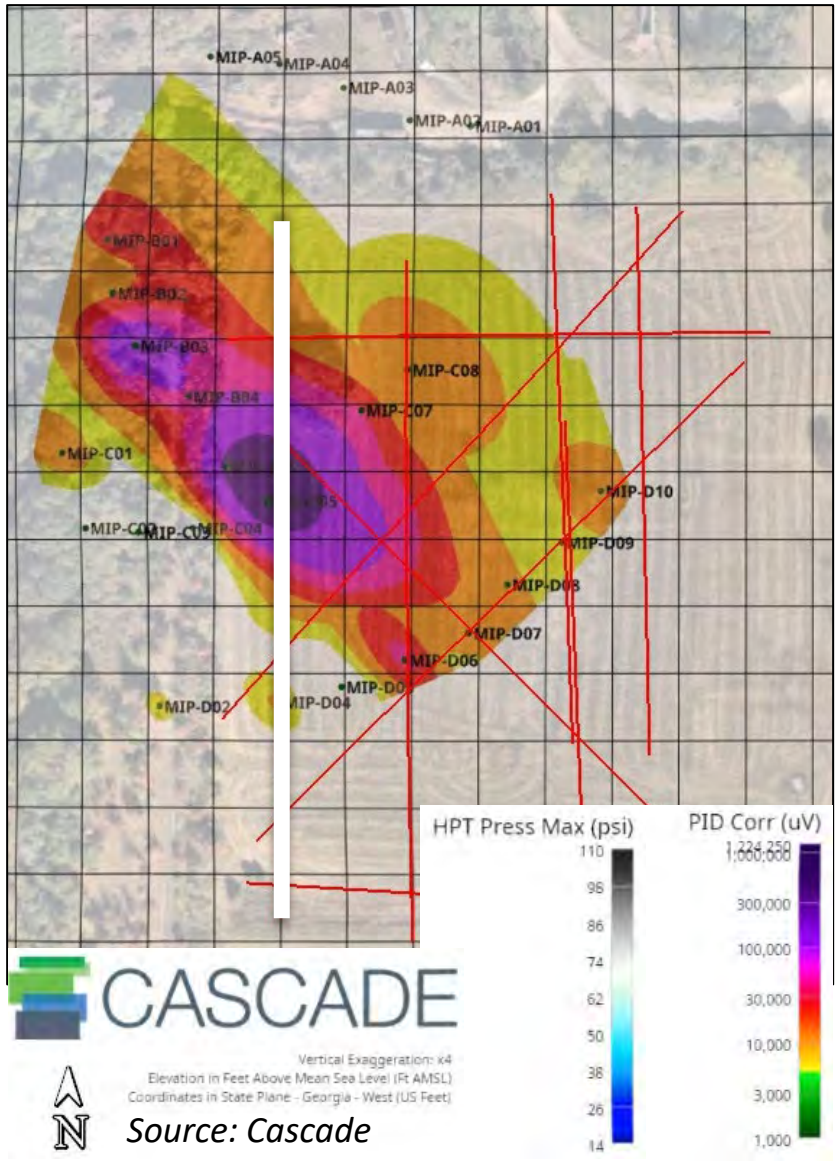
Phase 1 ERI surveys

TCE concentrations in GW

Phase 1 ERI surveys

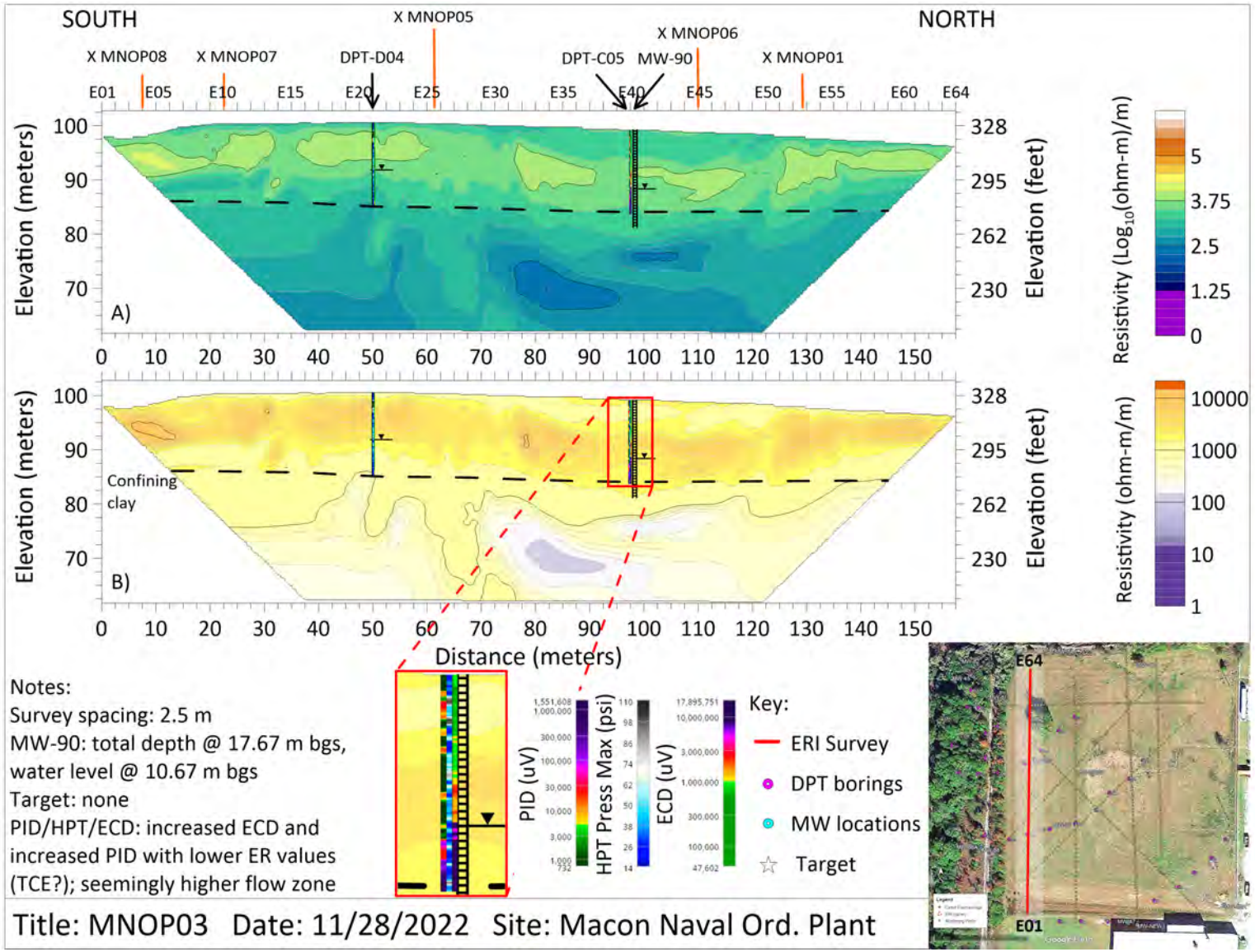
Phase 1 Results

PID concentrations (Cascade)



