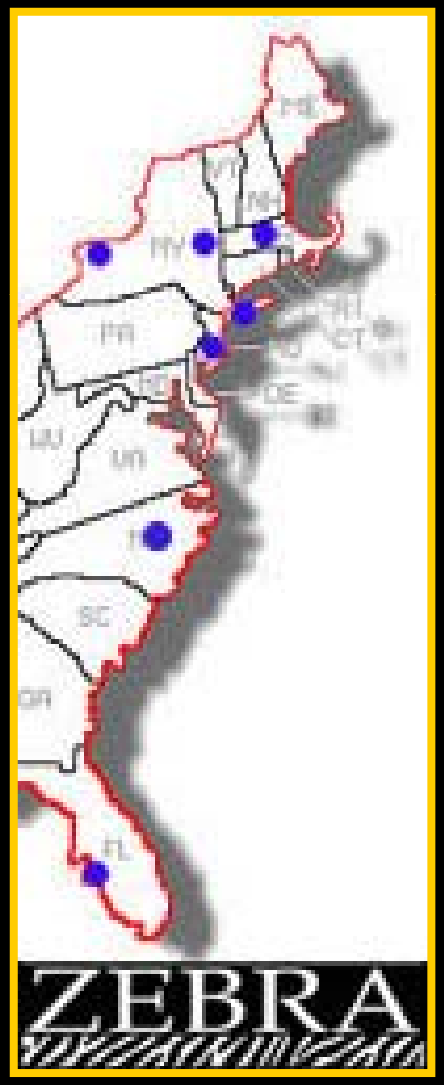
ZEBRA ENVIRONMENTAL

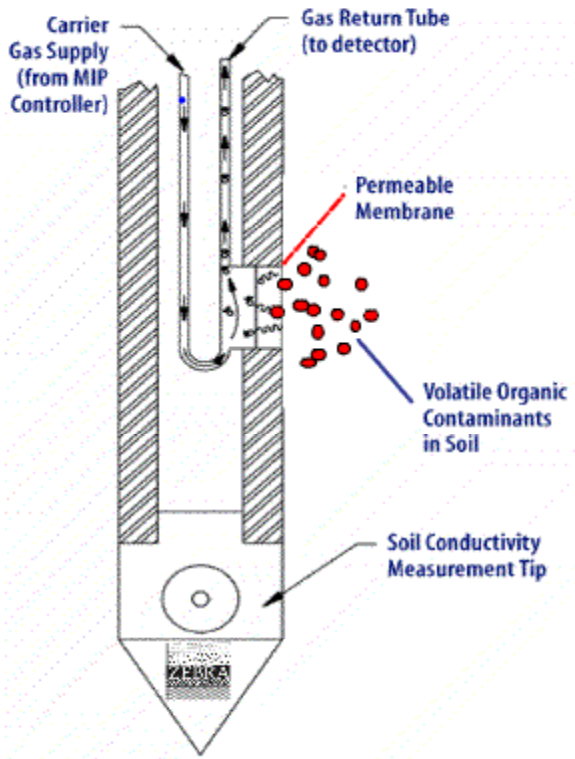


- **DIRECT SENSING**
- **SAMPLING**
- **INSTALLATION**
- **INJECTIONS**

ZEBRA ENVIRONMENTAL MIP/EC

What is the Membrane Interface Probe?

The Membrane Interface Probe (MIP) is rapid, high-resolution field screening technology that provides information about relative concentrations of VOCs in the subsurface, and the Electrical Conductivity of the soil.

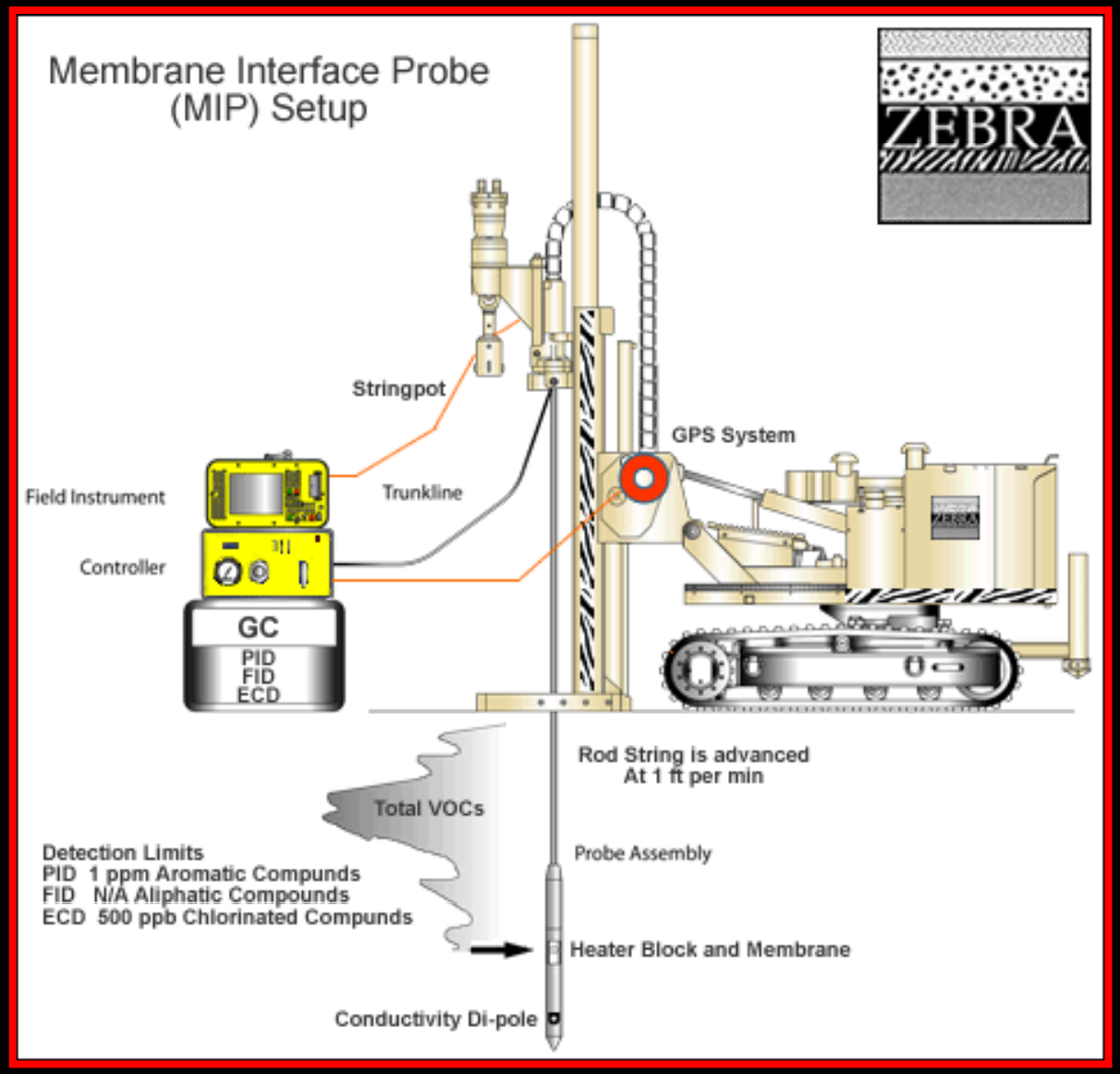


The MIP uses a thin film fluorocarbon polymer membrane approx. 6.35mm in diameter which stays in direct contact with the soil during MIP logging.

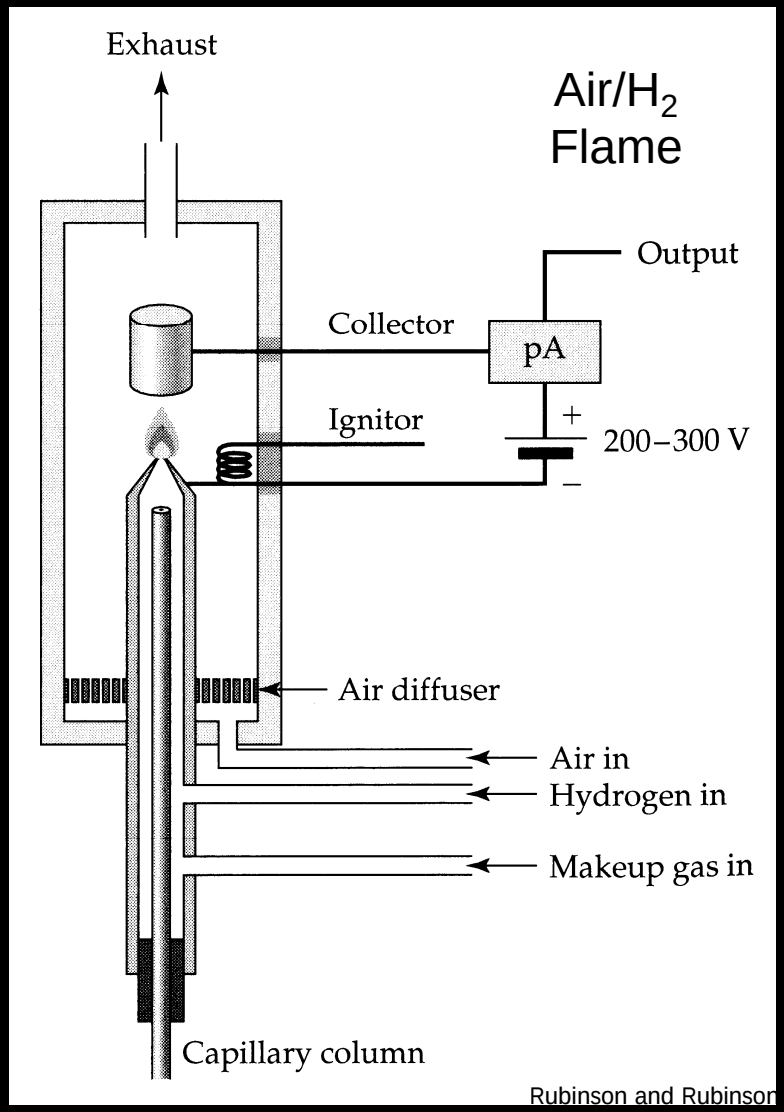
•The thin film membrane is impregnated into a stainless steel screen which serves as a rigid support for the fluorocarbon polymer.
•The down-hole, permeable membrane serves as an interface to a detector at the surface.
•Volatiles in the subsurface are getting transferred across the membrane and partition into a stream of carrier gas where they are swept to the detector. The membrane is heated in order to facilitate VOC transfer and self-cleaning.

ZEBRA ENVIRONMENTAL MIP/EC

THE SYSTEM

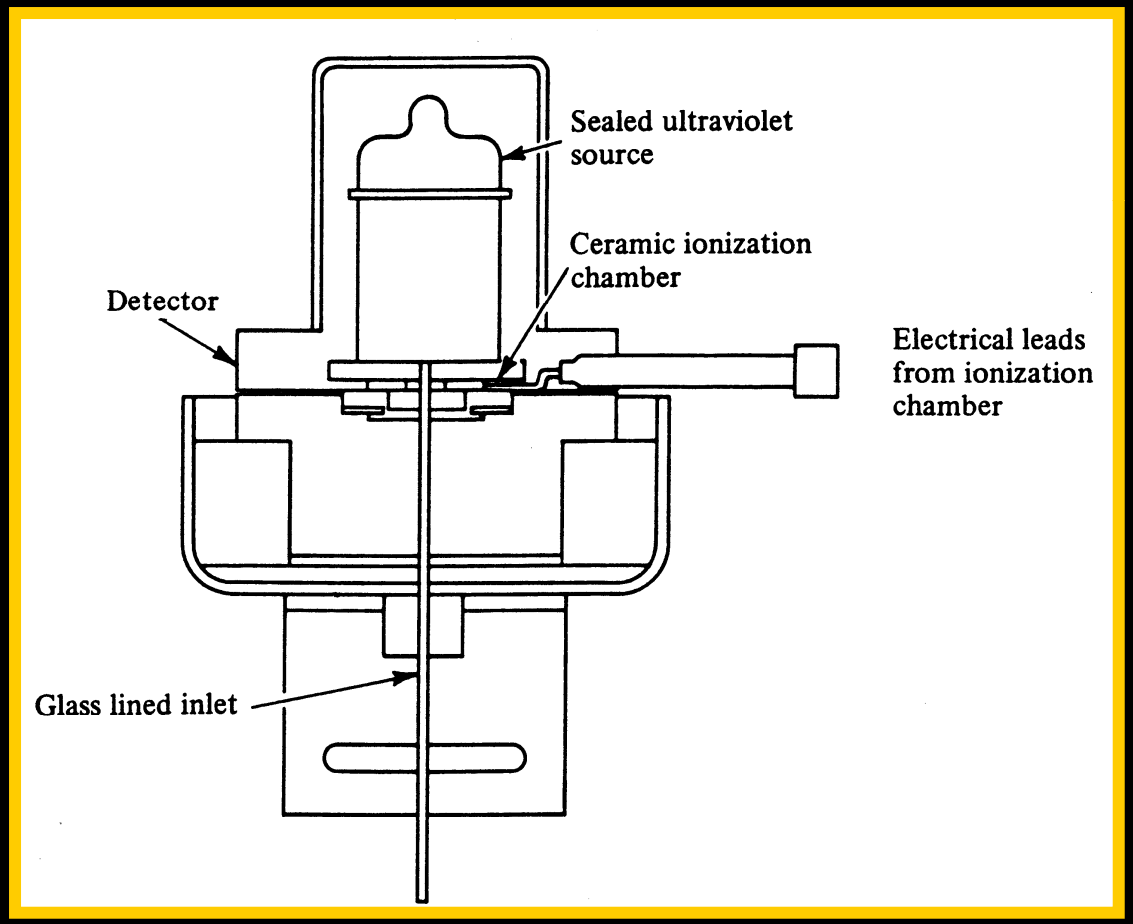


Flame Ionization Detector



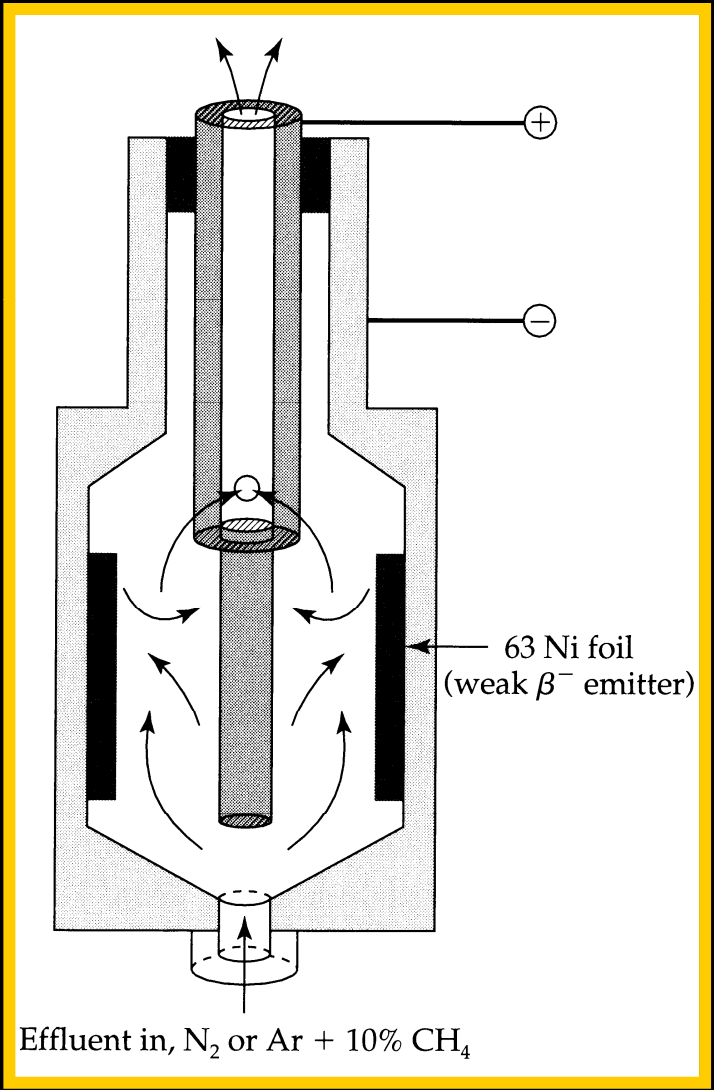
- Organic analytes are pyrolyzed in an air/H_2 flame
- Ions are produced in the plasma around the flame
  - proportional to number of carbons present
- Positive voltage is applied to collector; negative to the flame body
- Ions migrate to collector producing a current (signal)

