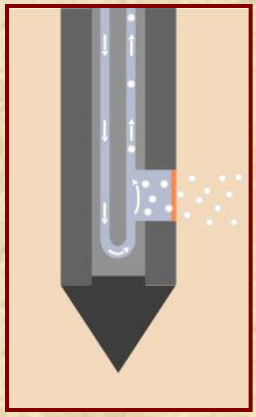
MIP System Field Test Results for Low Level TPH-GRO

Salina, KS
June & July 2011

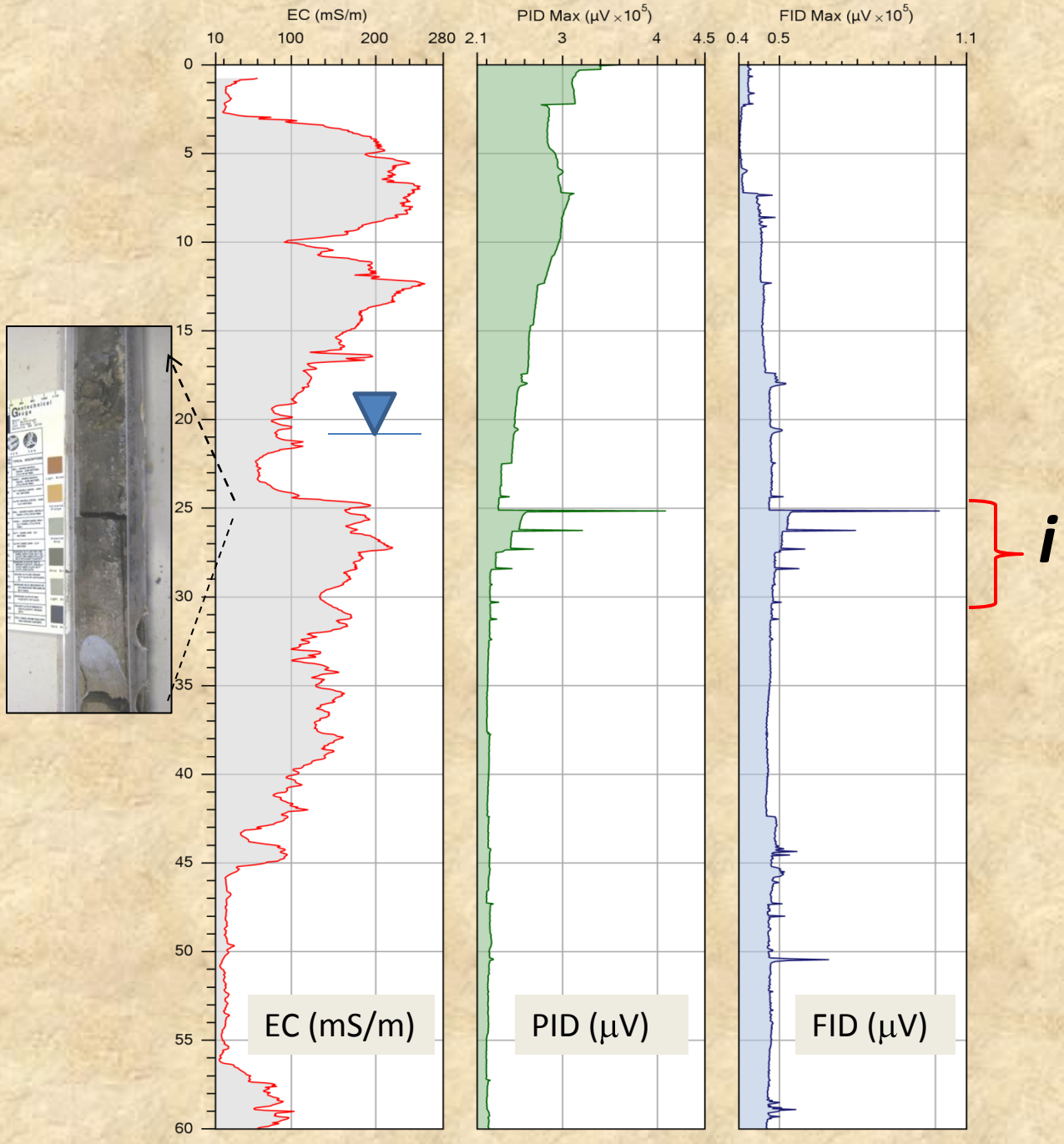
Tom Christy and Blake Slater run MIP logs at local site in Salina, KS where gasoline contaminates the soil and groundwater.