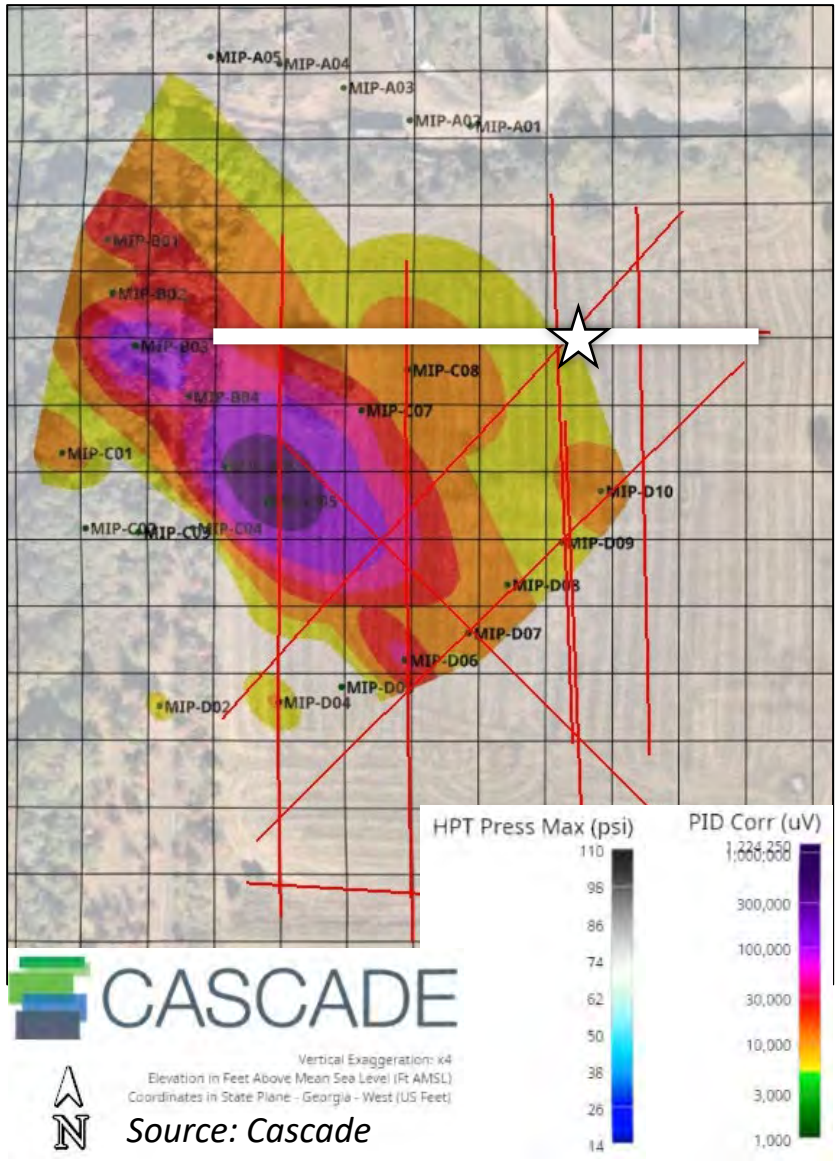
Source: Cascade

ERI Results (EPA ORD)



Phase 1 Results

PID concentrations (Cascade)



Source: Cascade

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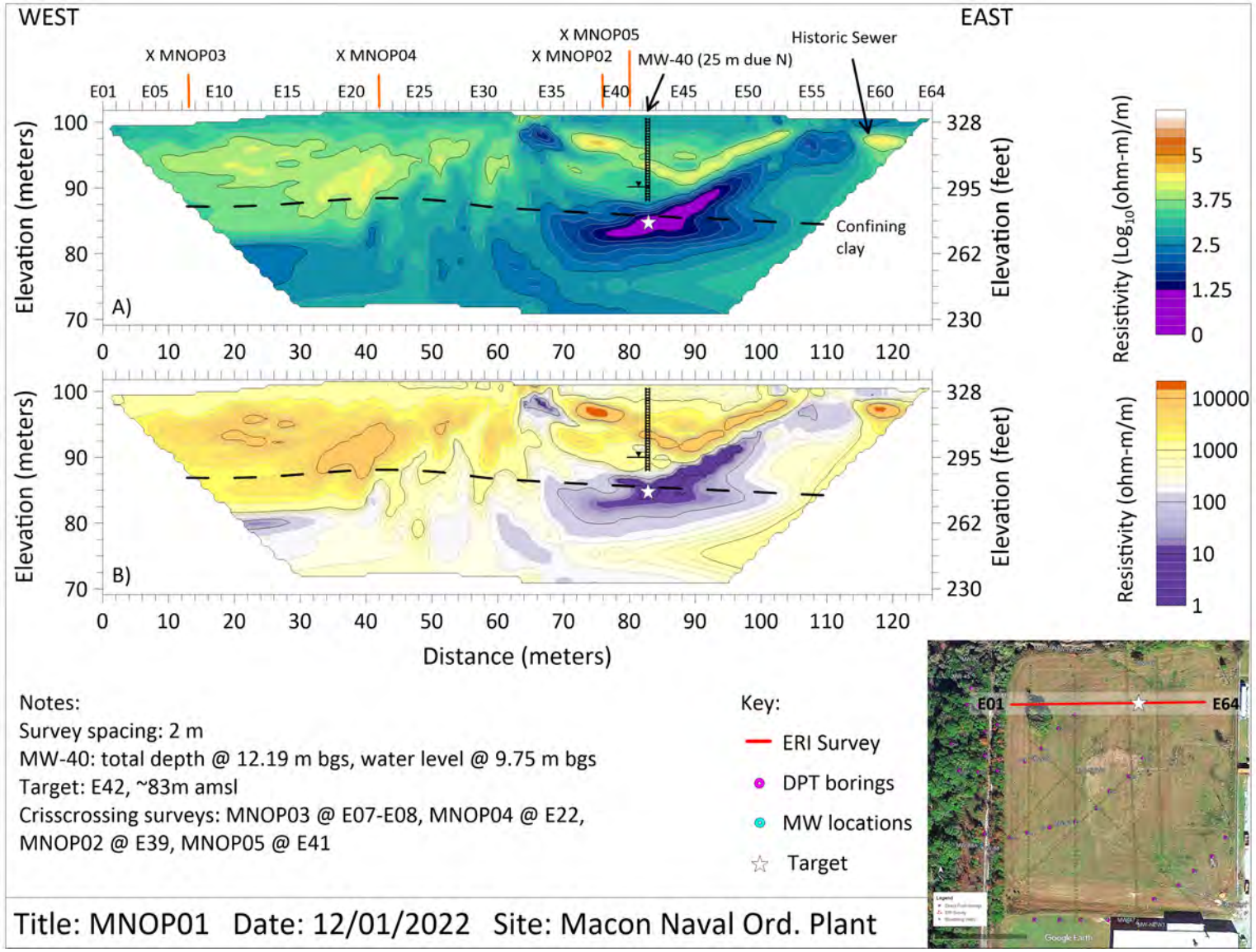


