

Use of Semi-Quantitative Field Screening Data in Hydrocarbon Investigation and Remediation

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Outline

- Introduction
- TPH (hydrocarbon) Investigation for Remediation
- Field Screening vis-s-vis Lab
- Hanby Method: Case studies, Benefits
- Optimizing efficiency & cost



TPH (hydrocarbon) Investigation for Remediation

Two standard approaches

- Rapid field screening techniques
- Laboratory analysis

Summary of Field Methods for TPH

Type of Contamination		Applicable Methods	
		Method Reference	Method Name
Petroleum	Soil	USEPA 4030	Soil Screening for Petroleum Hydrocarbons by Immunoassay
Petroleum	Soil	USEPA 9074	Turbidimetric Screening Method for Total Recoverable Petroleum Hydrocarbons in Soil
Petroleum	Soil	RemScan (REMScan, 2014)	Infrared Spectrophotometry
Petroleum	Soil	USEPA Innovative Technology Verification Reports (USEPA, 2008)	Various (see reference), examples include Chemetrics, Inc. "Remediaid TPH Starter Kit", and Sitelab Corporation's "UVF 3100 TPH Analytical Test Kit"
PAHs	Soil	USEPA 4035	Soil Screening for PAHs by Immunoassay
Petroleum	Soil	Maine DEP-SOP:TS004	PID Bag Headspace Test
Petroleum	Soil	Maine DEP-SOP:TS004	Oleophilic Dye Test

From FIELD SCREENING METHODS, Jan 2016,
State of Hawai'i, Department of Health



Field screening – pros & cons

Pros

- Rapid result
- Low cost

Cons

- “Screening” at best
- A number of conditions, such as moisture content, wind, nature of soil etc will preclude reliable data acquisition
- OVA (organic vapor analyzers): flame-ionization detectors (FID) to photo-ionization detectors (PID)
Readings.....”not much better than your own nose” – James Young | Mar 24, 2016 | The How |