Schematic of MIP Probe with VOCs penetrating the membrane.

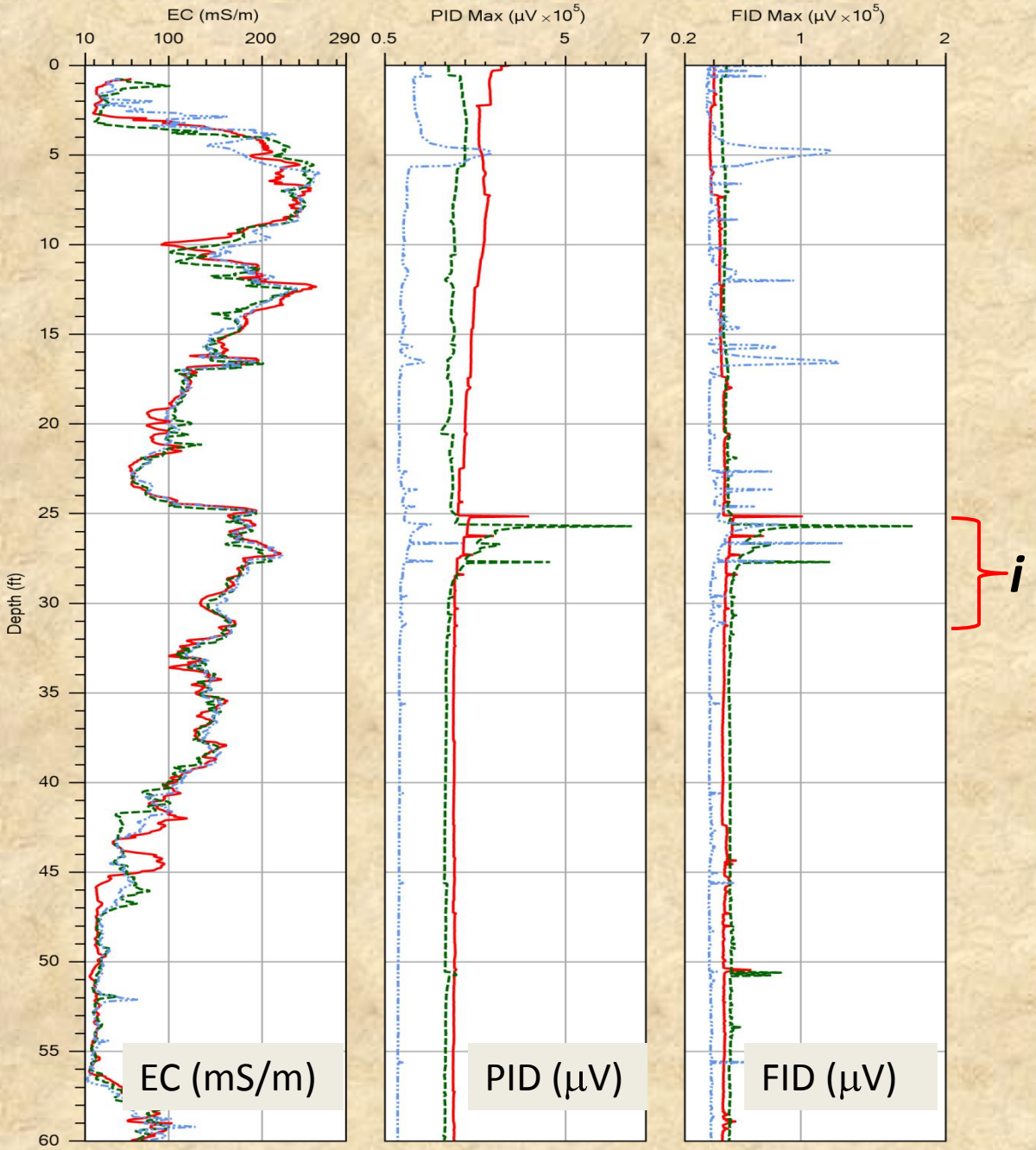
This presentation describes testing performed by Geoprobe Systems™ to compare MIP log results to lab analysis of co-located soil samples. The logs and samples were obtained at a petroleum release site where the spill occurred over 10 years ago. There was low level GRO contamination (< 1 ppm) at the location studied here.