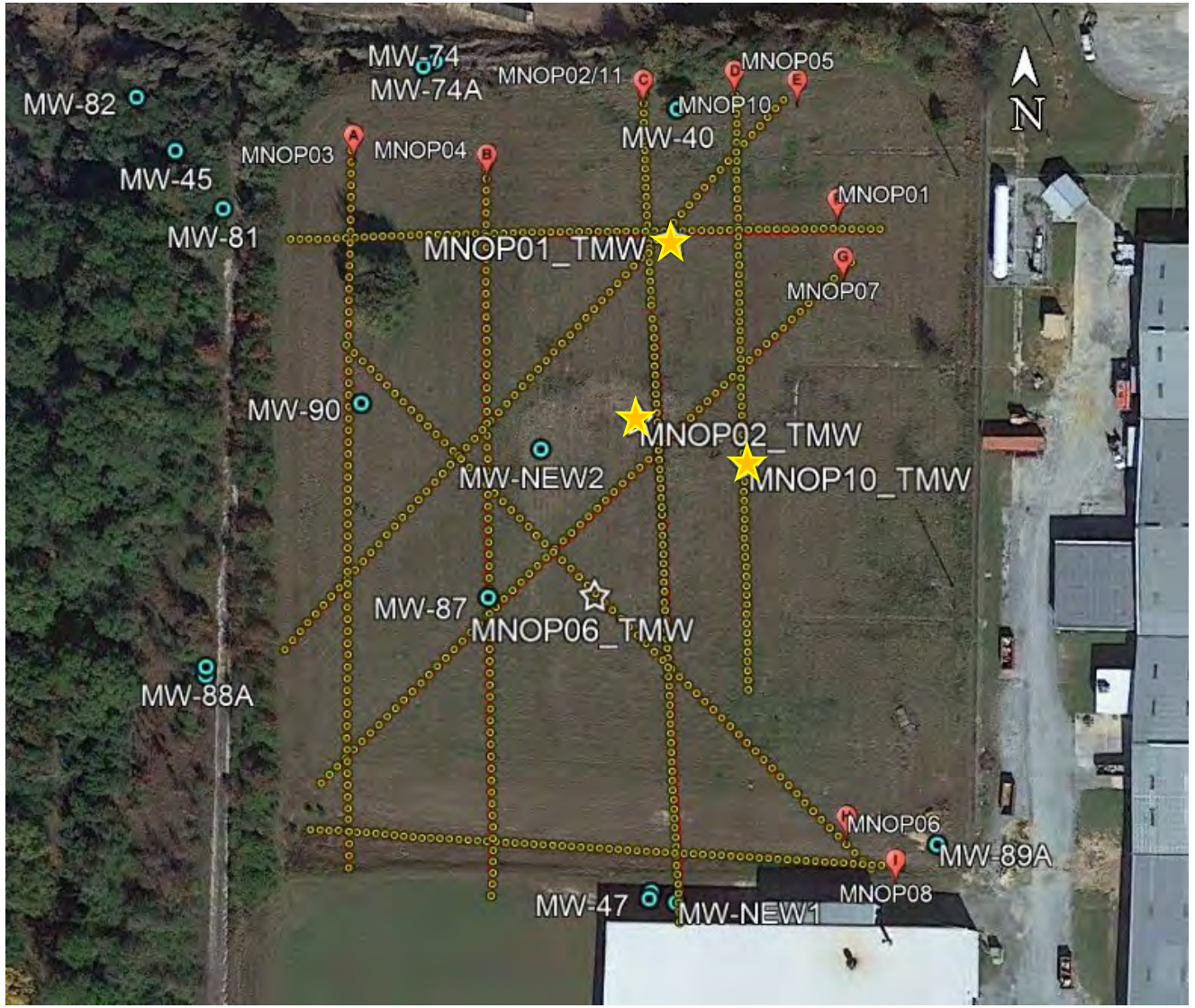
Model calibration

- Doctors don’t operate without prior knowledge (scan)

- ERI surveys can indicate targets for further inspection (drill)

Phase 2 Plan

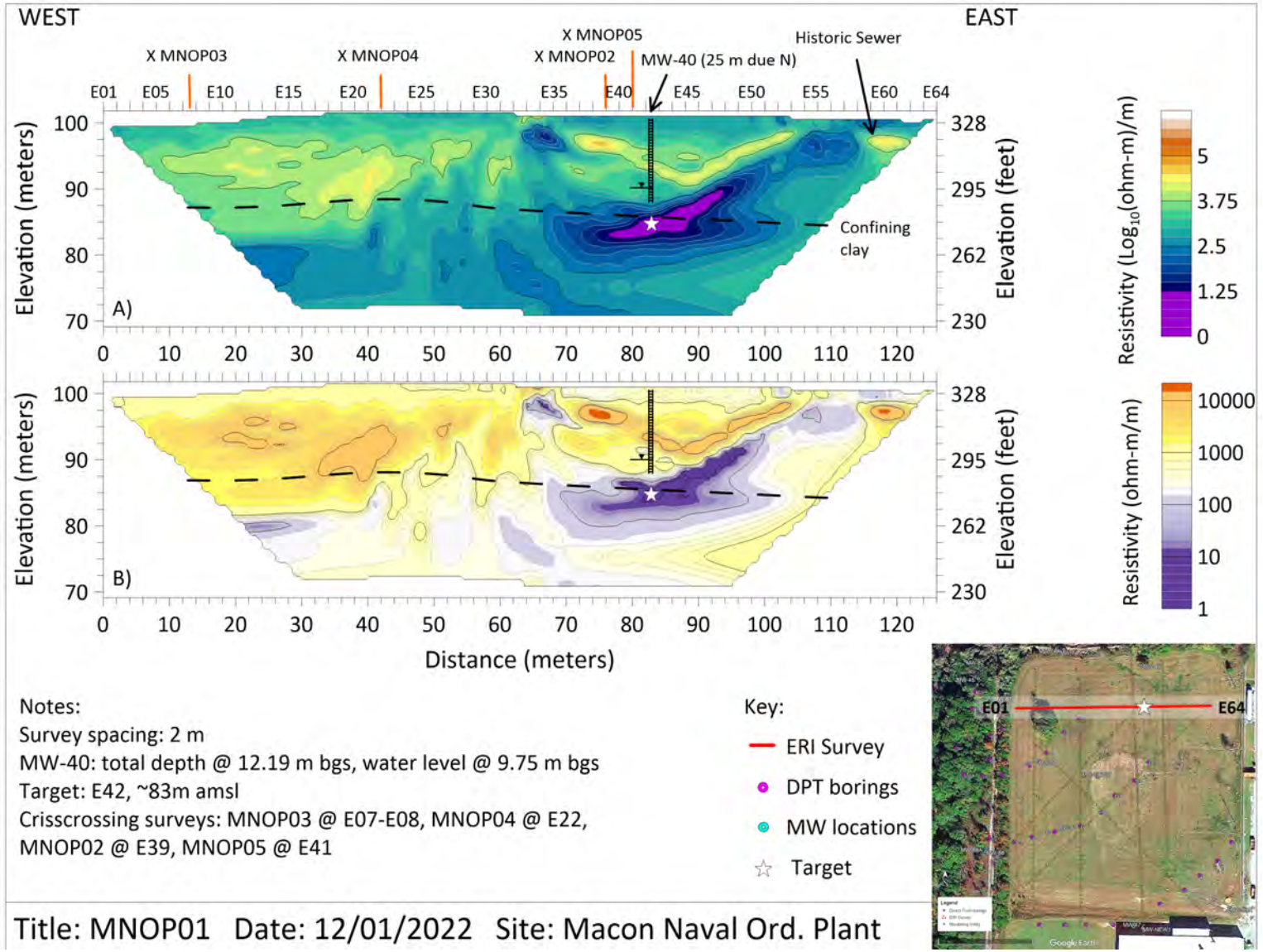
- Model verification; Drilling targets
  - Four locations
    - Variable depth: 53 ft, 40 ft, 37 ft, and 12 ft bgs.
    - Confining clay depth: ~50 ft bgs.
  - Soil core sampling
  - Groundwater sampling (if present)
- VOC analysis
  - TCE and breakdown products