Photoionization Detector



- An UV source ionizes all the molecules in the column effluent
- Ions produced are collected resulting in a current flow

Electron Capture Detector



How it Works

- Column effluent is passed over a ß$^-$ emitter
  - Tritium or 63-Ni
- The carrier gas is ionized
- A burst of e^- is produced with each radioactive decay
- Potential is applied between the collector (anode) and the detector body (cathode)
- Produces a constant background current
- The current flow decreases in the presence of analyte molecules
  - The analyte captures the emitted electrons

Detector Characteristics

- Sensitive to molecules containing electronegative functional groups (e.g. Cl^-)
- Non-linear response to analyte concentration

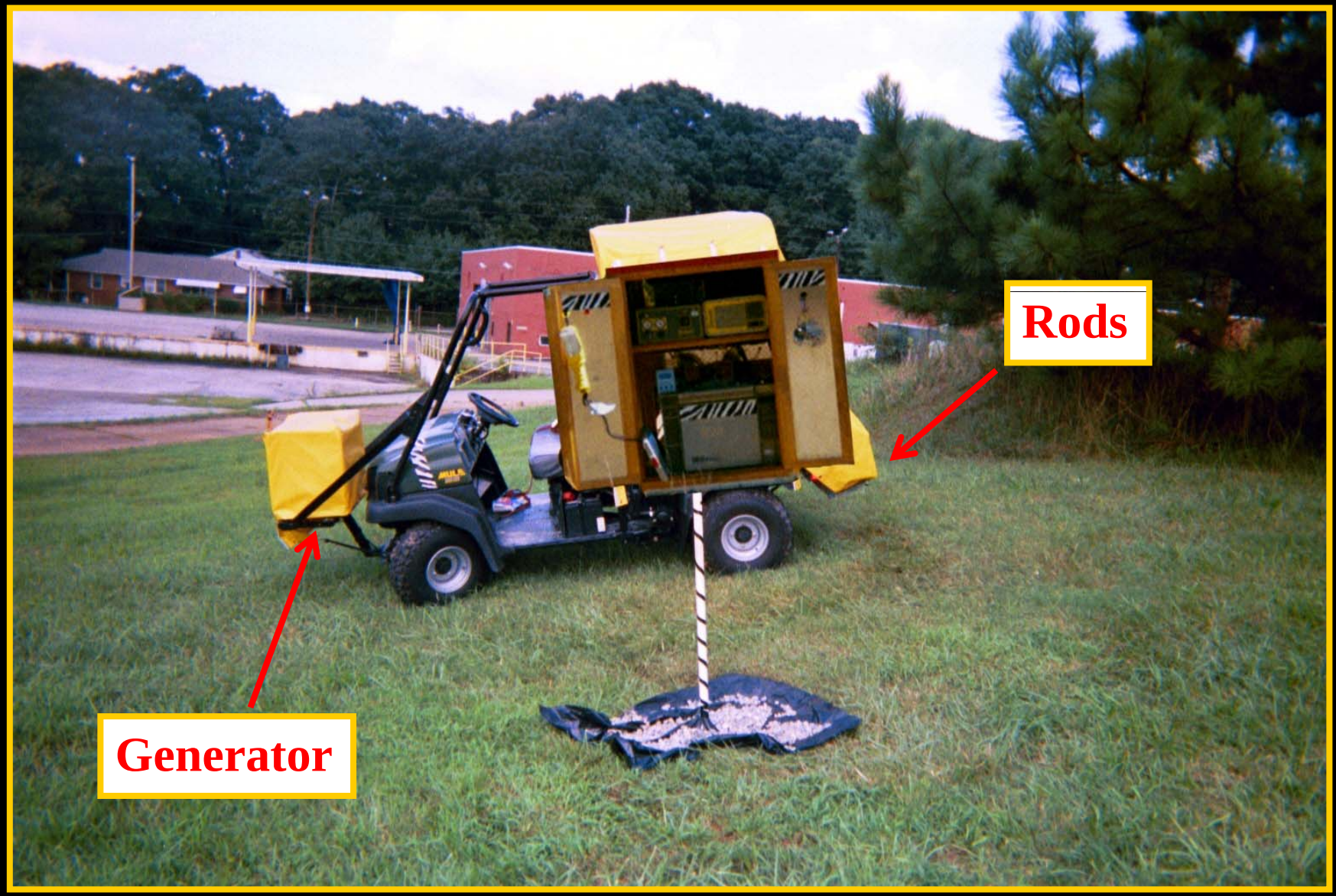
MIP DIRECT SENSING

MIP Detection Limits

MIP DETECTORS			
	Contaminates	**Detection Limit**	**Carrier Gas**
PID	BTEX	1 PPM	Nitrogen, Helium
FID	Methane, Butane	NA	Nitrogen, Helium
ECD	Chlorinateds	250PPB	Nitrogen

ZEBRA ENVIRONMENTAL MIP/EC

THE MIP SYSTEM SIDE



Production rates: 150’ to 300’ per day.

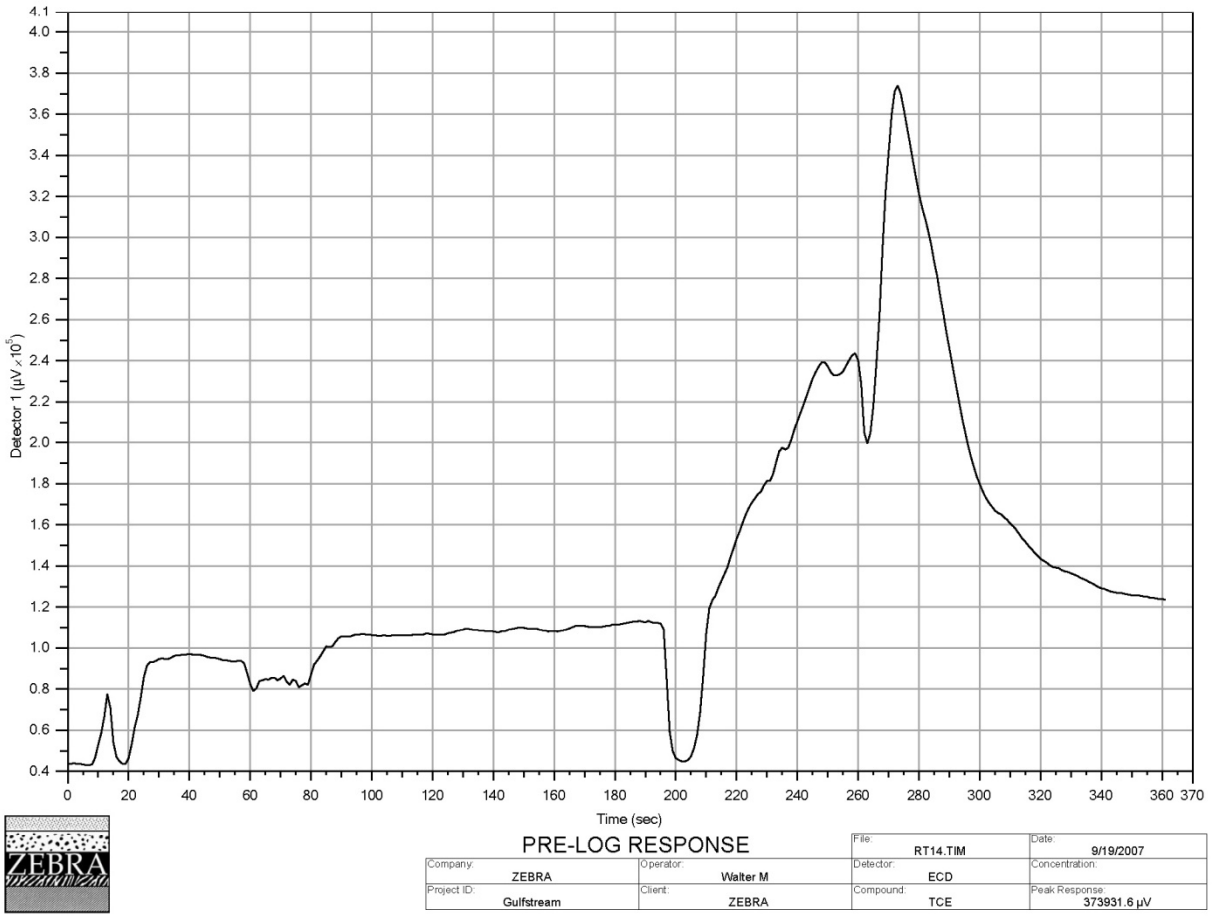
The production rate of the MIP is affected by :

- the number of logging locations
- the depth of logging
- subsurface conditions
- access restrictions
- probe hole abandonment requirements
- weather