MIP Log Tst8 Location



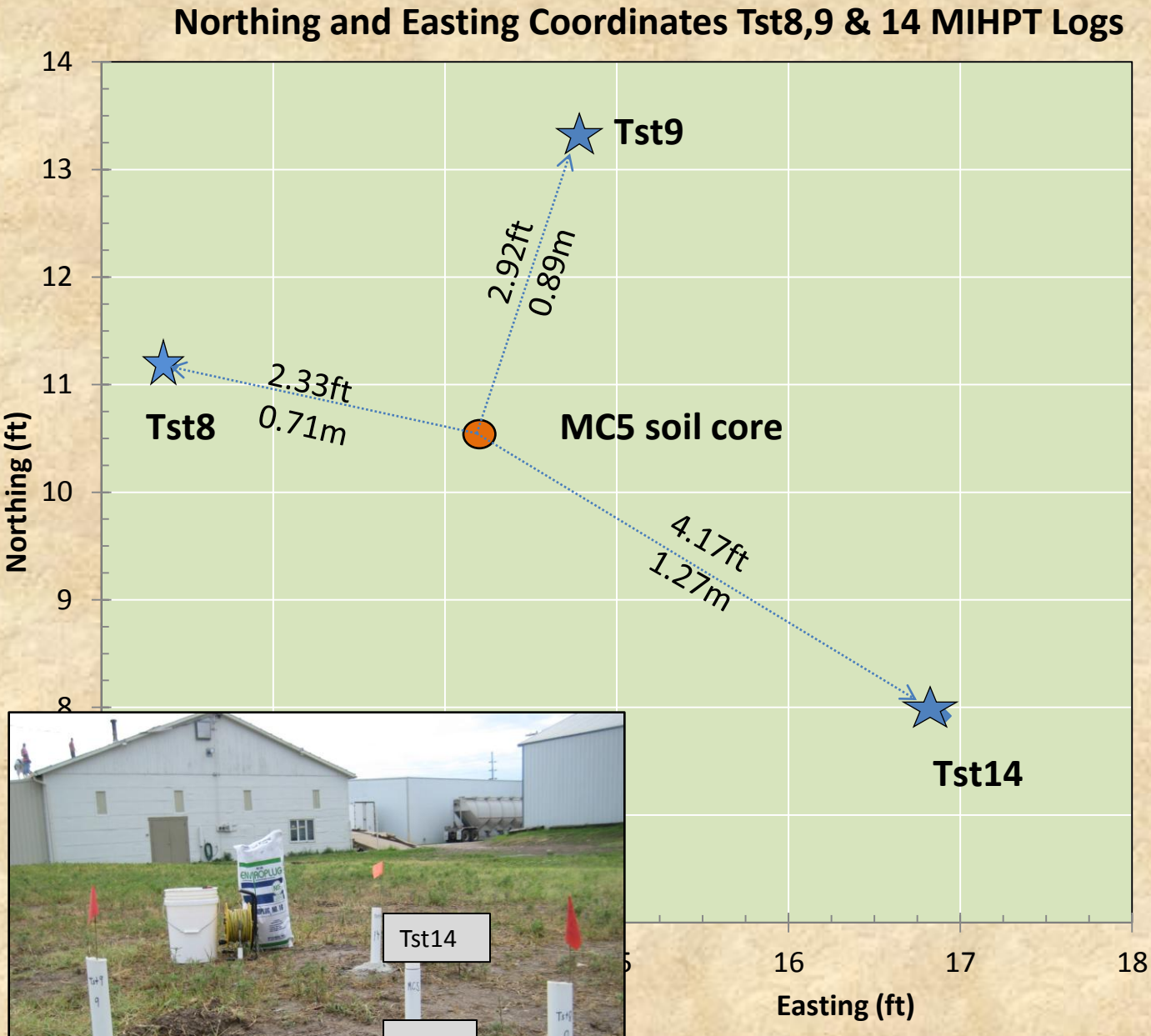
Both the PID detector (green) and the FID detector (blue) indicate the presence of low level volatile contaminants between ~25 to 30 feet (***i***). The EC reading between 25 to 30ft (about 140 to 220 millisiemens/meter) suggest these are fine grained soils with clay (confirmed with soil samples). The comparison made in this study is for the MIP log results and soil samples from the saturated zone at this location.