Phase 2 Preliminary Results

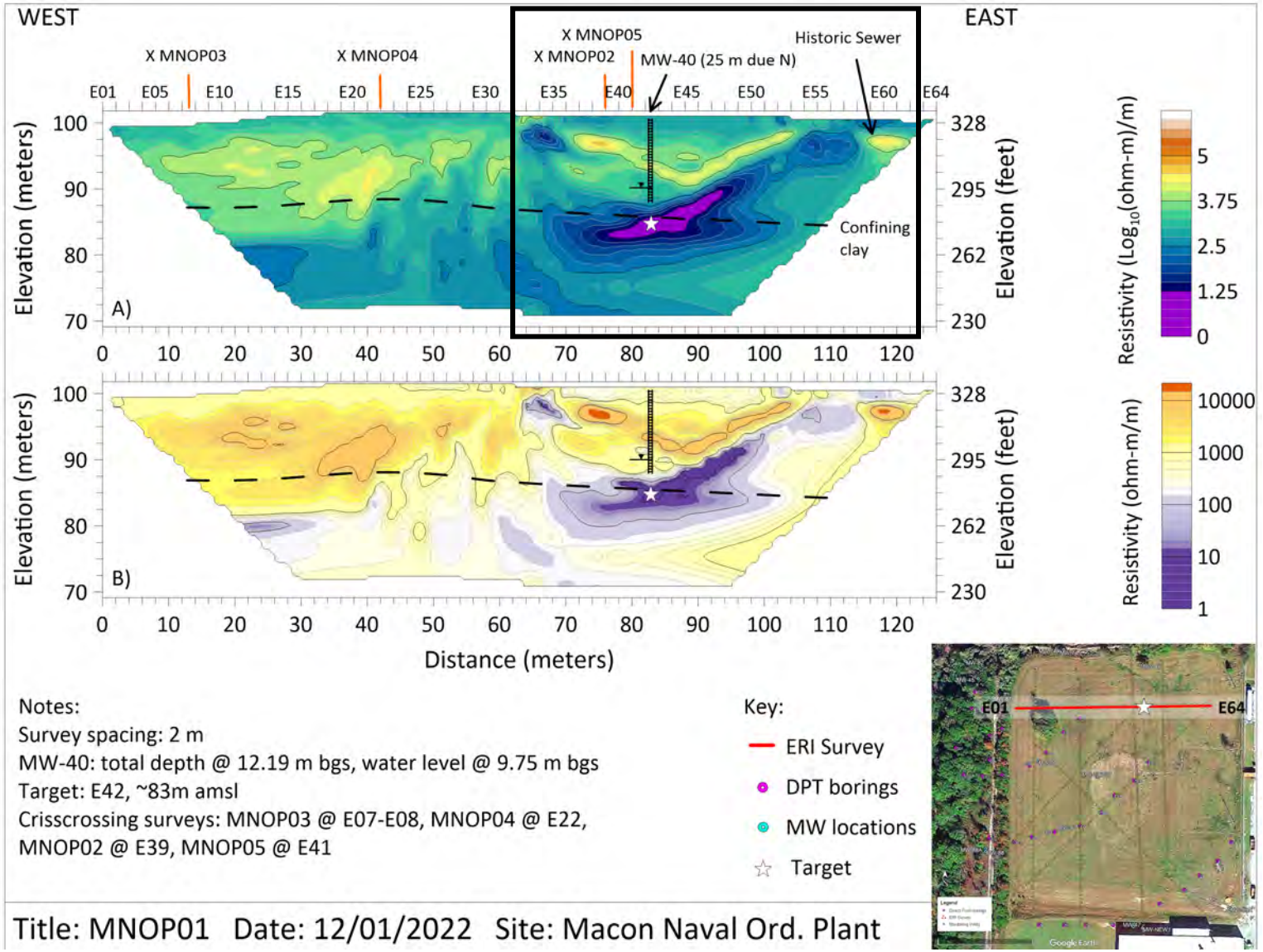
- Very sandy formations; some very plastic clay lenses
- Water table found where expected; produced sufficient water given limited screen and development
- No PID response except for the bottom 5-ft of MNOP02_TMW
  - What now?
  - Possible causes?
- **Importance: not every signature is a bogeyman; ERI is a tool that requires analytical validation.**

Phase 2 Preliminary Interpretation



ERI Results (EPA ORD)