Lab result – pros & cons

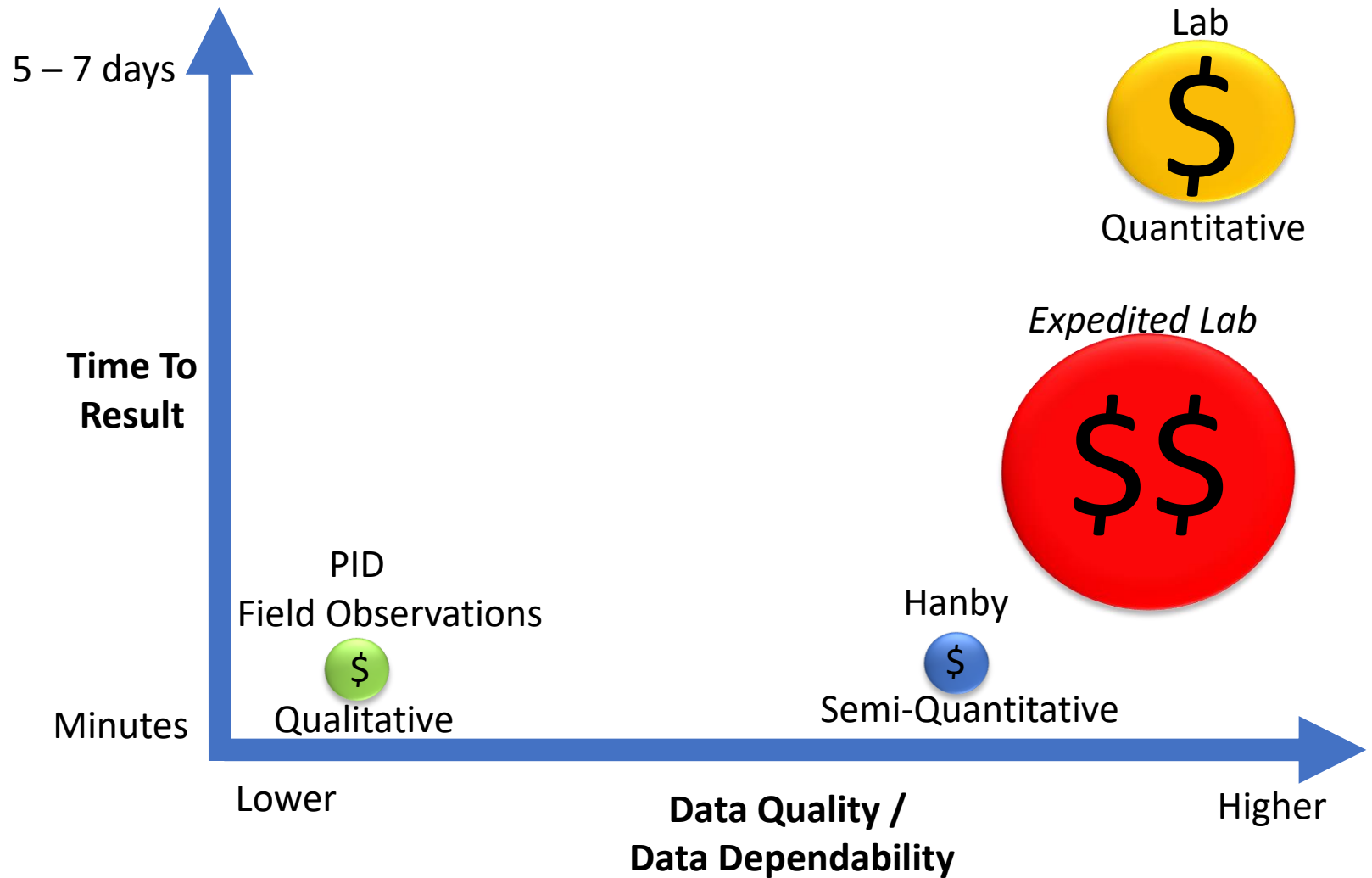
Pros

- Final answer to make decision
- “Approved” methods by regulatory agencies
- Generally appropriate “chain of custody” and information management system (LIMS) aid in data tracking

Cons

- Time (TAT - Turn around time)
 - Distance to Lab
 - Complexity of the procedure
 - Overall logistics
- Accuracy of the result vs making the decision, especially when more than one lab is involved
- Cost
- Tendency to accept / “believe” the lab result

TPH Measurement Tools: Cost-Value Matrix



TPH Estimation by Hanby Method: Well Established in Environmental Industry

Sample (soil or water)



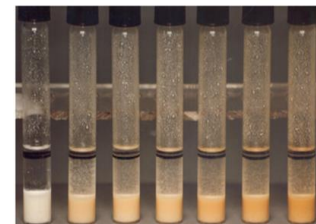
Hydrocarbon extraction by solvent



Treat with color development Reagent
(The **Friedel–Crafts** reactions)



Compare with standard photo



BLK 40 50 60 80 100 120
GASOLINE in Soil mg/Kg

Darker color, more hydrocarbon



Advantages of the method and kit

- **Accurate Results**

- results are scaled down in PPM; validated by EPA

- **Speed**

- takes 5-6 min for a result

- **Portability**

- Lightweight & rugged case can travel in back of truck & not be damaged

- **Easy to use**

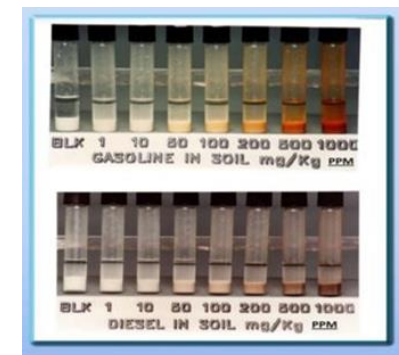
- color is developed in response to the presence of a contaminant and the resulting color is matched to a color chart supplied in the kit