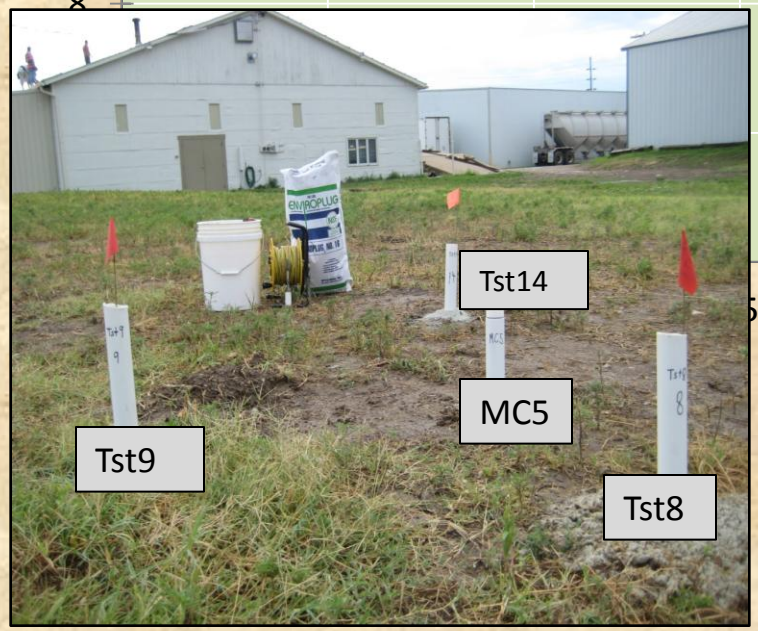
Overlay of Tst8, 9 & 14 MIP Logs



Two replicate logs were run near the Tst8 log to verify repeatability of the original log and that contaminant mass did not change dramatically in the area where soil cores would be collected. There is good overall agreement between the replicate logs indicating low level contamination between ~25 to 30ft (**i**). PID detector response ranged between about 2 to 4 X 10^5µV above baseline while the FID detector response ranged between about 1 to 2 X 10^5µV above baseline. Based on the results of the logs soil coring was targeted around the 20 to 35ft interval to assess nondetect and low level GRO concentrations.

MIP Tst8, 9 & 14 Log Locations
Low-Level GRO Area Map





MC5 soil cores were taken near the center of the MIP log array.