Phase 2 Preliminary Interpretation



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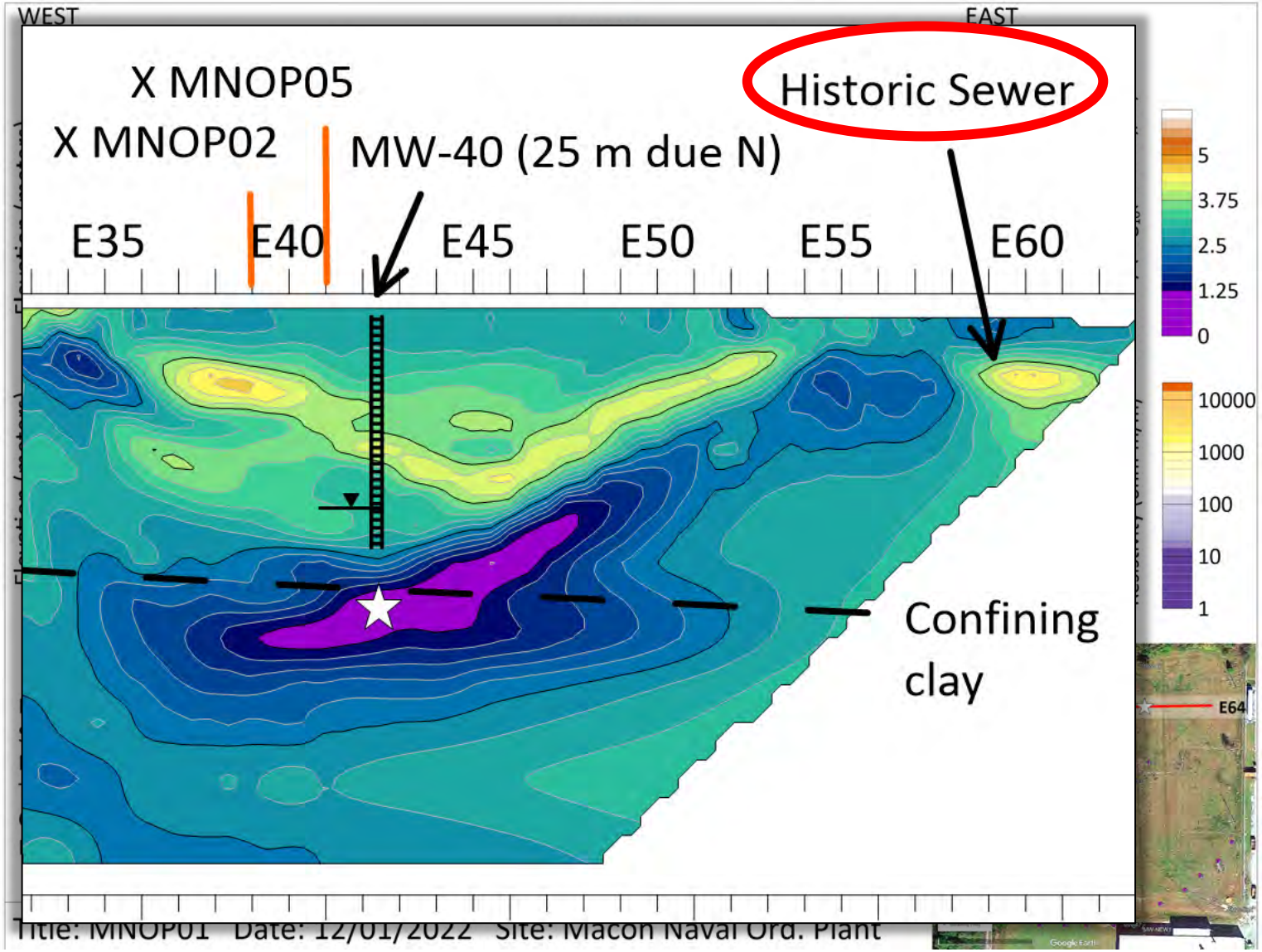


ERI Results (EPA ORD)

Lessons Learned

- How to set expectations:
  - What is the goal?
  - What is the product?
  - What do you do next?
- Potential affect of overly high contact resistance
- Potential for interference in images

Expectations

Goals

- Lithology characterization
- Contaminant characterization
- Flowpath identification

Product

- 2D images
- Psuedo-3D model
- Including other data

Data quality importance

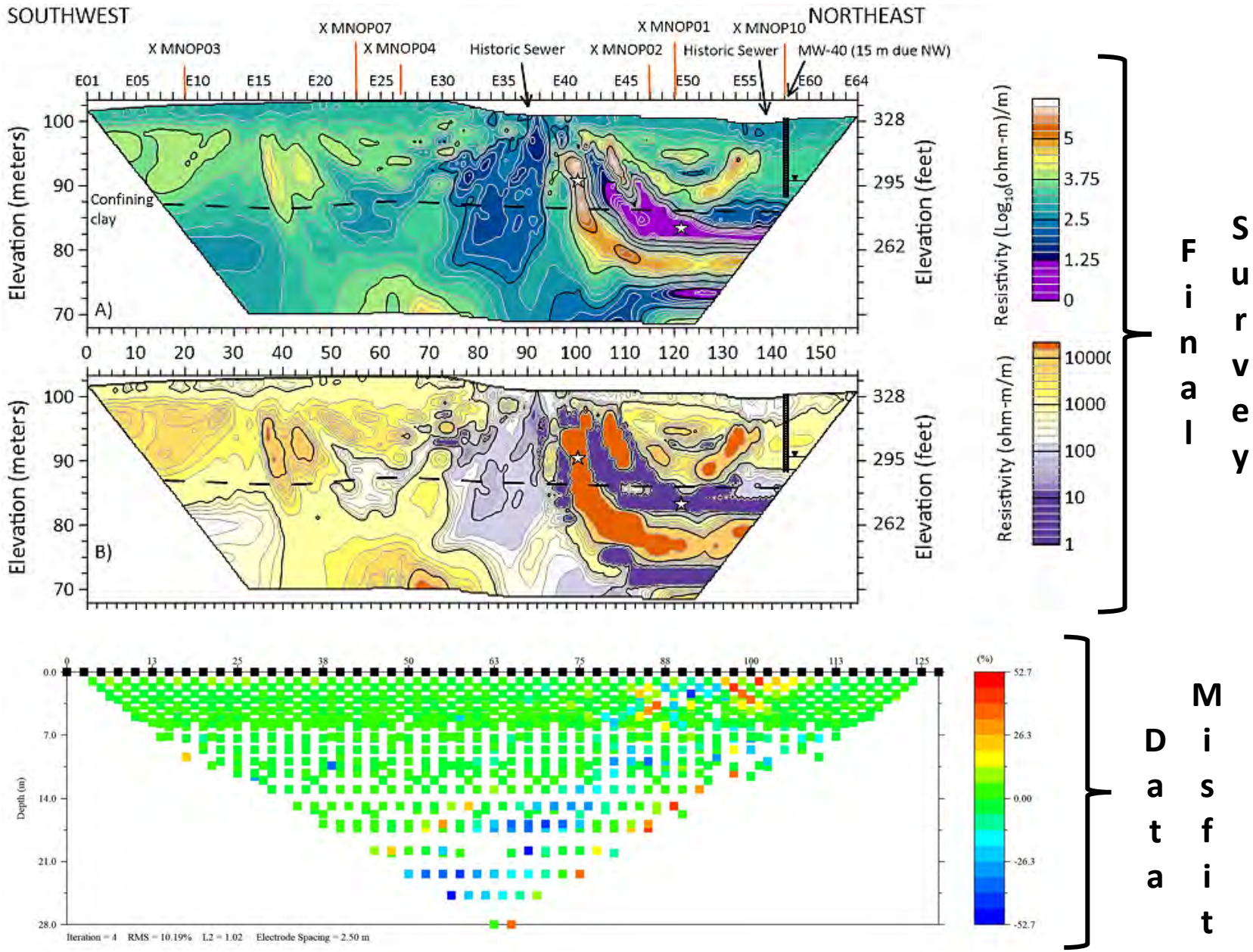
Removed electrodes which were sources of error; reprocessed data.