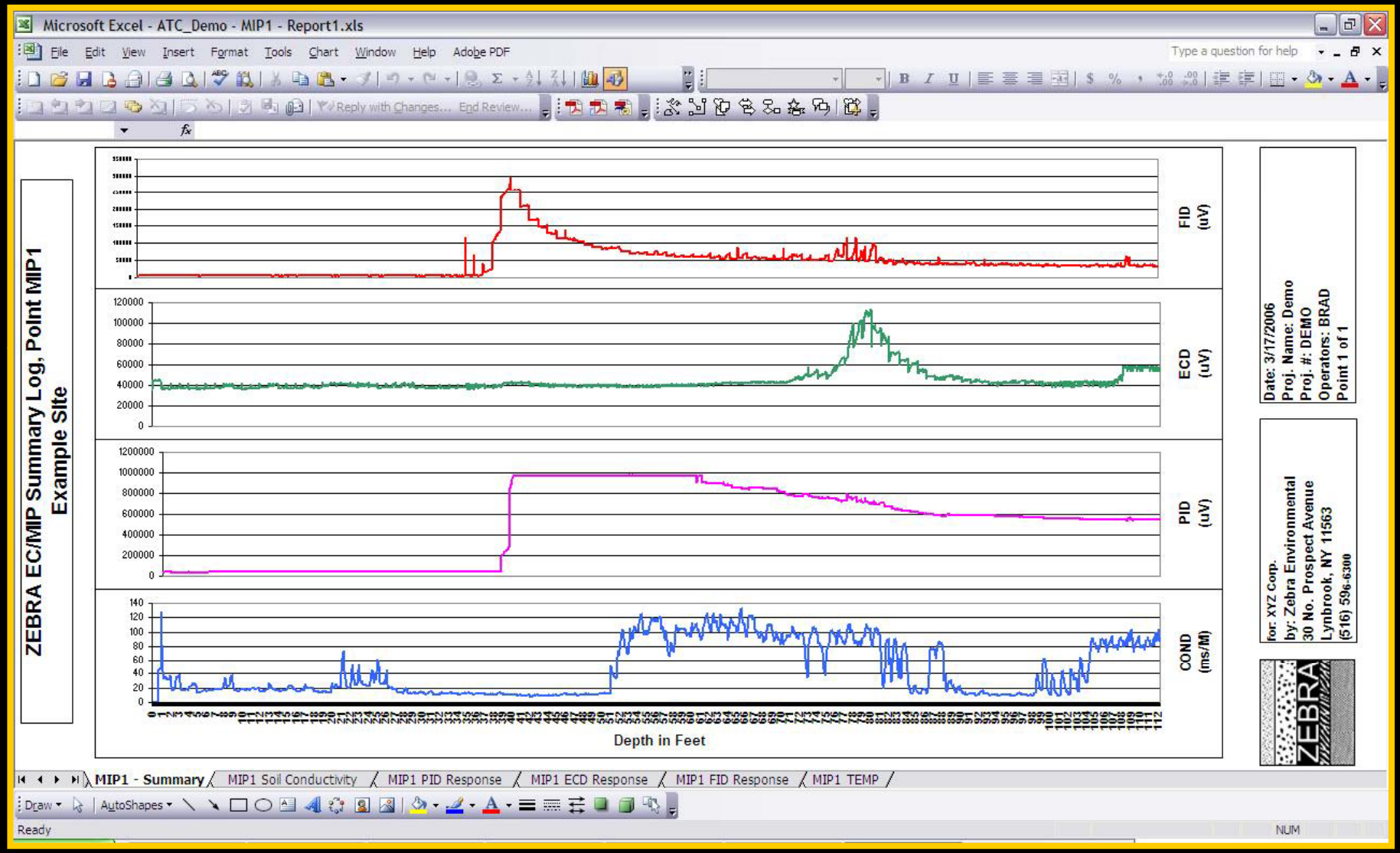
MIP LOGGING

MIP DIRECT SENSING

Pre Log Response



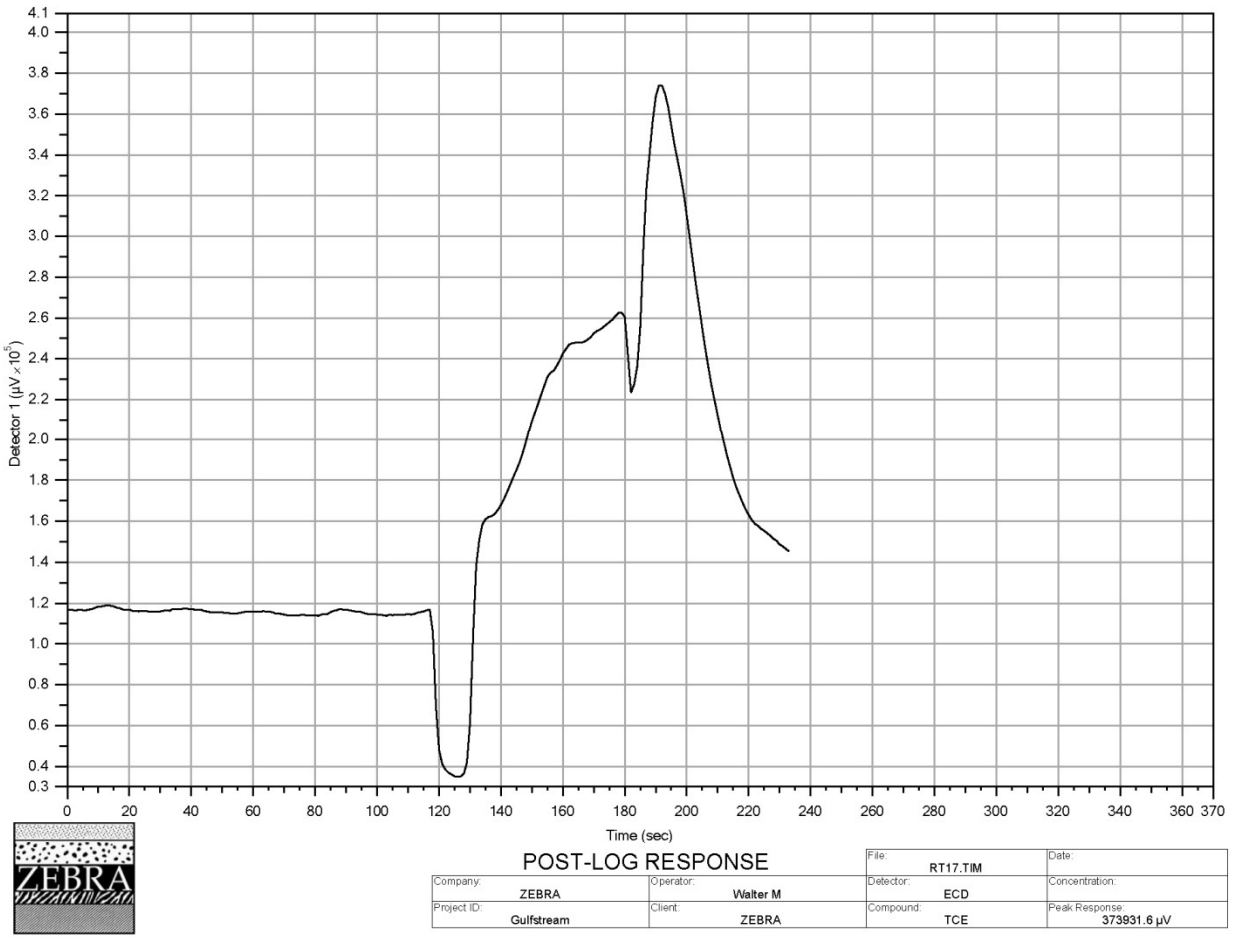
MIP DIRECT SENSING



Example of a Microsoft Excel Spreadsheet graphically displaying FID/PID/ECD and Conductivity Logs.

MIP DIRECT SENSING

Post Log Response



ZEBRA ENVIRONMENTAL MIP/EC

The Gator

Gator In Action

CPT/MIP

Cone Penetration Testing (CPT)

CPT/MIP

CPT is (Cone Penetration Testing) commonly used to determine the subsurface stratigraphy in-situ and to estimate geotechnical parameters of the materials present in the subsurface.

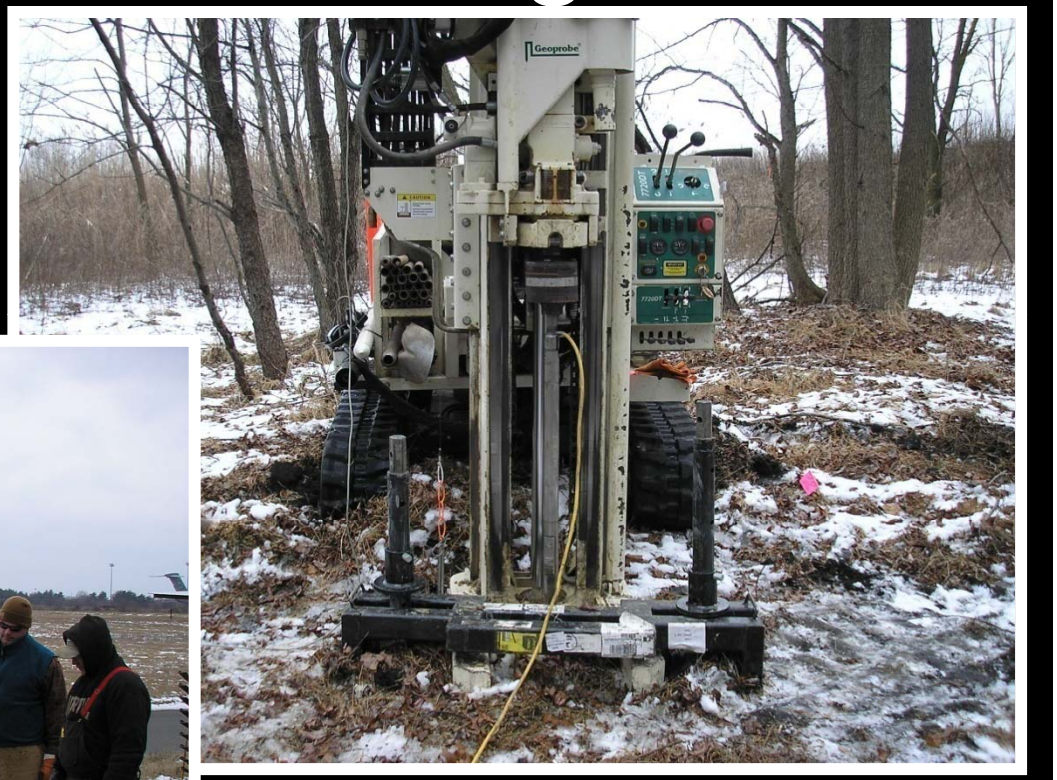
- Efficiency of technology (lightweight, mobile)
- Innovative cone penetration technique
- Repeatable penetration results
- Cost savings over more traditional boring and sampling methods