Macro Core MC5 Soil Sampling for TPH-GRO

MacroCore MC5 closed piston system equipped with a 5ft (1.52m) core barrel and PVC liner was used to collect 4ft (1.22m) long soil cores to a depth of 40ft (12.2m) between the replicate logs at the low-level GRO area. (See map above)

A Terra Core™ tool (En Novative Tech. Inc.) was used to collect about 5 grams of sample from a hole cut in the side of the MC liner at each targeted depth.

The soil core was then transferred immediately to a tared VOA vial already prepared with a stir bar and reagent grade water.

Once the transfer was completed the VOA vials were stored on ice in a cooler until delivered to the lab for analysis.

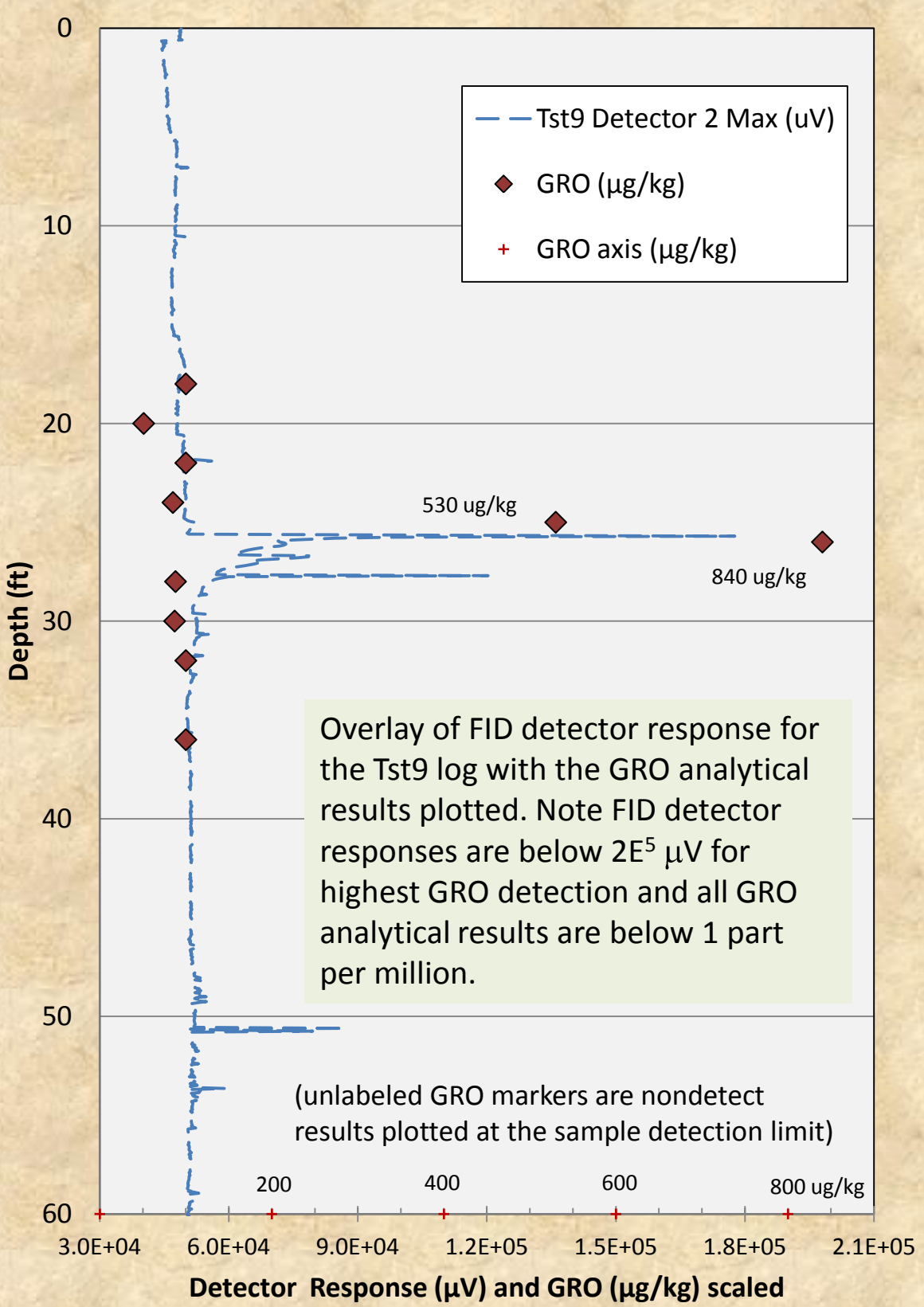
MC5 Soil Analytical Results for TPH-GRO

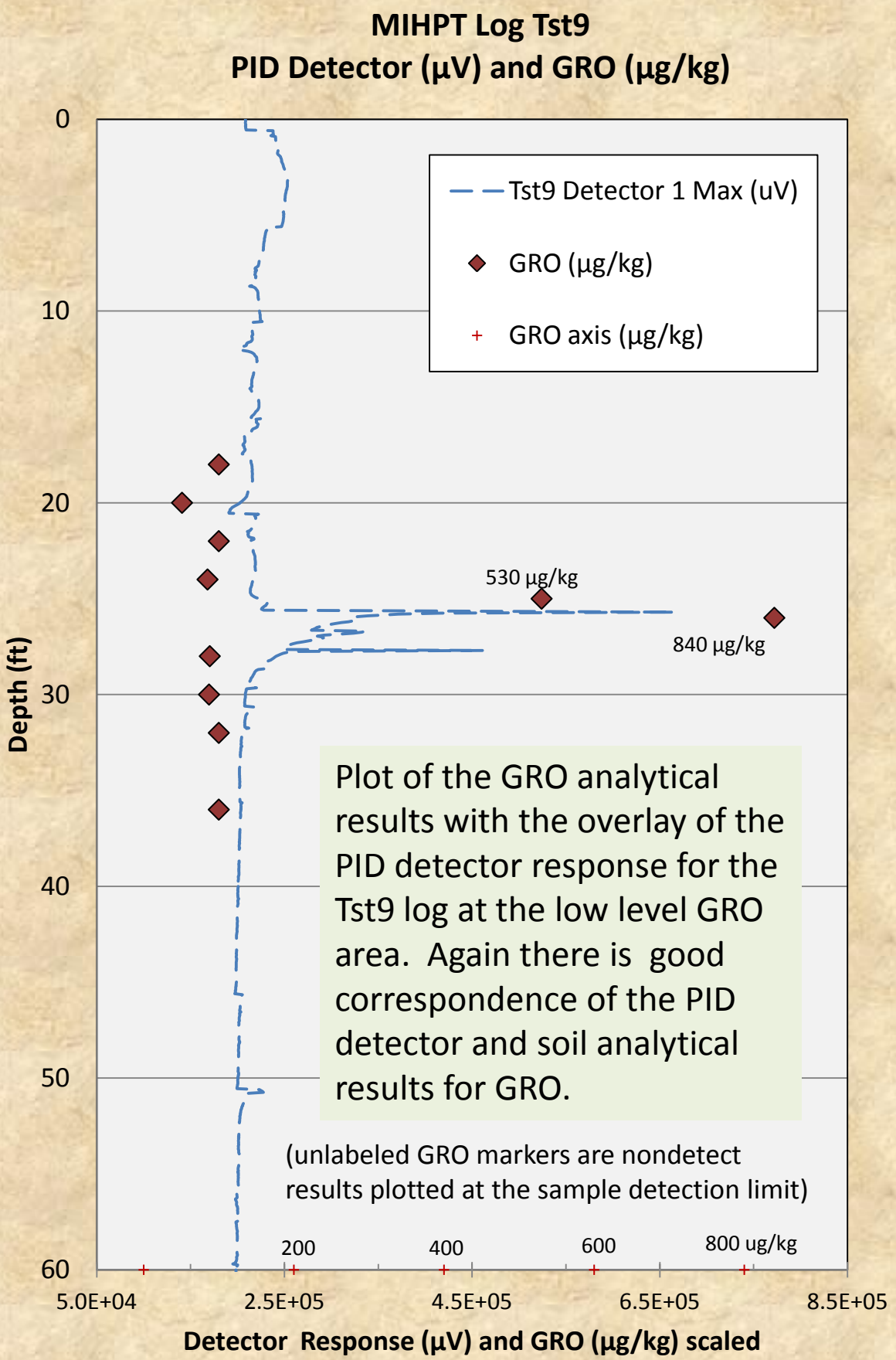
Sample Depth (ft)	TPH-GRO (µg/kg)
18	ND 100
20	ND 51
22	ND 100
24	ND 85
25	**530**
26	**840**
28	ND 88
30	ND 87
32	ND 100
36	ND 100