ERI Results (EPA ORD)

Electrode Editor

Electrode ID	Number of Noisy Data	Total Number of Data	% of Noisy Data
☑ 56	18	66	27
☑ 60	13	49	27
☑ 57	18	76	24
☑ 62	9	38	24
☑ 59	15	64	23
☑ 63	11	47	23
☑ 55	19	87	22
☑ 58	16	74	22
☑ 53	18	88	20
☑ 54	17	87	20
☑ 64	14	72	19
☐ 51	13	79	16
☐ 50	12	85	14
☑ 61	9	68	13
☐ 32	12	99	12
☐ 49	11	90	12
☐ 31	12	111	11
☐ 52	12	106	11
☐ 33	11	99	11

Settings | Remove | Restore | Close



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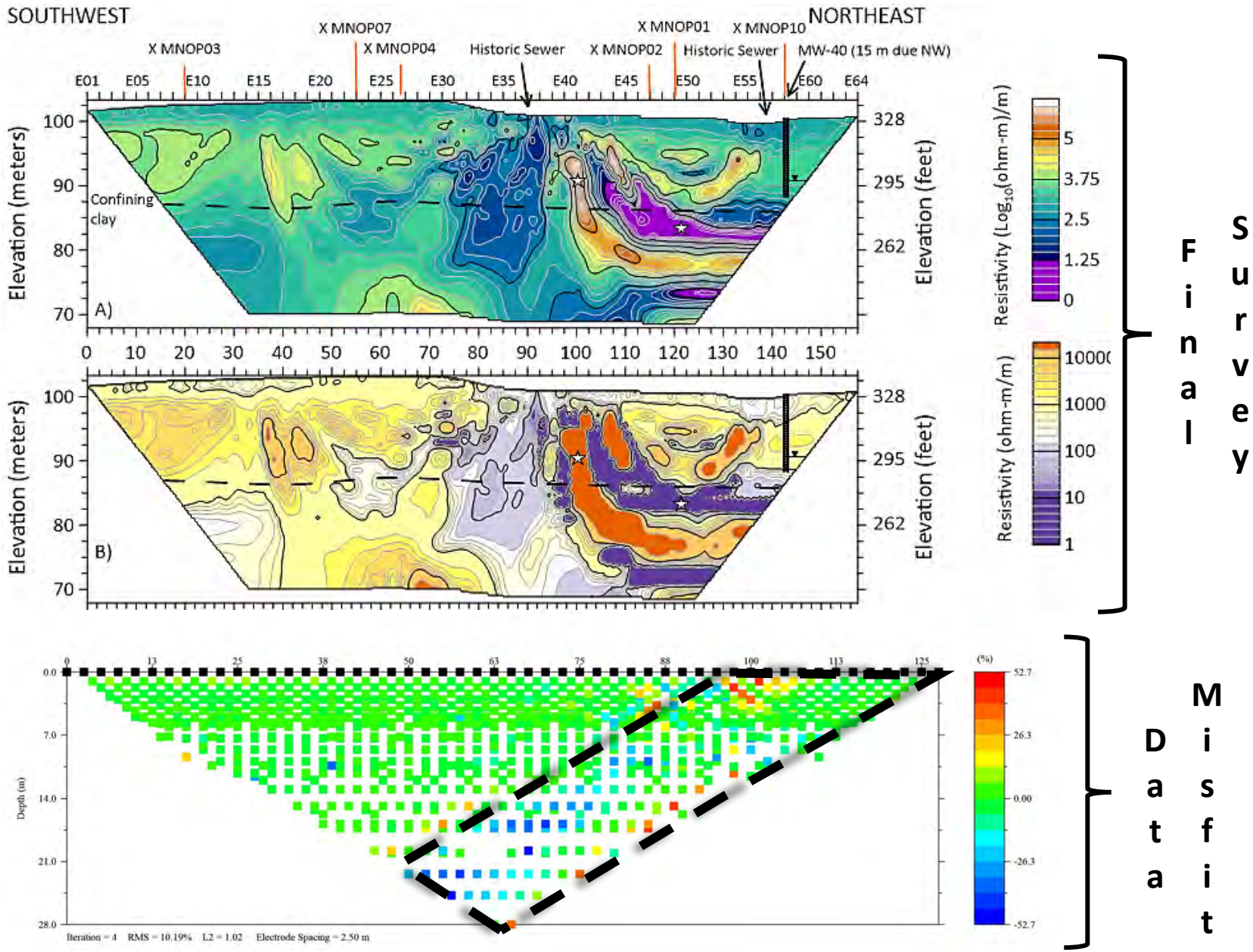
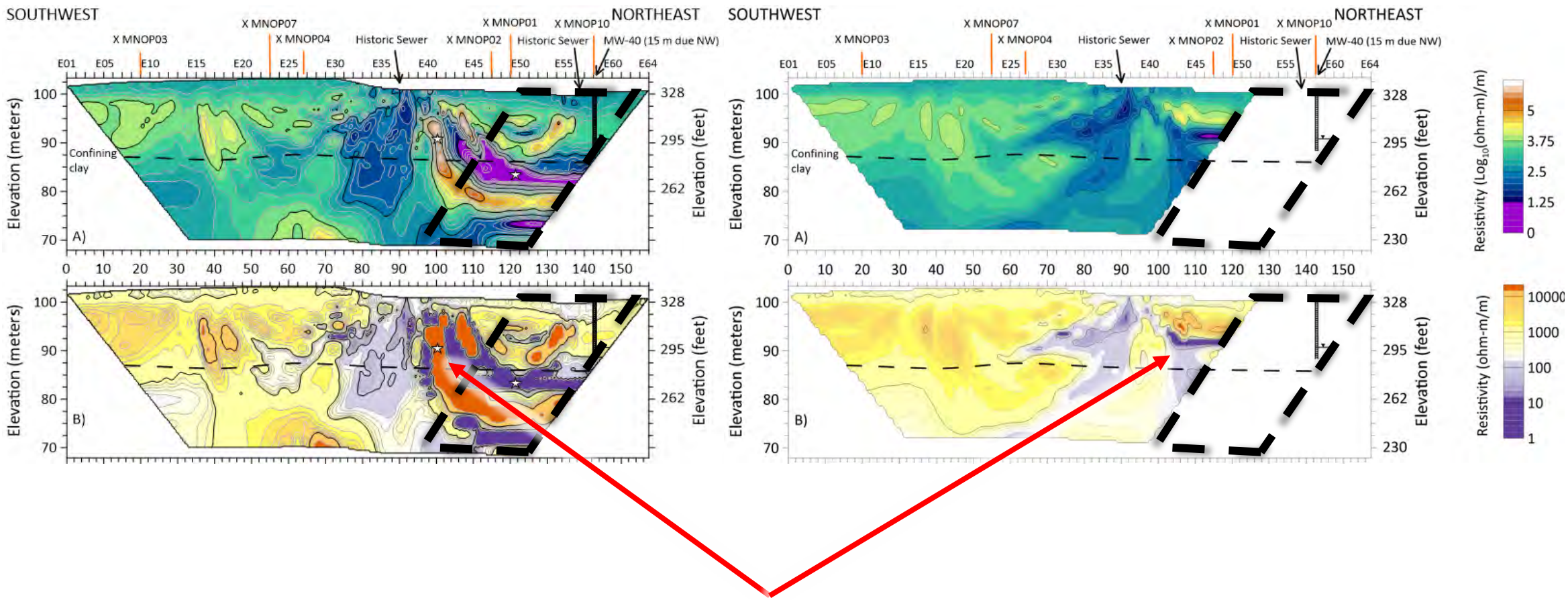