ZEBRA ENVIRONMENTAL CPT/MIP

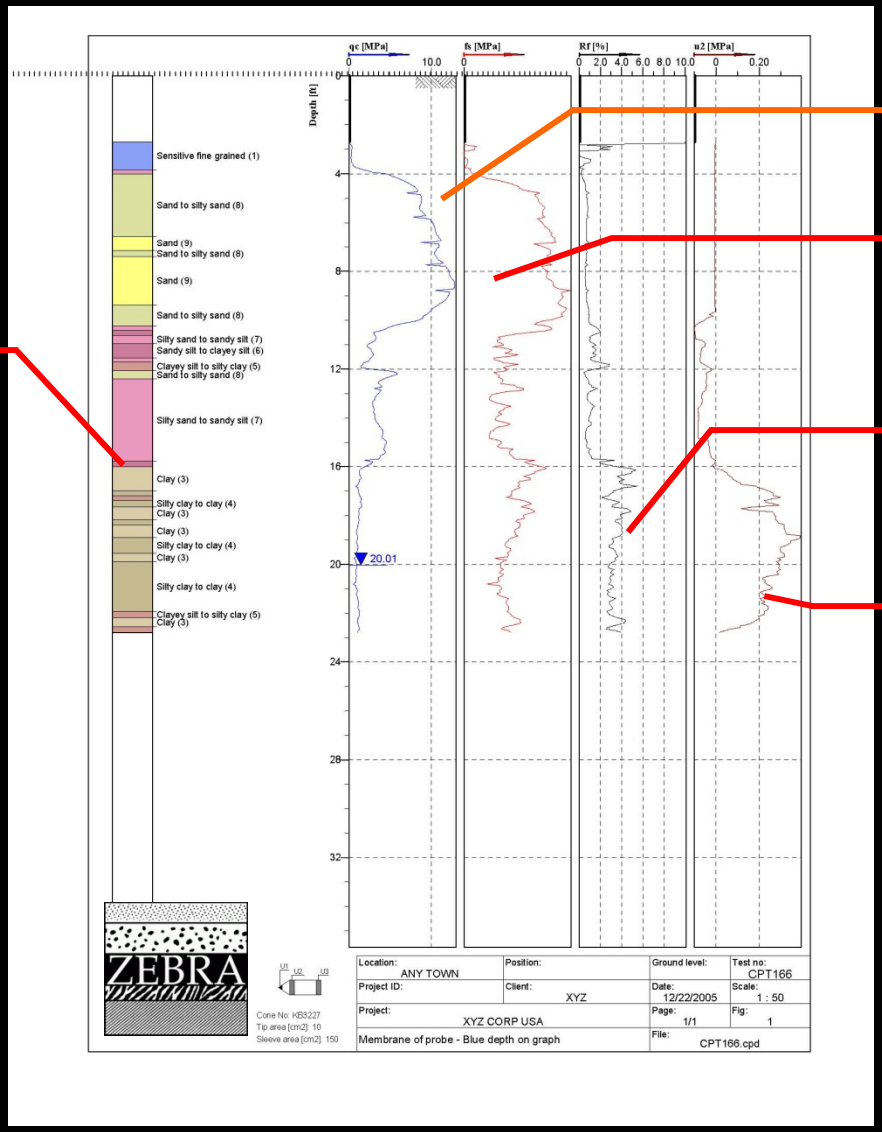
CPT/MIP

CPT/MIP Unit

CPT/MIP Anchoring



ZEBRA ENVIRONMENTAL CPT/MIP



Lithology Description

Tip Pressure

Sleeve Friction

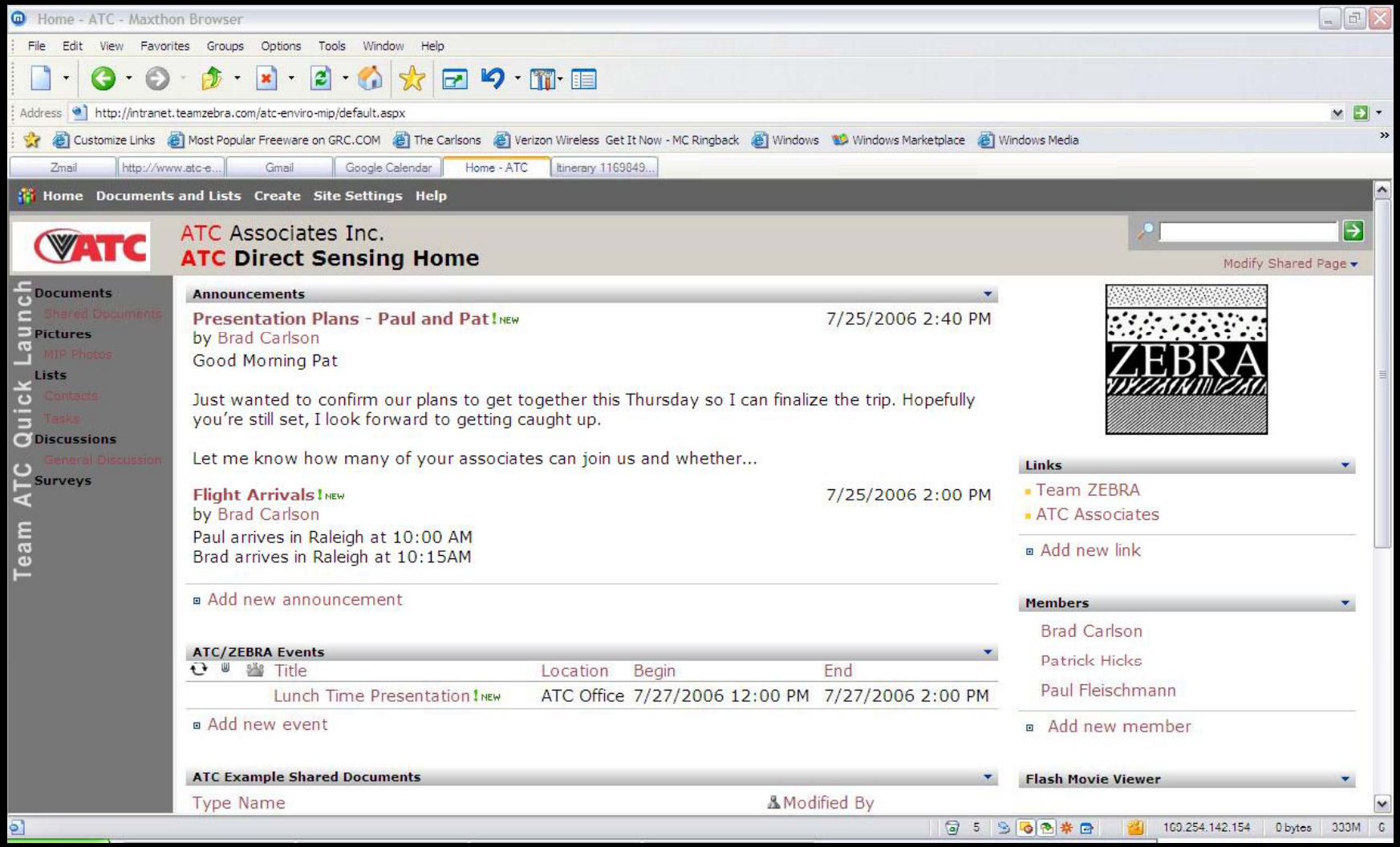
Friction Ratio

Pore Pressure

CPT Response Graph

DATA

ZEBRA ENVIRONMENTAL DATA INTEGRATION

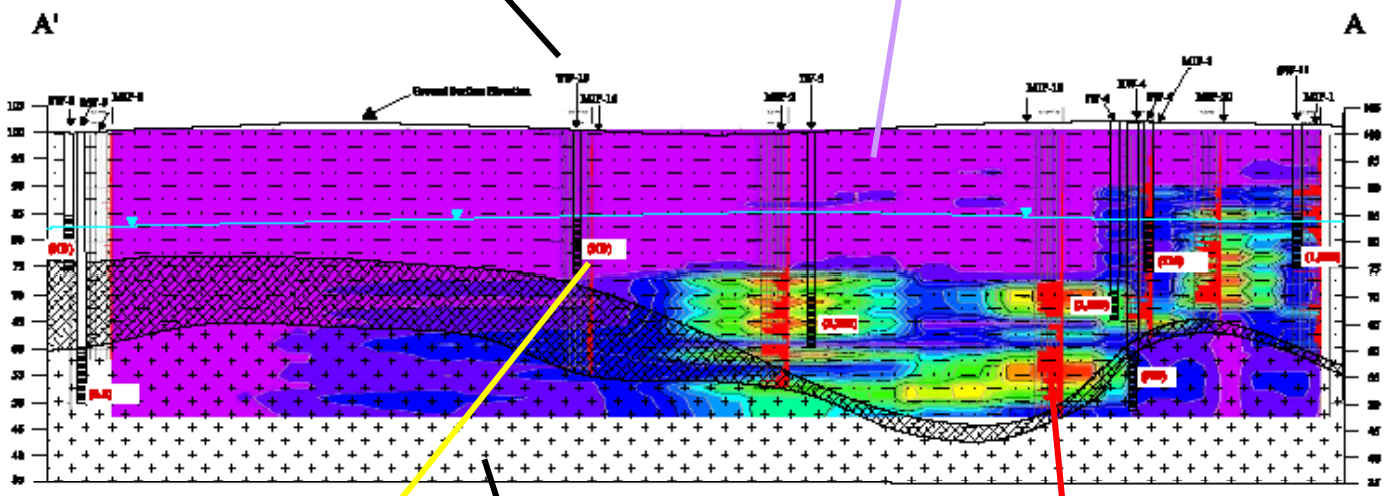


SHAREPOINT WEBSITE FOR DATA SHARING

ZEBRA ENVIRONMENTAL DATA INTEGRATION

Installed MW overlay

ECD Background Slice



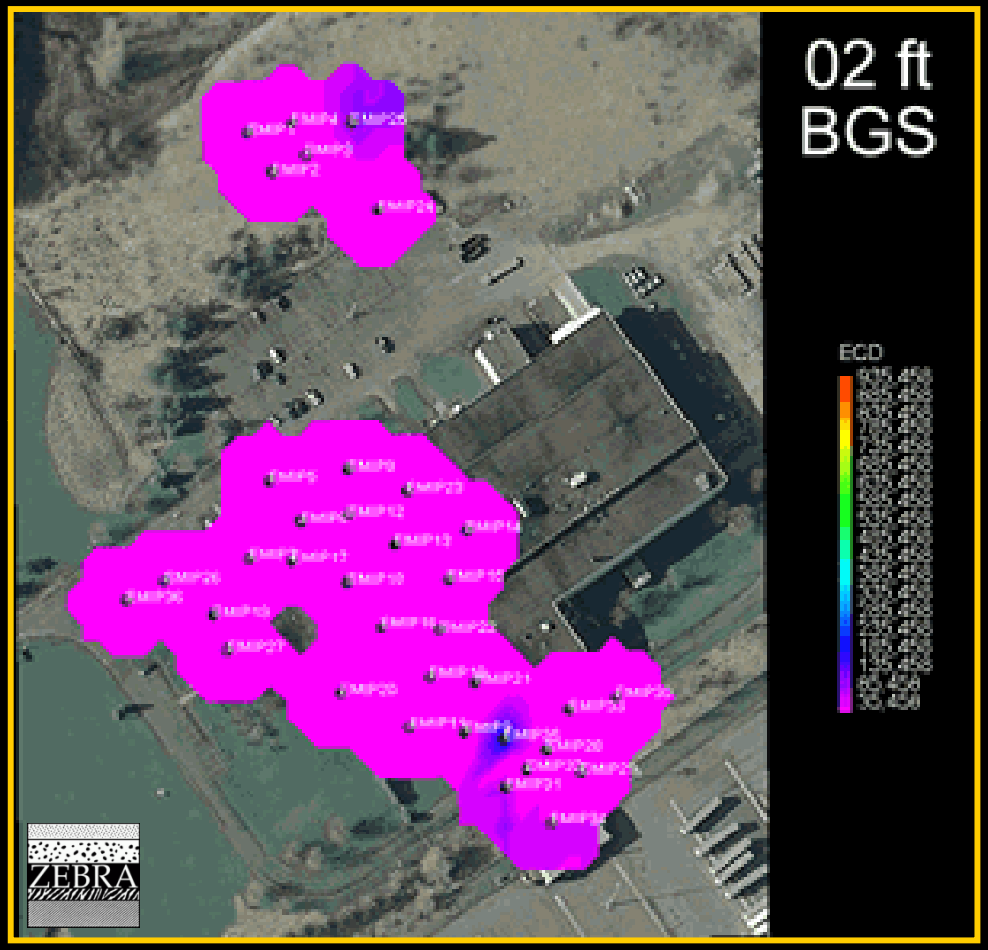
Sampling Event Data

Lithology Overlay

ECD Graph Overlay

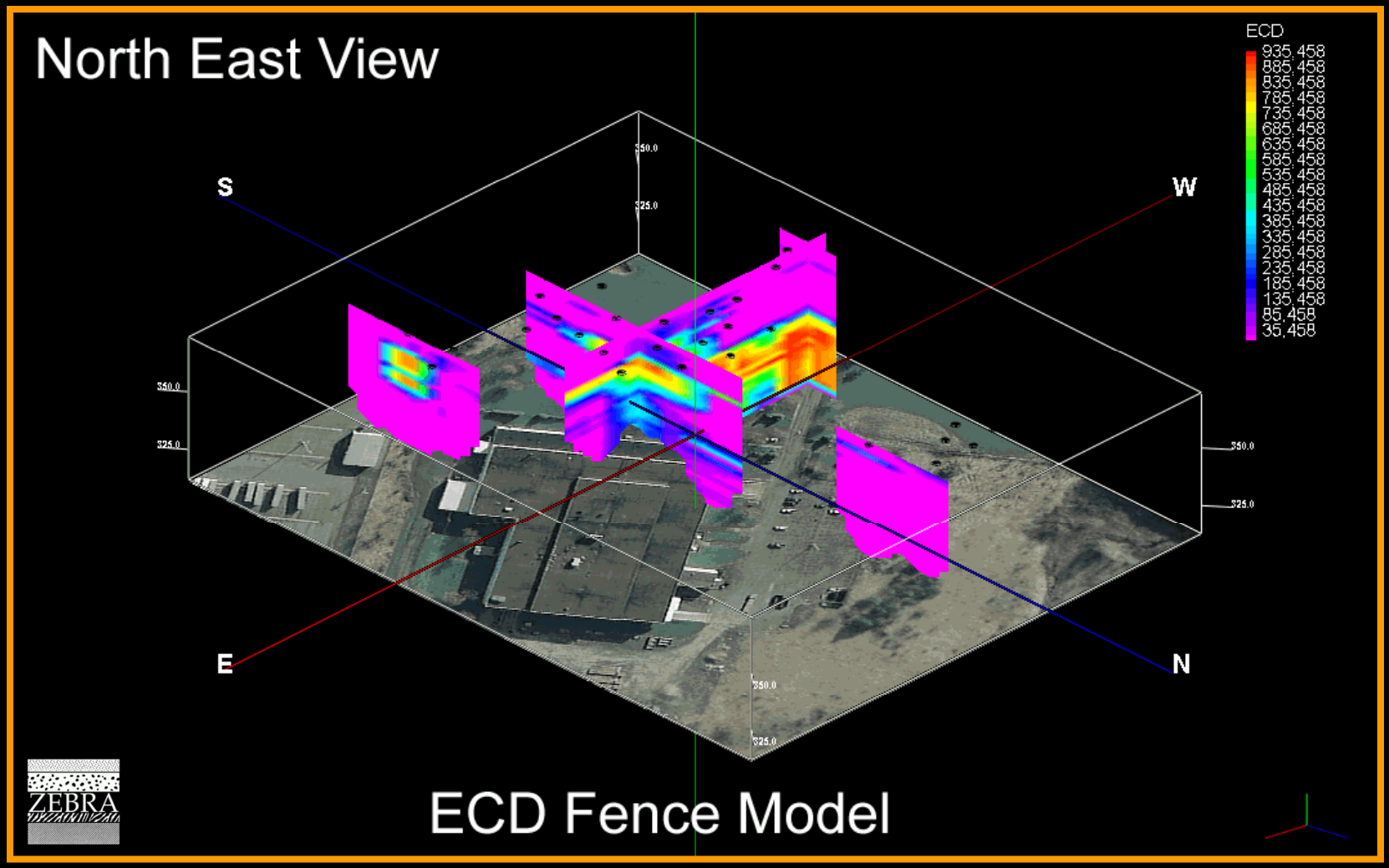
Cross-section from a 2D ECD Fence Slice.

ZEBRA ENVIRONMENTAL DATA INTEGRATION



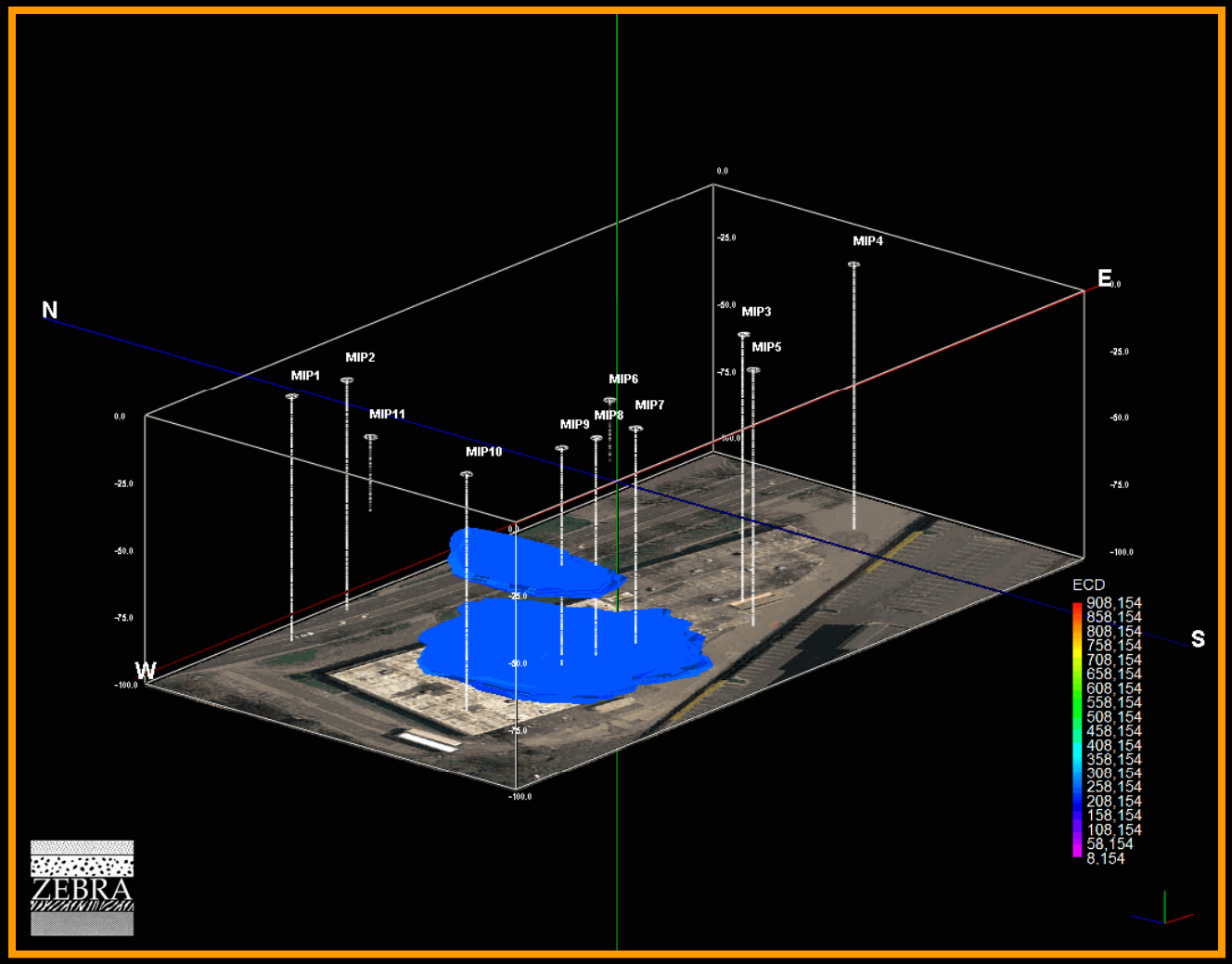
Using 3D modeling software, we can generate true 3D Solid Models. This Plan View model was created using ECD data from a recent MIP project . Any orientation can be displayed and cross-sections or fence diagrams can be created.