ND = nondetect, the adjacent number is the method reporting limit for the sample. A pdf copy of the CAS analytical report is available on request.

The soil samples were submitted to Continental Analytical Services (CAS) Laboratory, Salina, KS for analysis by EPA Method 8015 GC-MS for TPH-GRO. The method reporting limit ranged from about 50µg/kg to 100µg/kg (parts per billion) depending on the mass of sample recovered and other factors.

MIHPT Log Tst9
FID Detector (µV) and GRO (µg/kg)




MIHPT Log Tst9
PID Detector (µV) and GRO (µg/kg)
Tst9 Detector 1 Max (uV)
GRO (µg/kg)
GRO axis (µg/kg)
530 µg/kg
840 µg/kg
Plot of the GRO analytical results with the overlay of the PID detector response for the Tst9 log at the low level GRO area. Again there is good correspondence of the PID detector and soil analytical results for GRO.
(unlabeled GRO markers are nondetect results plotted at the sample detection limit)
Depth (ft)
0
10
20
30
40
50
60
200
400
600
800 ug/kg
5.0E+04
2.5E+05
4.5E+05
6.5E+05
8.5E+05
Detector Response (µV) and GRO (µg/kg) scaled

Summary : MIP and Low Level GRO in soil

- The MIP system can easily detect gasoline range organics (GRO) in the 500μg/kg to 800μg/kg concentration range when maintained and operated properly.

- Replicate MIP logs with FID and PID detectors show generally good correspondence in detector response for low level GRO.

- Macro Core MC5 closed piston sampling was used to collect soil cores across the zone of positive detector response.

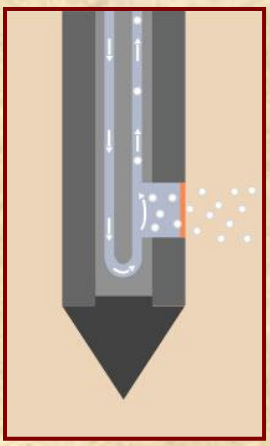
- Good correspondence is observed between both the PID and FID detector responses and the GRO analytical results for the soil samples.

- The soil GRO results are nondetect over the zones where the MIP detectors display little or no response above the baseline.

- The soil GRO results are positive detect over the interval where the MIP detectors show clear response in the replicate logs.

- Soil coring and sub-sampling techniques for volatiles analysis can have a substantial impact on the analytical results as well as the correspondence between MIP results and soil sample results.

- It is also important to collect the soil core in close proximity to the MIP logs, in both space and time, to get a good correlation between the MIP log and analytical results.



To learn more about the MIP system visit

www.geoprobe-di.com

MIP System Specifications for this Study:

Probe: Combined MIP-HPT Probe, PN MK6530

GC and Detectors: SRI Model 310C GC equipped with 10.6eV PID and FID detectors

MIP Controller Model MP6505

Field Instrument Model FI6000

Carrier Gas: N_2 at 40ml/min

Trunkline equipped with an unheated 1/16” OD x 0.04” ID stainless steel return gas line