Removal of low-quality data

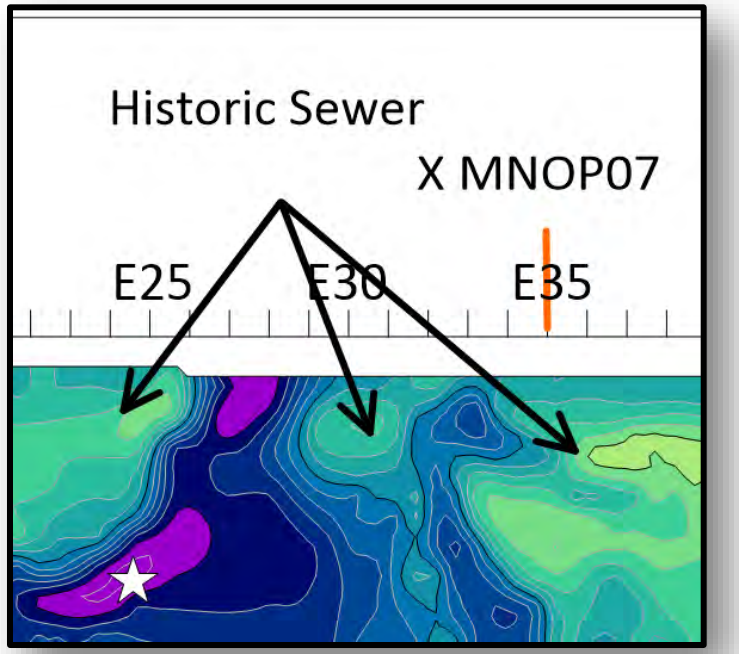
ERI Results (EPA ORD)

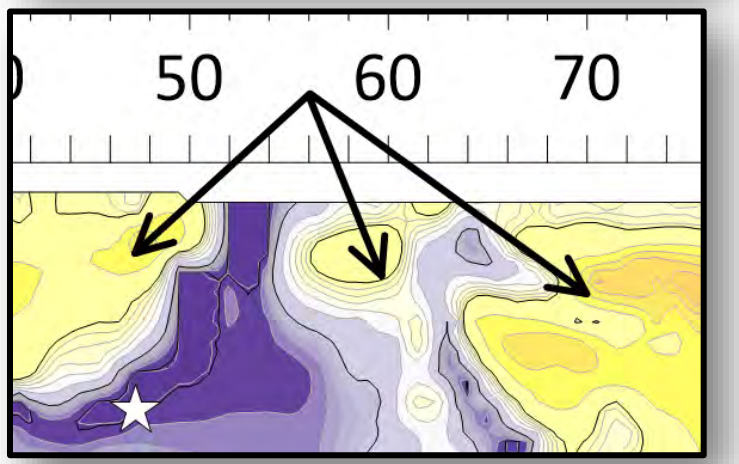


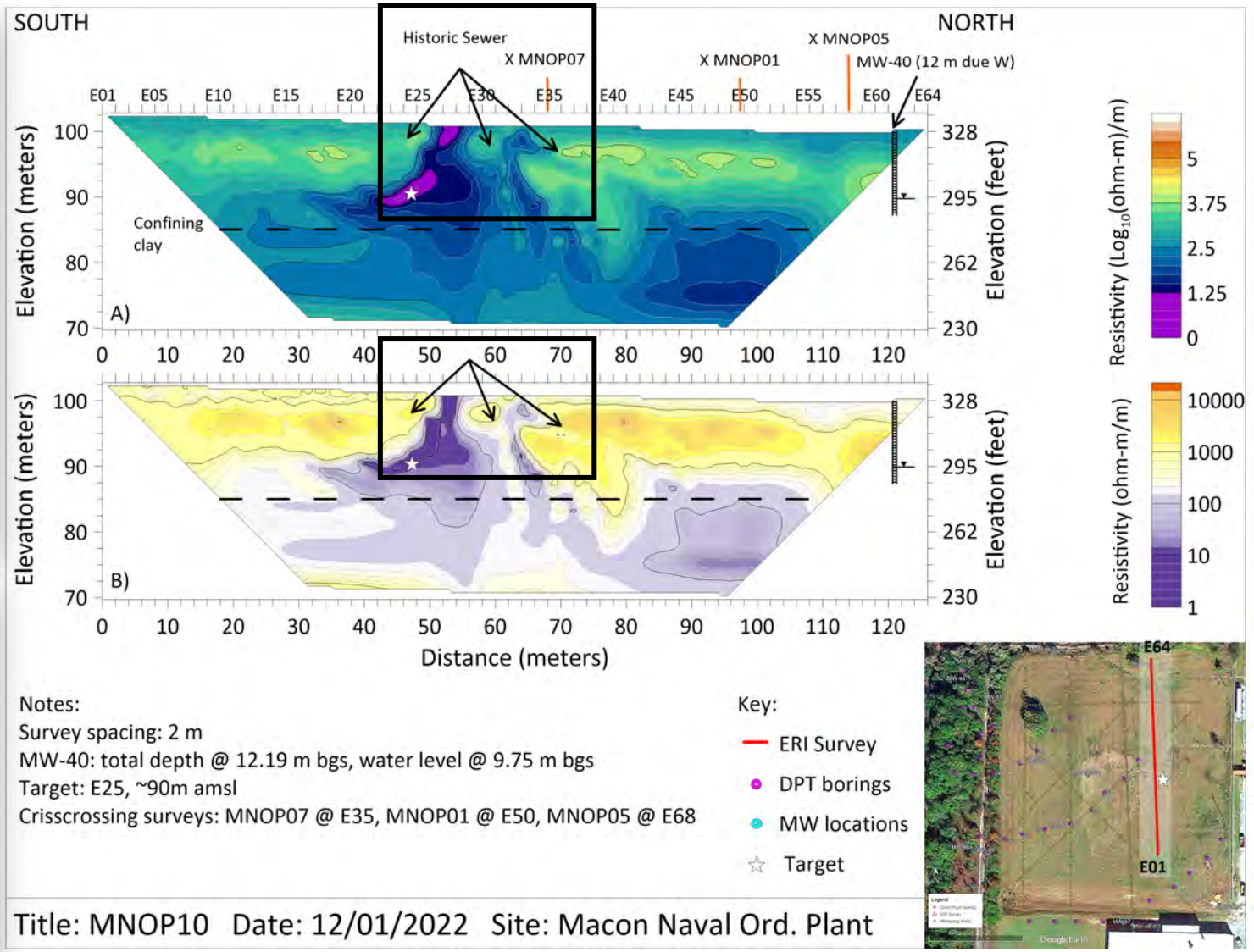
Signature greatly diminished after removal of erroneous data