ZEBRA ENVIRONMENTAL DATA INTEGRATION



3D ECD Fence Model

ZEBRA ENVIRONMENTAL DATA INTEGRATION



3D ECD Solid Plume Model

ZEBRA ENVIRONMENTAL

HPT

ZEBRA ENVIRONMENTAL HPT

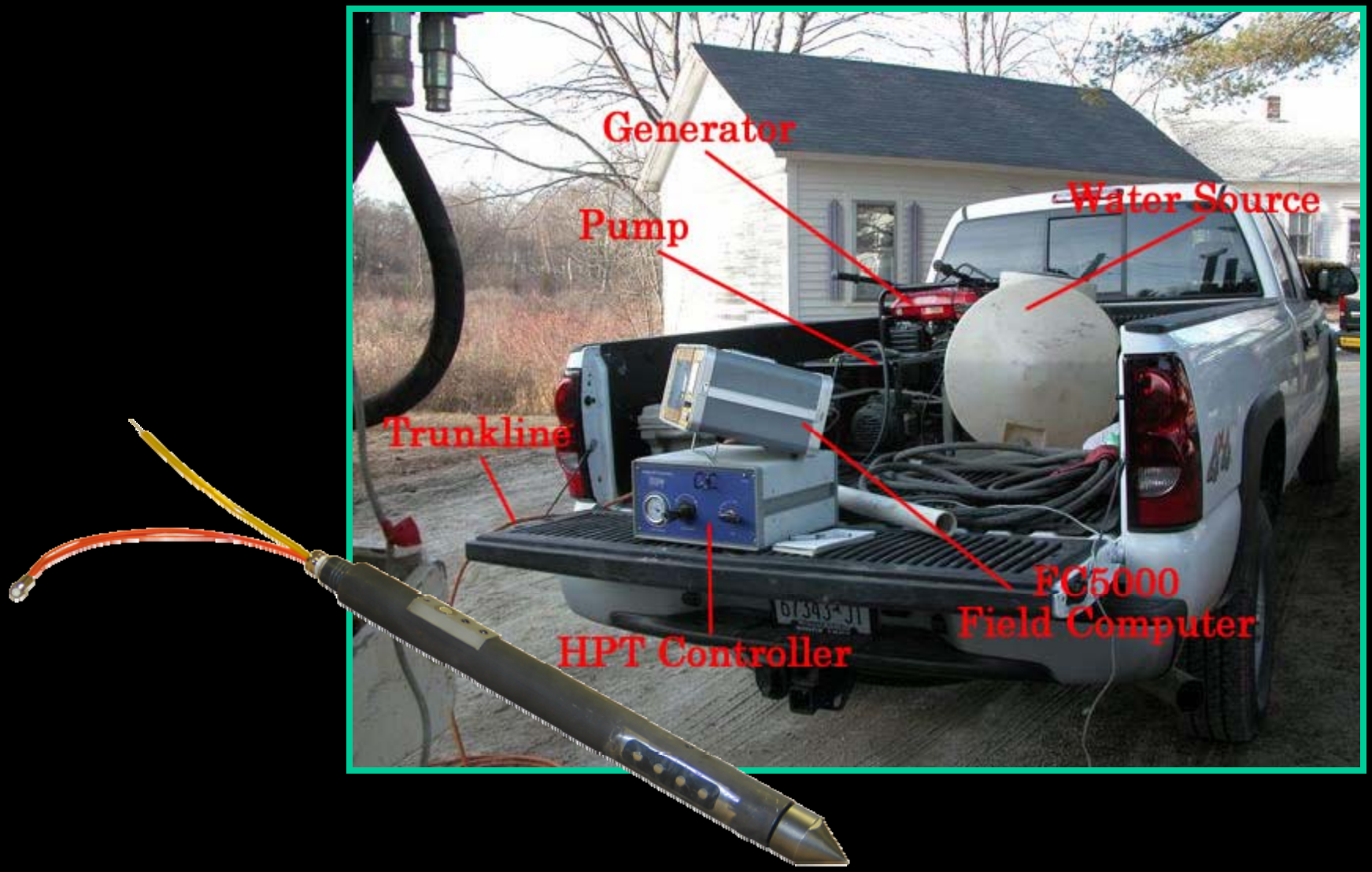
New direct push technologies

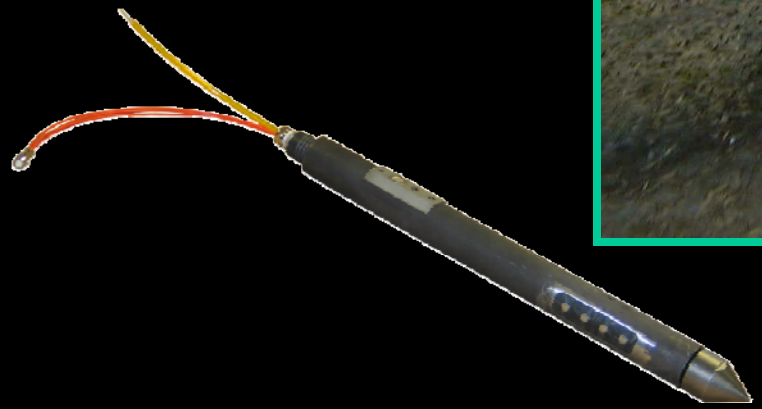
- HPT Logging
- Rhode Island

Hydraulic Profiling Components

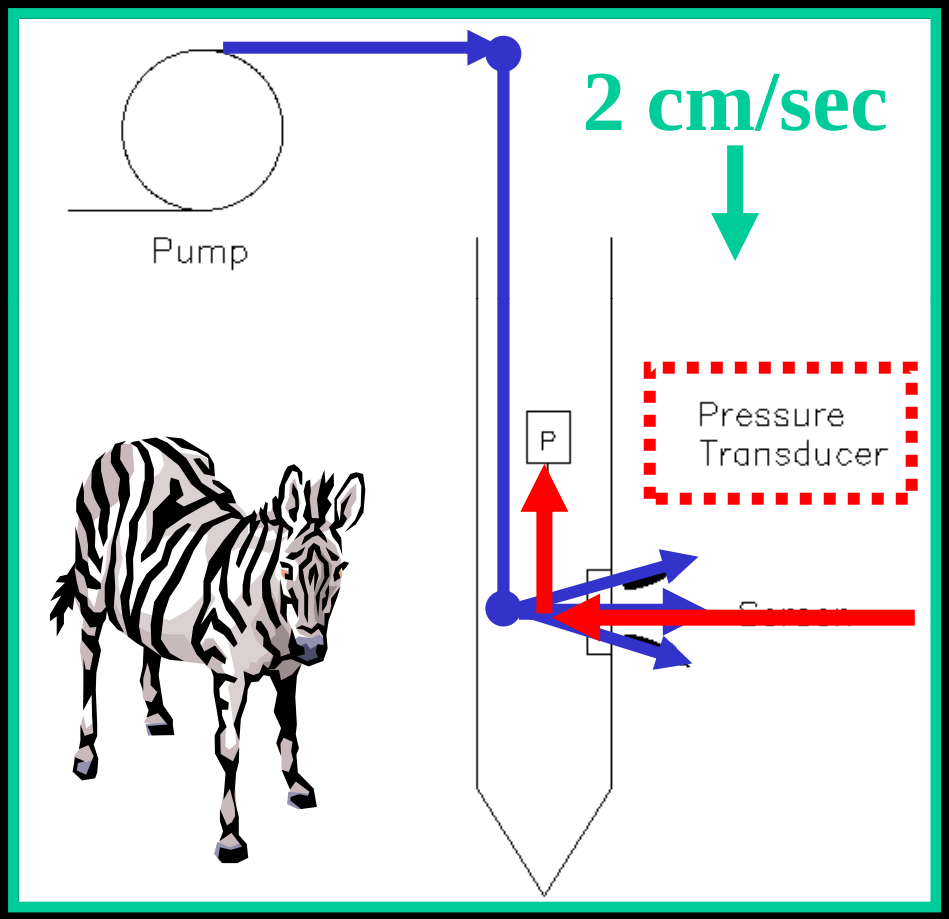
Hydraulic Profiling Probe

Hydraulic Profiling Tool (HPT)

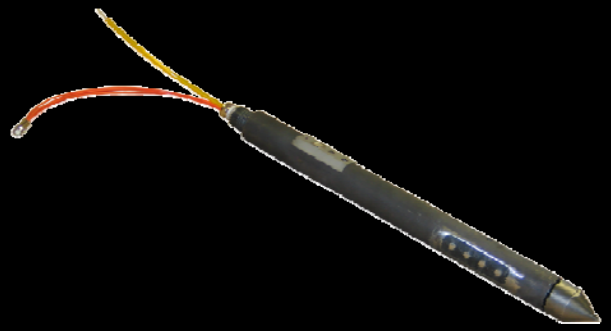




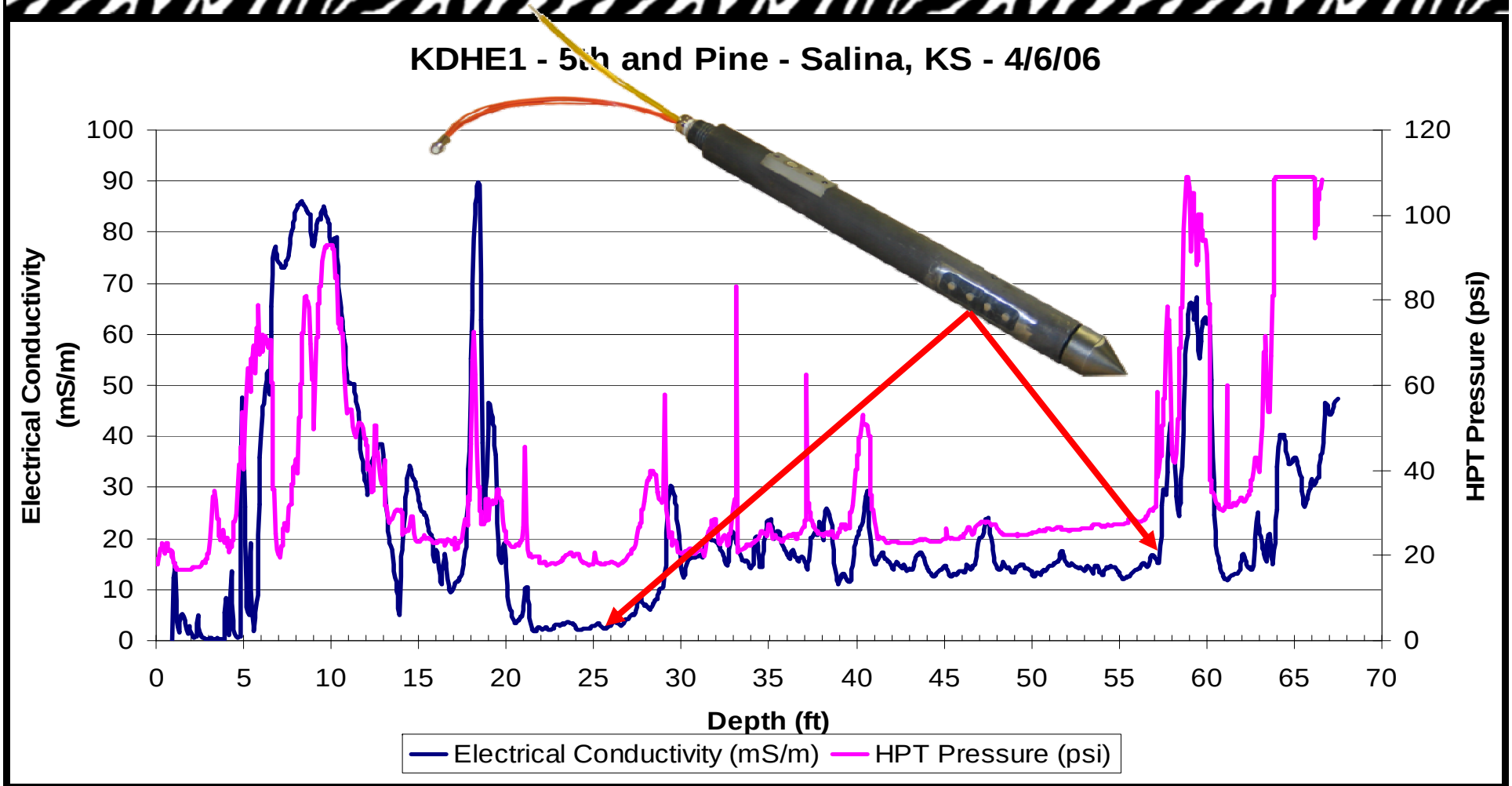
HPT Operational Theory



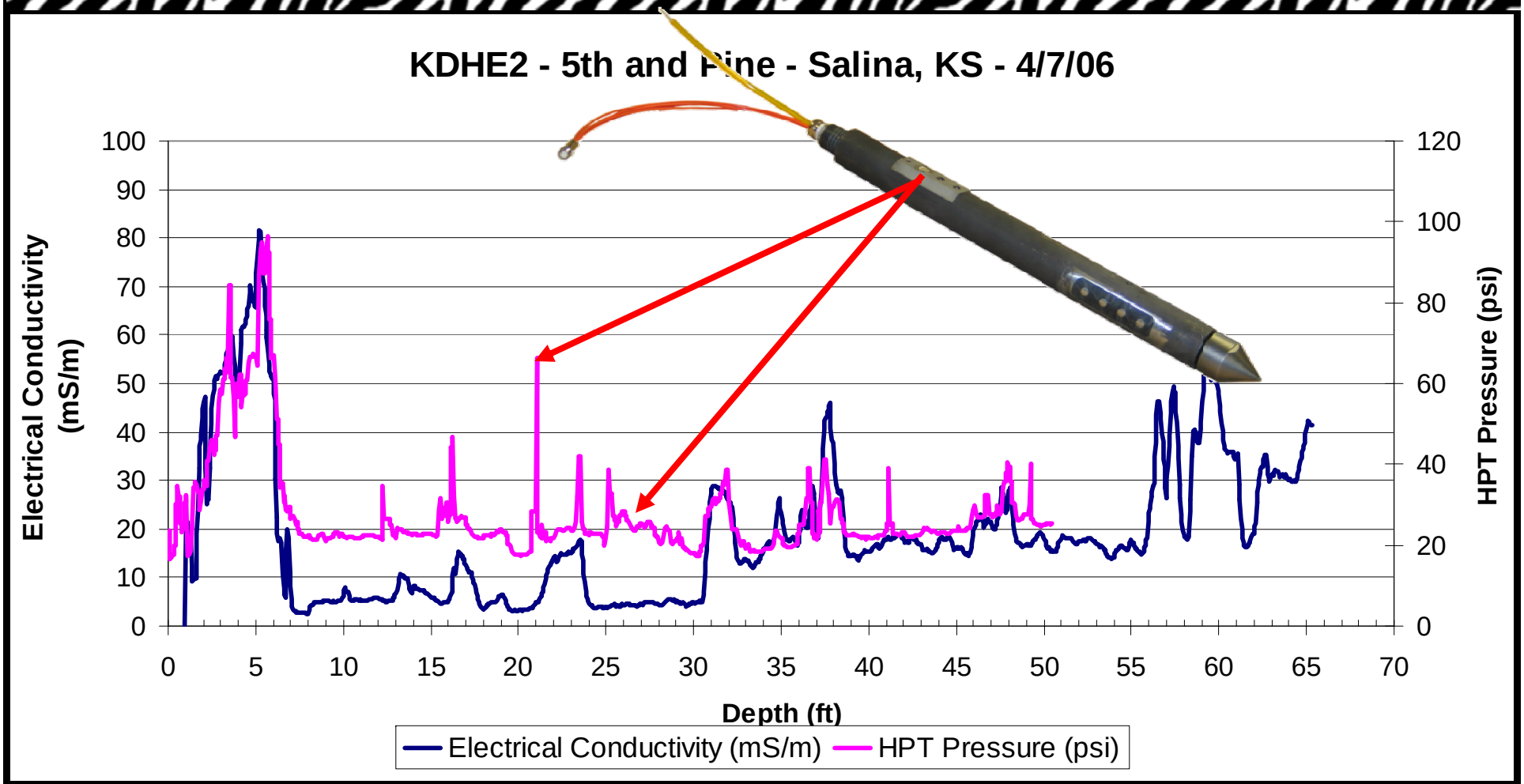
- Advance probe at constant rate
- Inject water at low flow rate
- Measure formation pressure response



HPT Conductivity

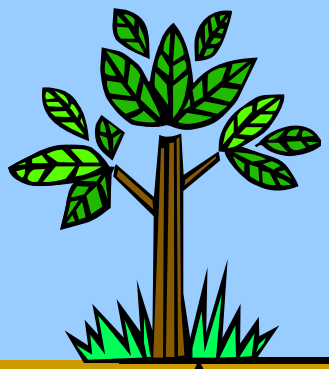


HPT Pressure



Dissipation Test

SWL = Depth – Static Pressure



52ft – 21psi = 31ft

Depth

52ft

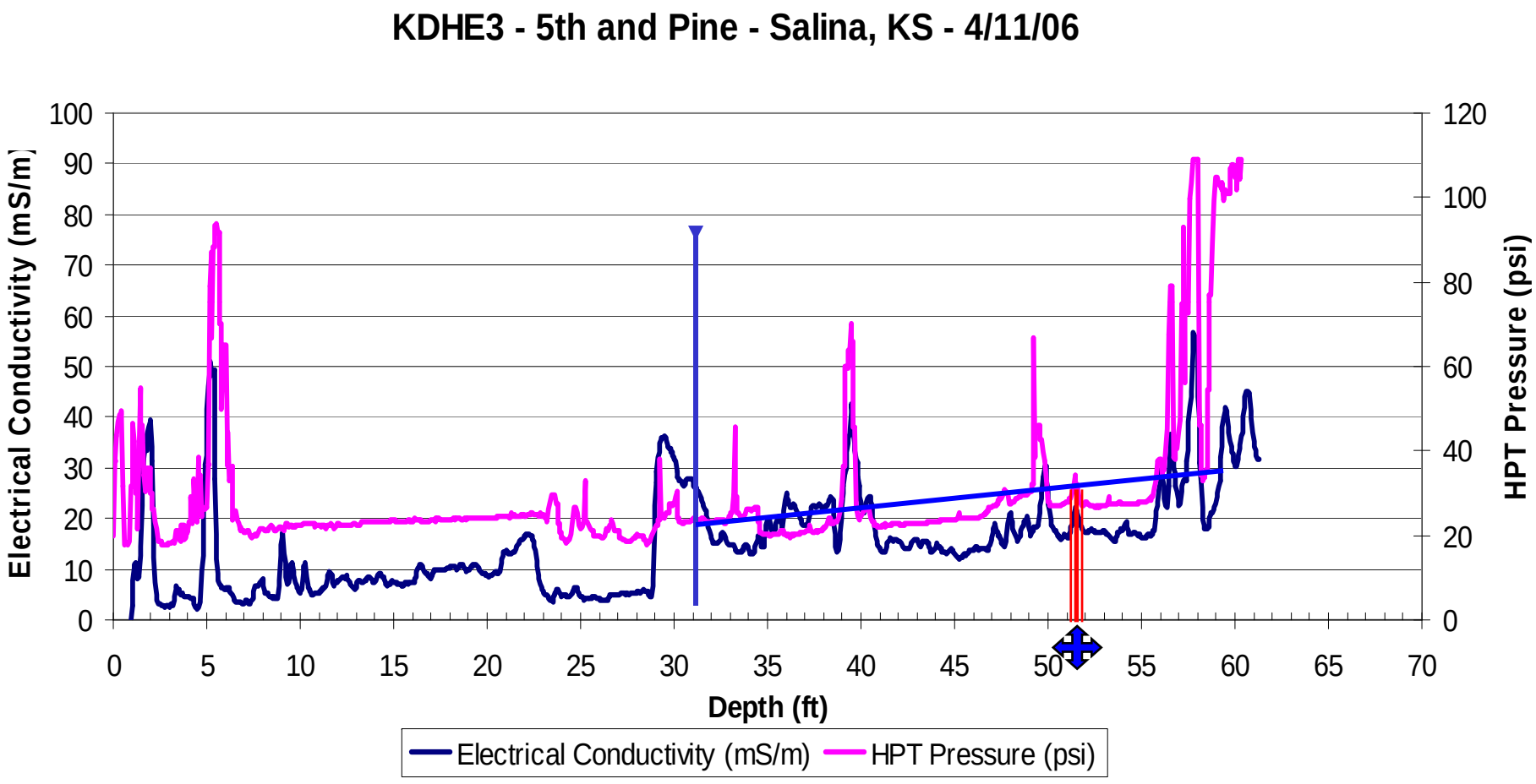
Flow = 0

ROP = 0

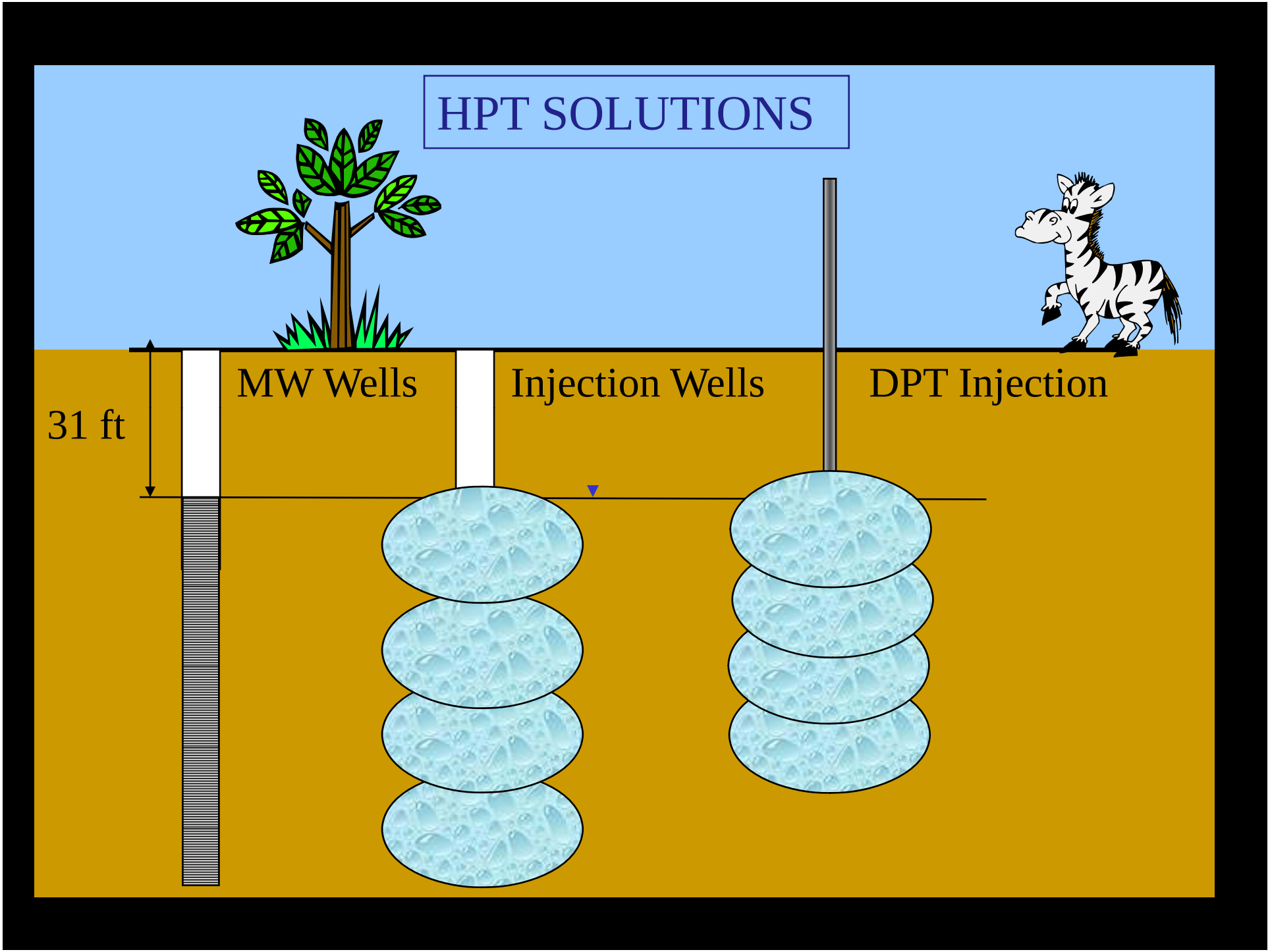
Static Pressure

21psi

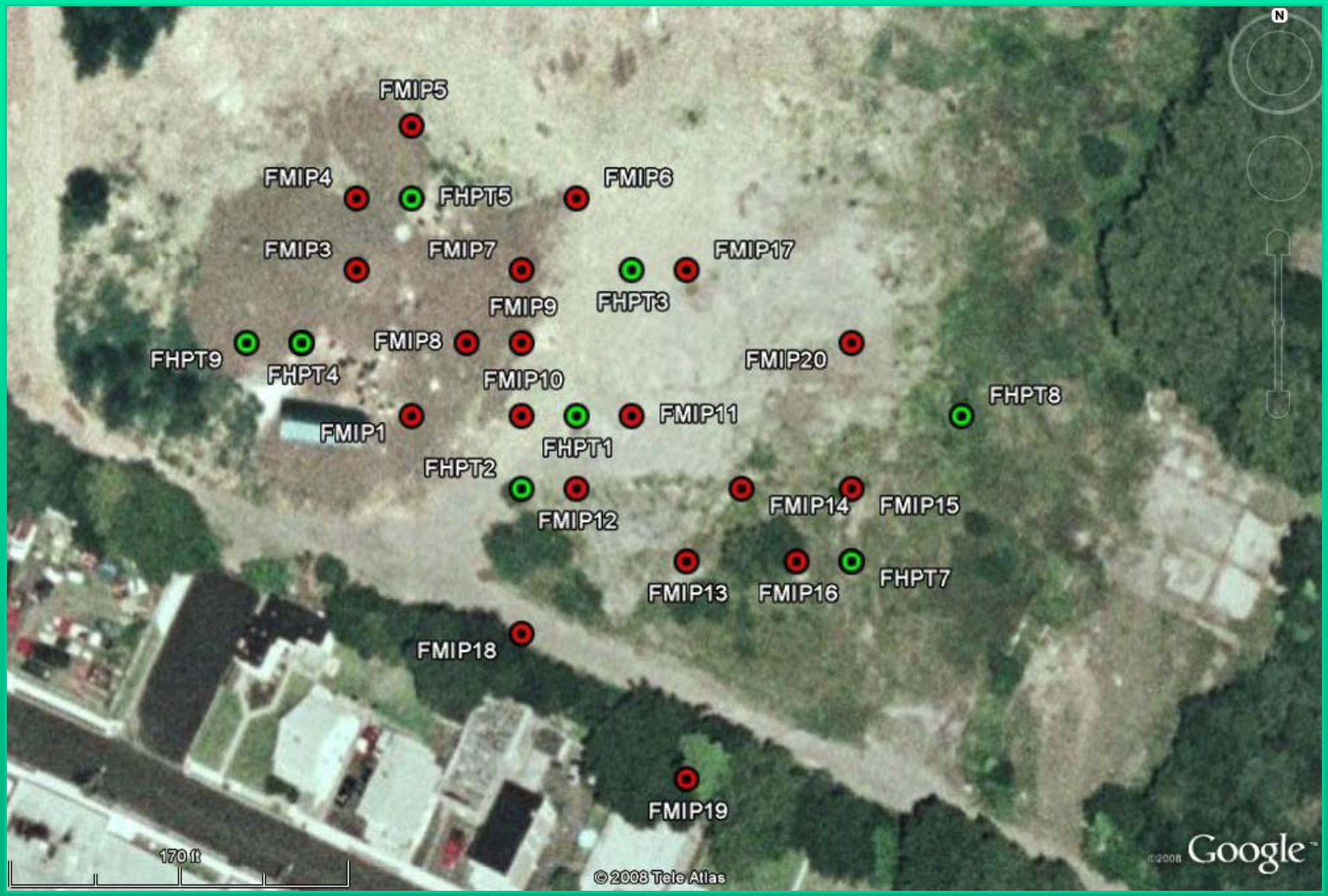
Static Water Level



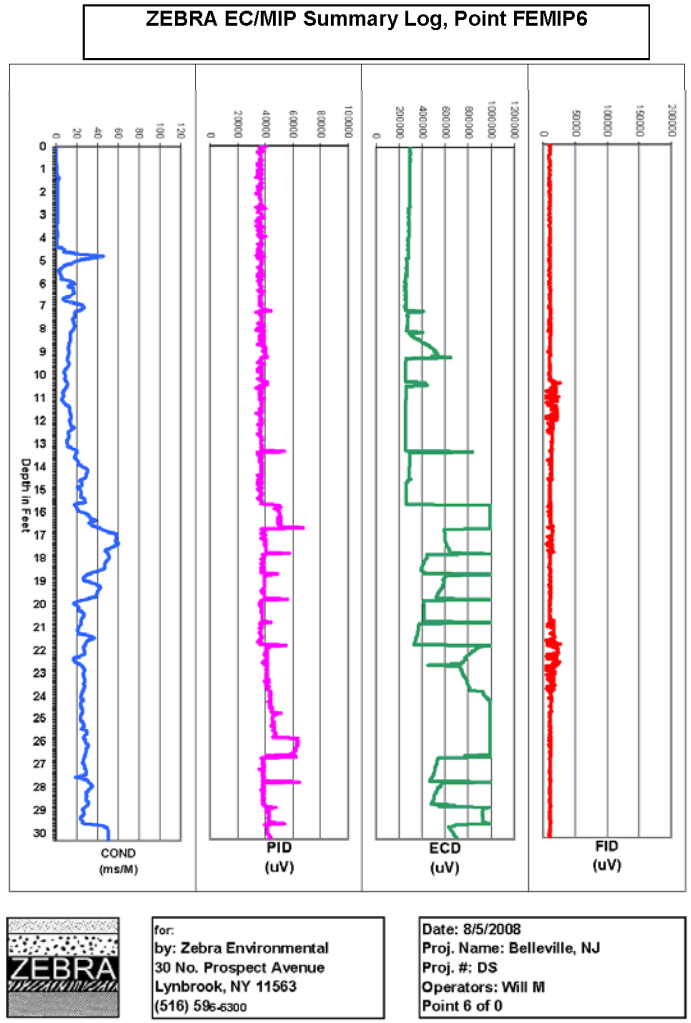
SWL = Depth – Static Pressure


HPT SOLUTIONS
MW Wells