Potential for interference

ERI Results (EPA ORD)







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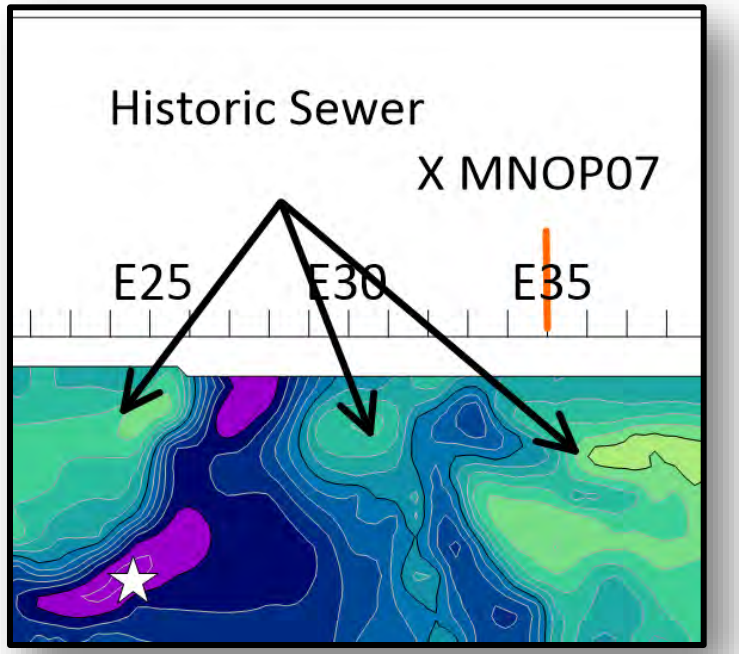

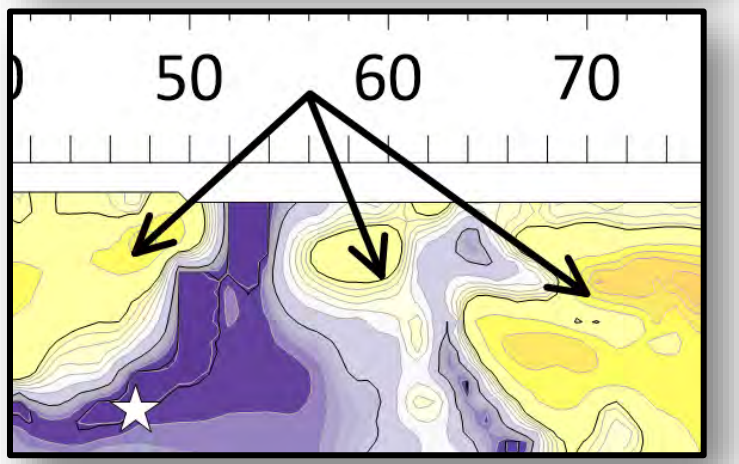

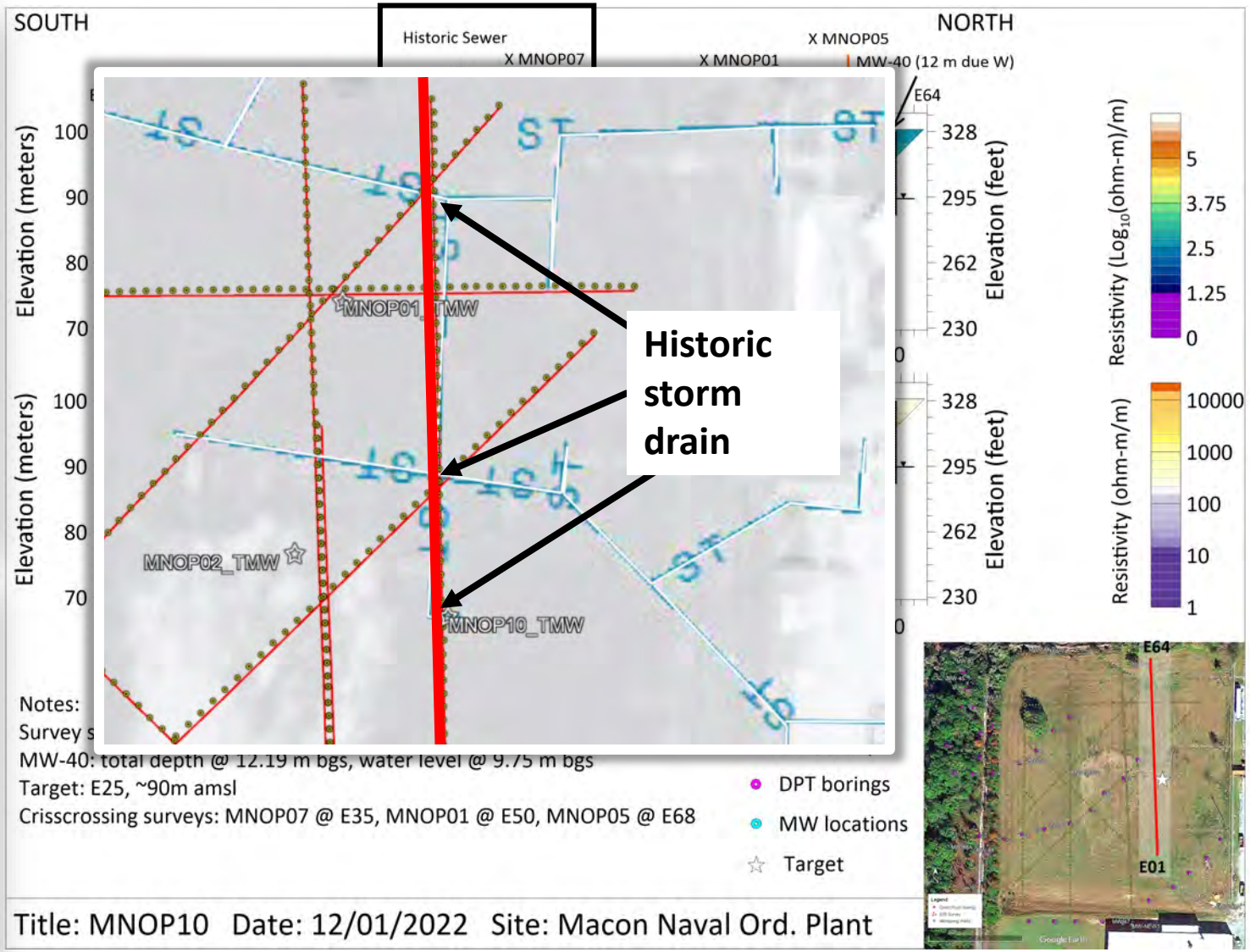

Summary

- Set your expectations (e.g., goals, products, next steps)
- ERI data can be qualitative or quantitative which may change your data quality objectives
- Geophysical techniques are tools whose results are dependent on good data; Garbage in, garbage out.

Thank you, questions?

Photos by EPA ORD; work by EPA