Injection Wells
DPT Injection
31 ft

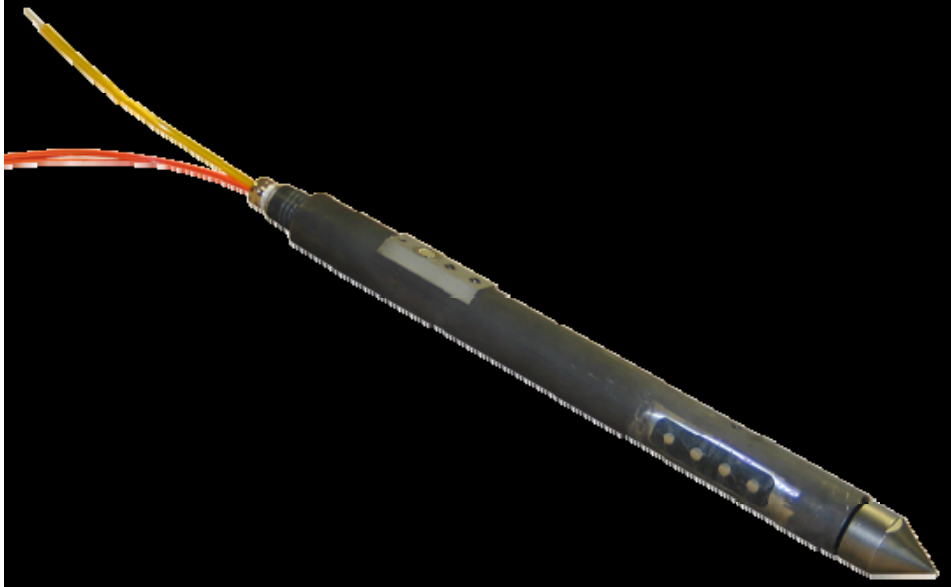
Case Study MIP/HPT NJ Site

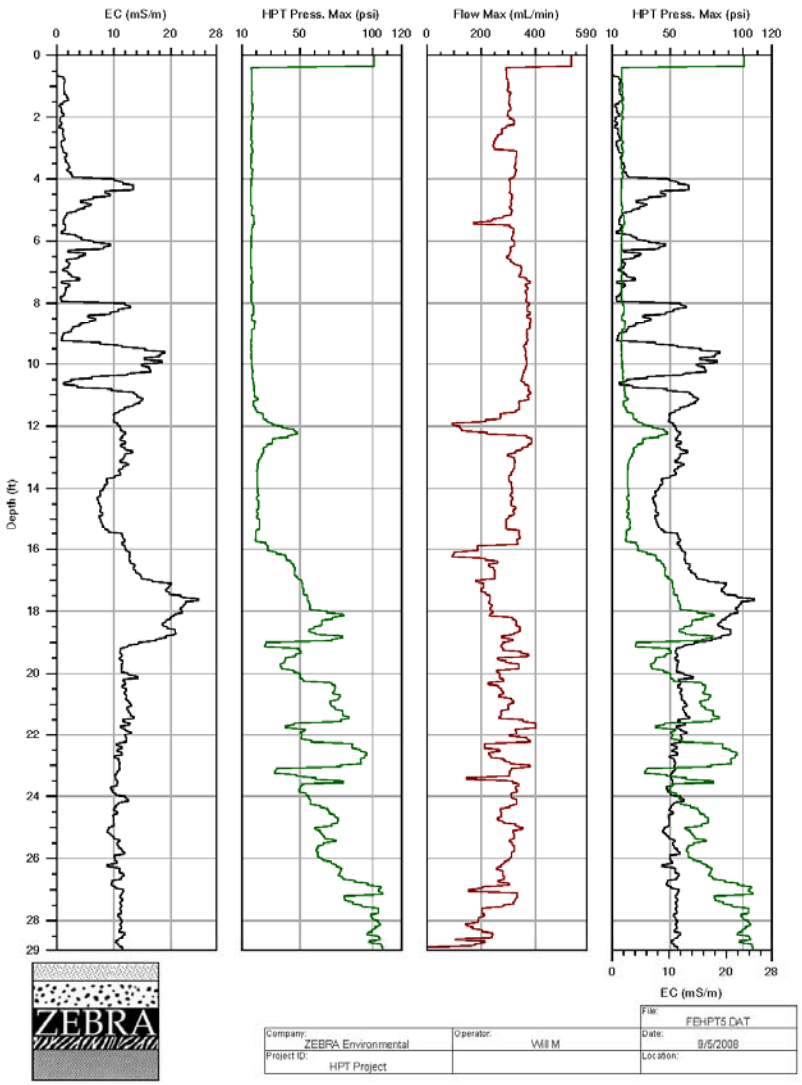


Case Study MIP/HPT NJ Site

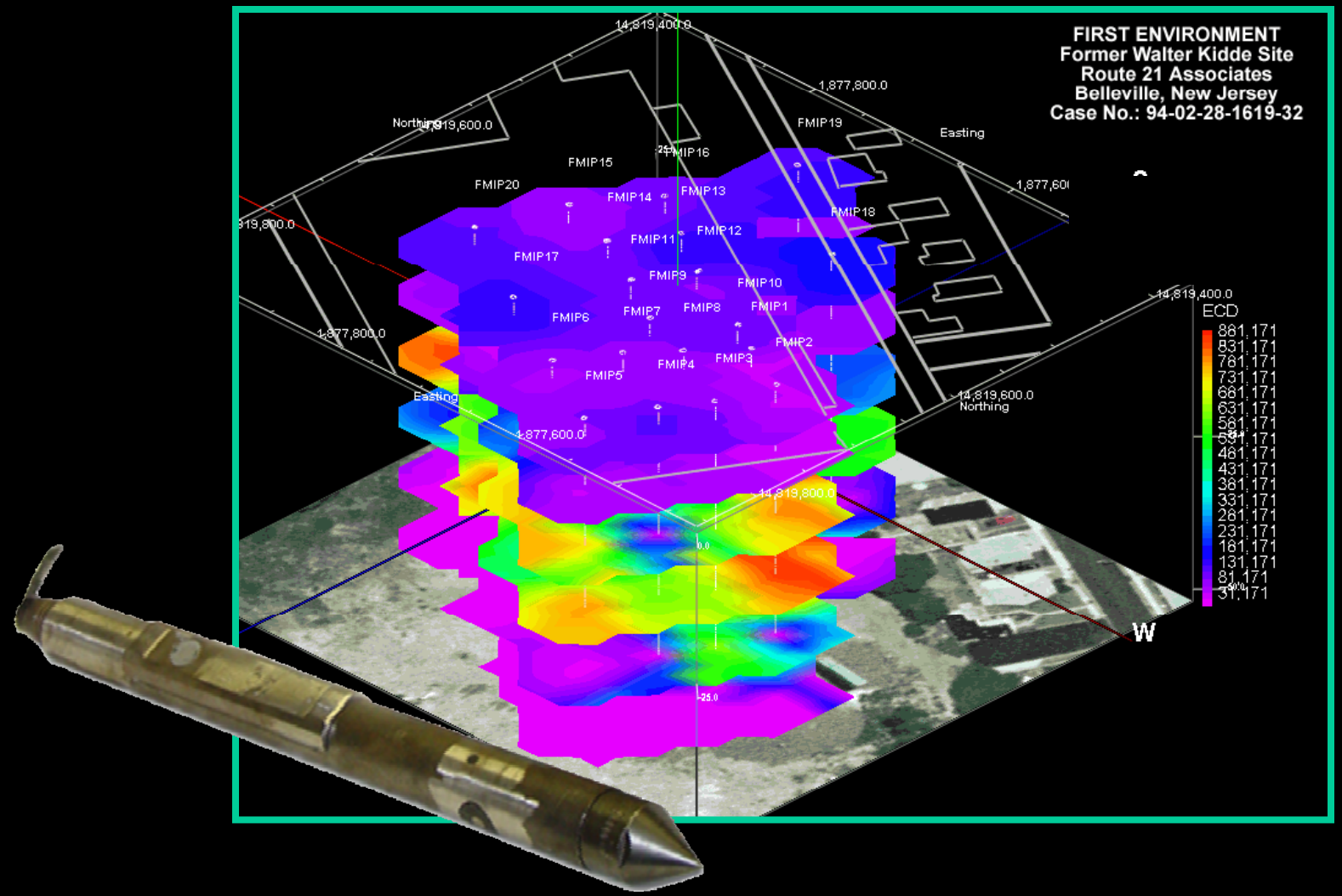


Case Study MIP/HPT NJ Site

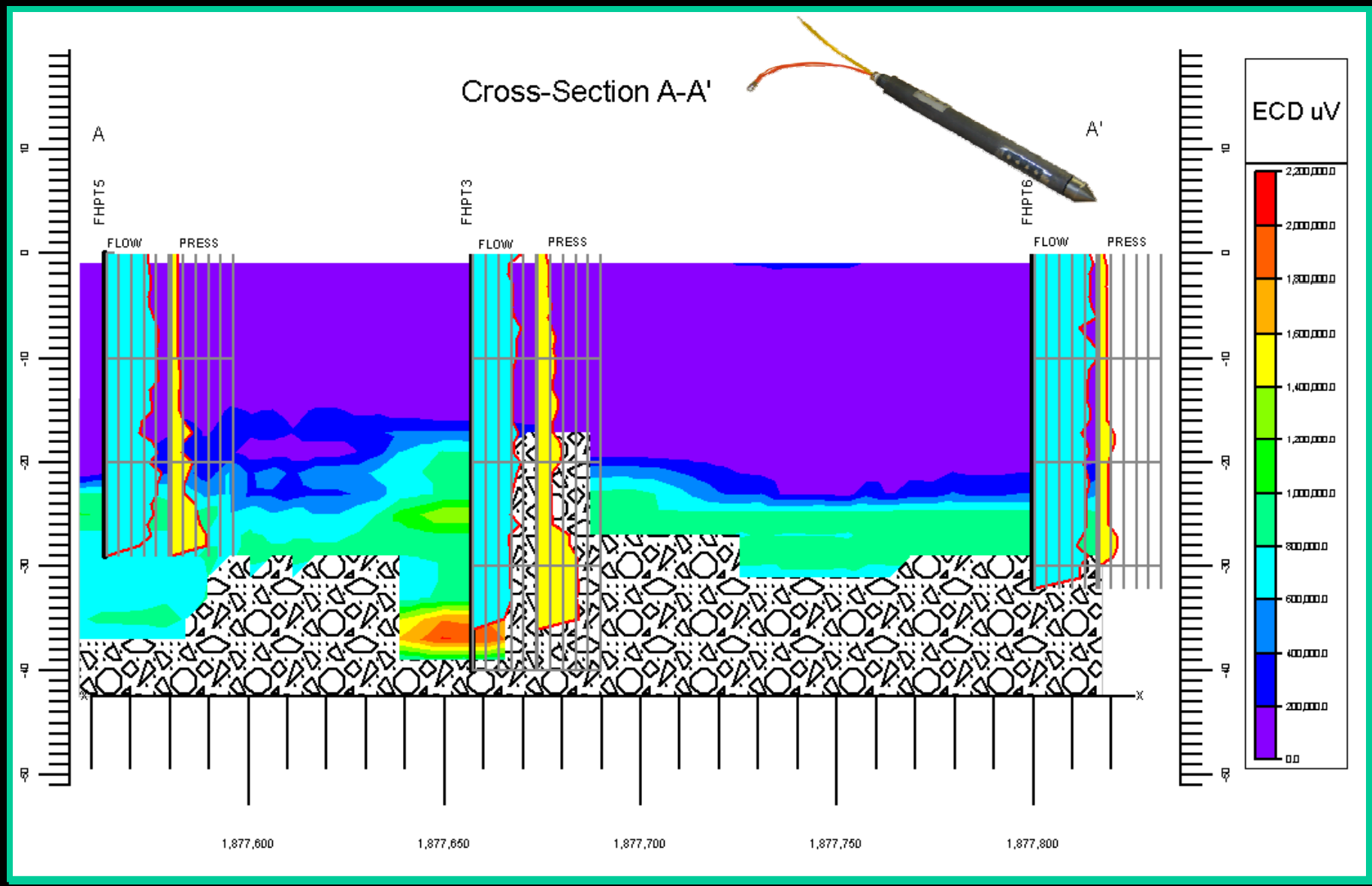




Case Study MIP/HPT NJ Site



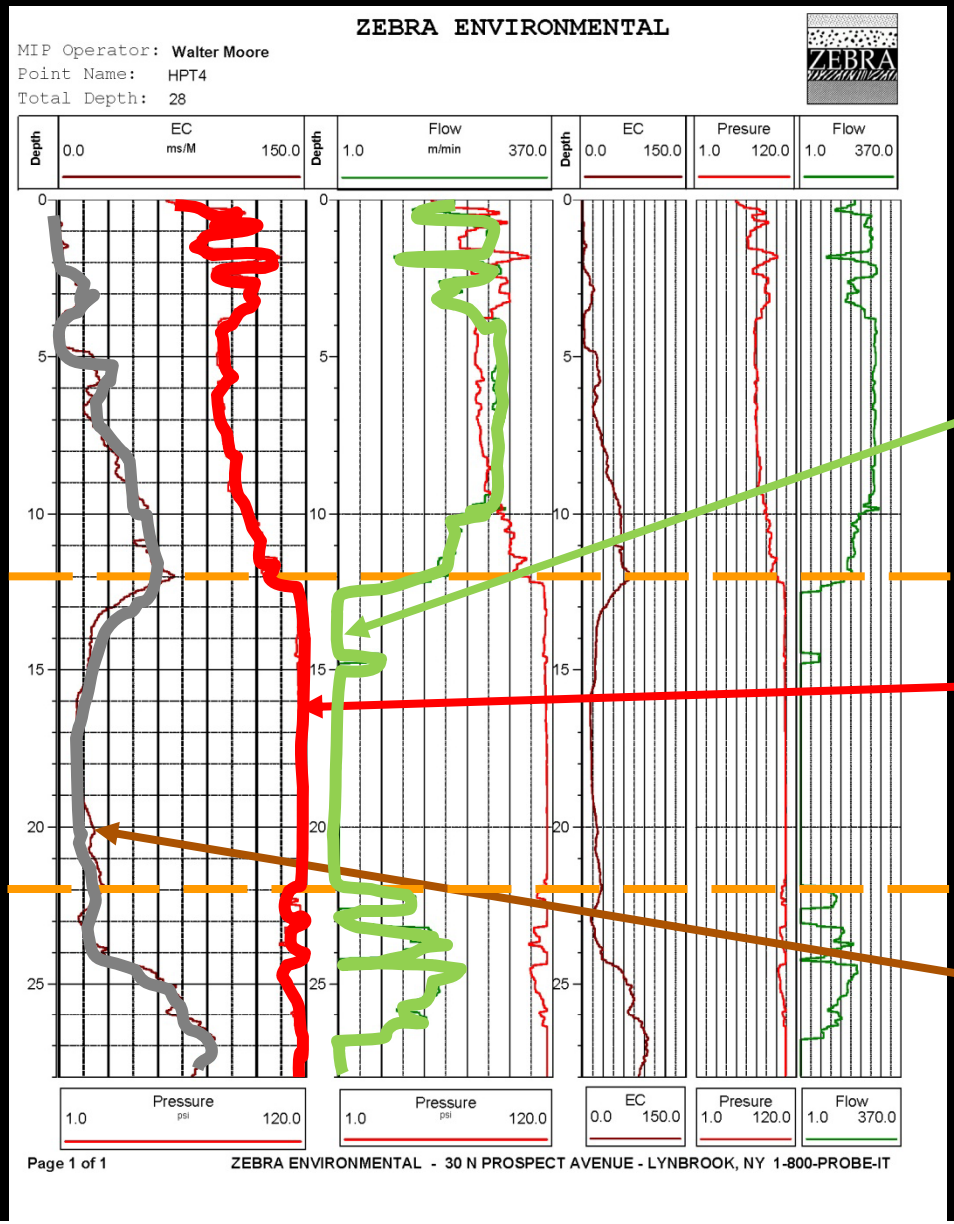
Case Study MIP/HPT NJ Site



Case Study - HPT VA Site

HPT VA SITE

Case Study - HPT VA Site

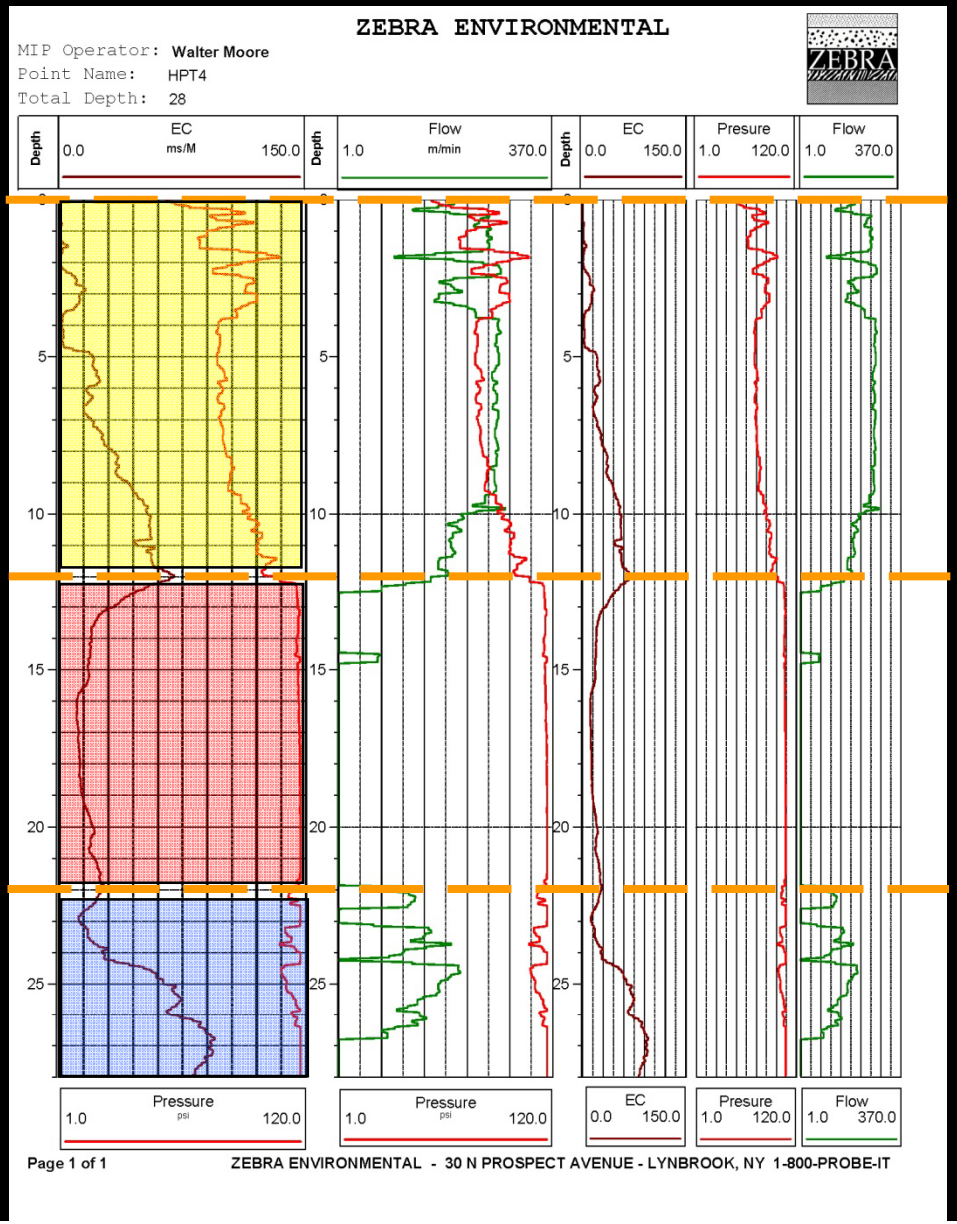


Flow – Zero

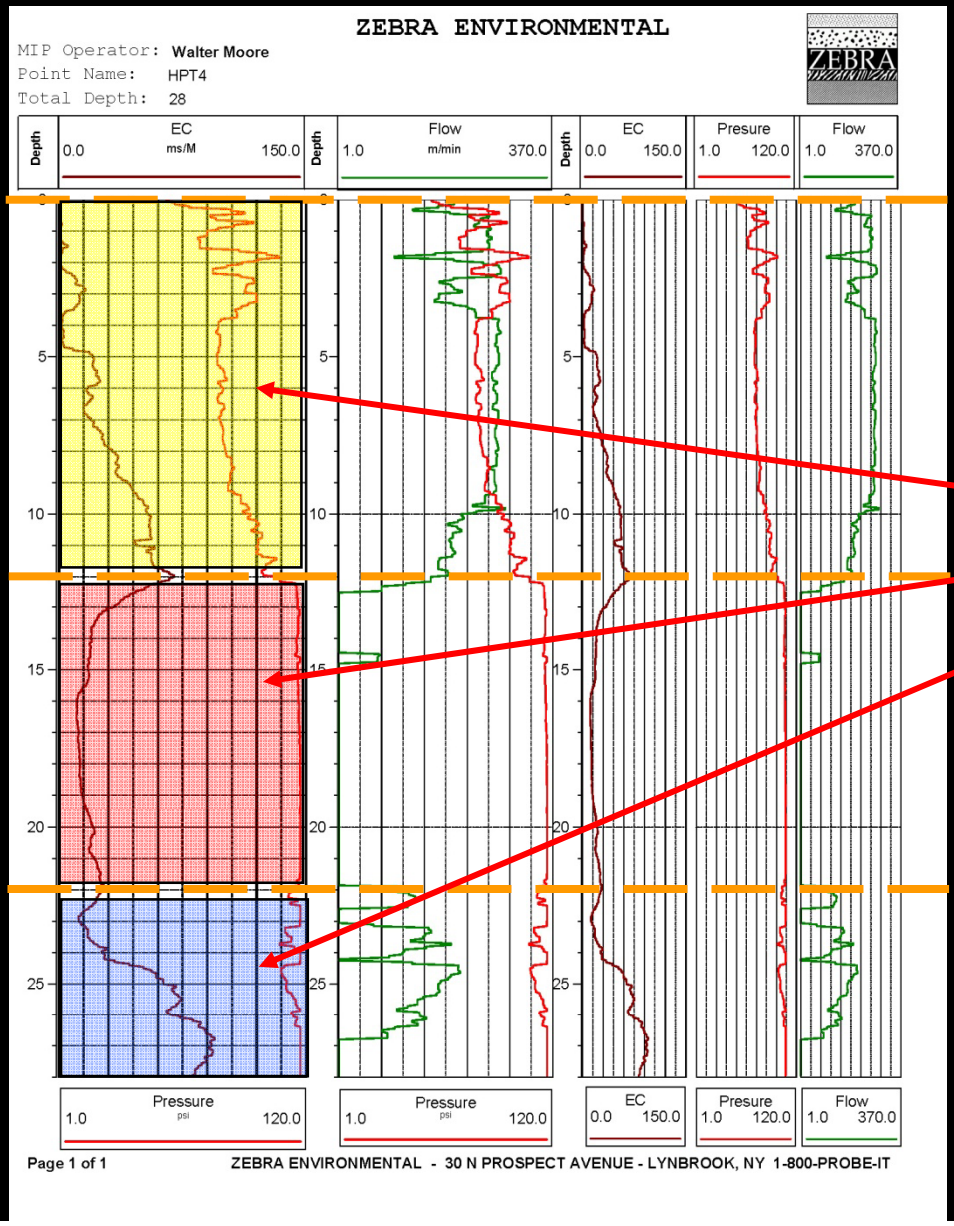
Pressure – High

EC – Sand

Case Study - HPT VA Site

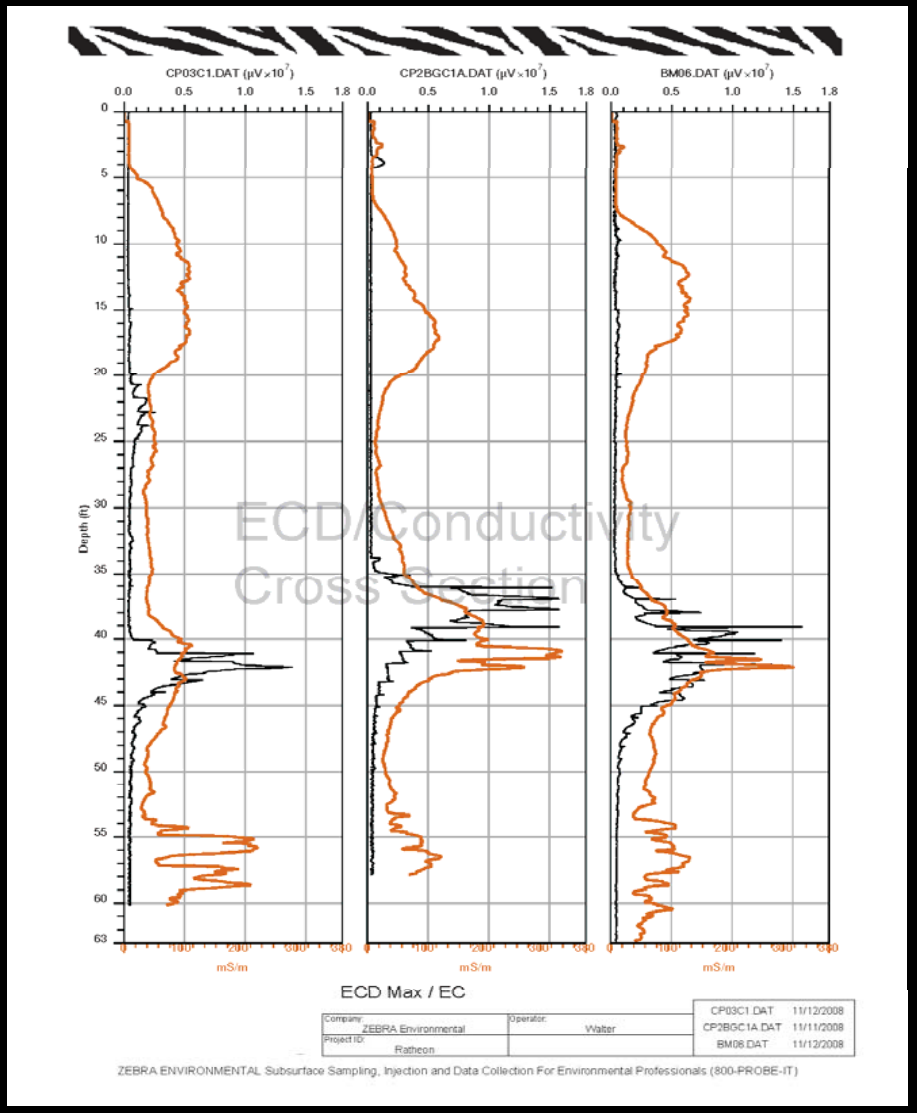


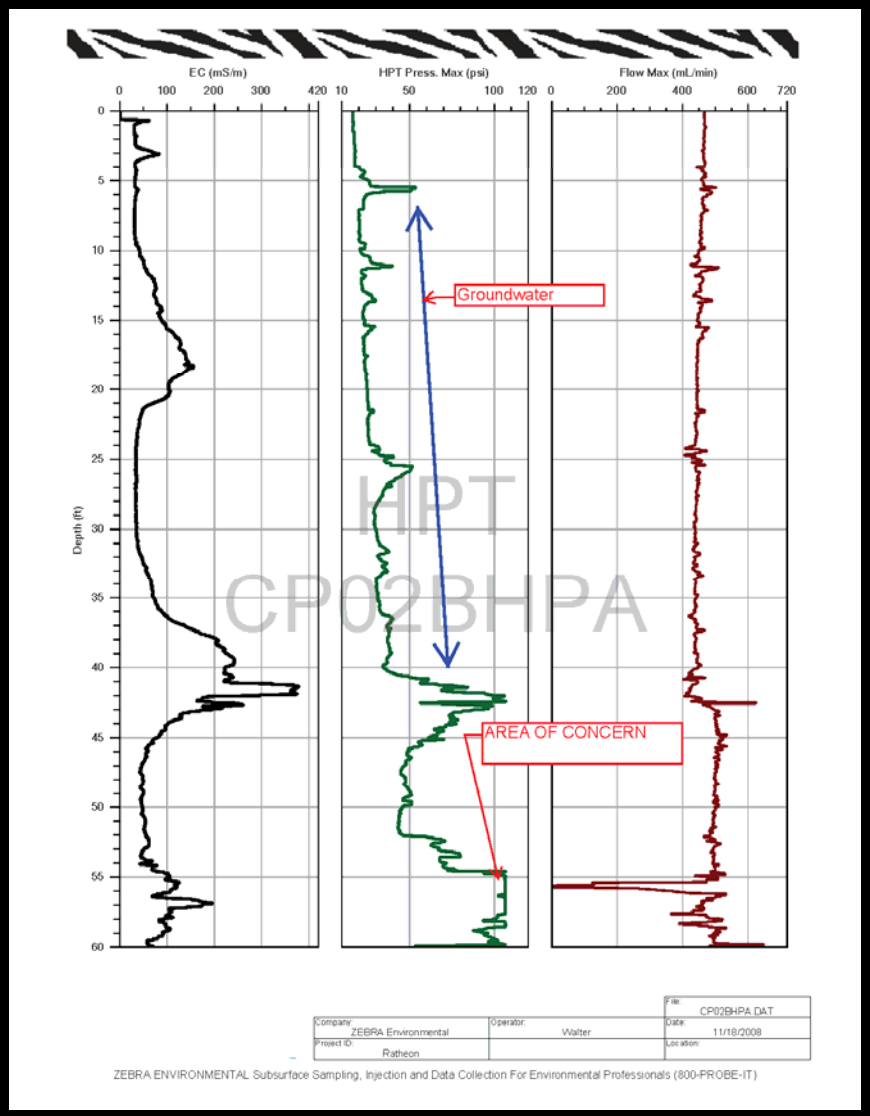
Case Study - HPT VA Site



Different Radius of Influence

Example – Tampa Bay Site





MIP DIRECT SENSING

For more information about the Membrane Interface Probe:

1-800-PROBE-IT

www.TeamZEBRA.com