- **Low cost per sample**

- 15 tests in one kit & 15 tests per refill order

- **Wide range**

- test for a broad range of petroleum related chemicals



Recent case studies: Groundwater Examples

- Case of a pending property transaction
- Needed to complete a 360-degree delineation of the plume in one shot
- Immediately begin design of an ISCO (*) event to remediate it
- To determine whether additional concentric arcs of wells were required to define a very low-concentration TPH plume
- Samples to delineate the plume to the required 1.0 mg/L clean-up level.
- *100% of lab data meeting expectations based on the Hanby kit results*



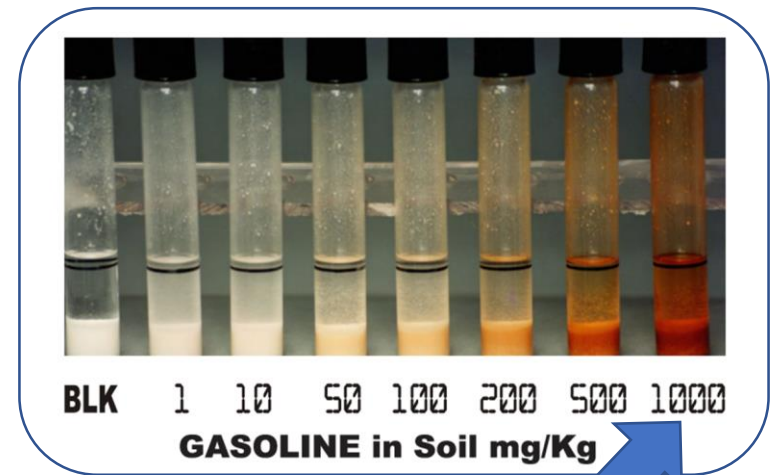
Well ID	Hanby Kit TPH (mg/L)	Lab Analytical (mg/L)
SB-1	<1.0	0.19
SB-3	<1.0	0.18
SB-5	<1.0	0.27
SB-7	<1.0	0.18
SB-9	<1.0	0.58
SB-11	<1.0	0.29

(*) In Situ Chemical Oxidation

Recent case studies: Soil Examples

Sample	Analyte	Hanby	Lab A	Lab B
		Results in ppm (mg/Kg)		
1	TPH (C06 – C35)	<50	1150	150
2	TPH (C06 – C35)	<50	3620	923

- When Hanby method shows samples contain less than 50 ppm TPH, Lab A reports TPH level in thousands
- Lab B result is order of magnitude less than that of Lab A. Perhaps to the “right direction” of the actual result.
- Six inch deeper samples contained no TPH by lab
- Without Hanby kit, Lab A result would have been accepted incurring more time and cost



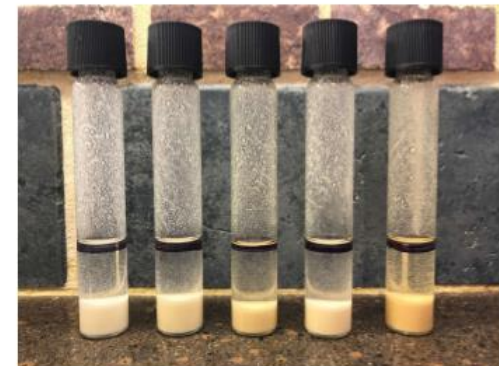
Soil with TPH > 1000 ppm would be make the white reagent much darker than that of 50 ppm!

Business Impact: Soil example with OMG Solutions

- A new remediation company wants to prove the power & efficiency of its newly launched chemical
- Initial TPH level is key to appropriately bid for a job
- In a recent case study, original lab report incorrectly stated contamination at 107,000 PPM Project was incorrectly bid based on original lab report.
- Hanby Field Kit correctly identified contamination at over 500,000 PPM.
- Then, for continuing operation, real time result was key to the success of the project



Aerial shot of McFaddin 131 Spill

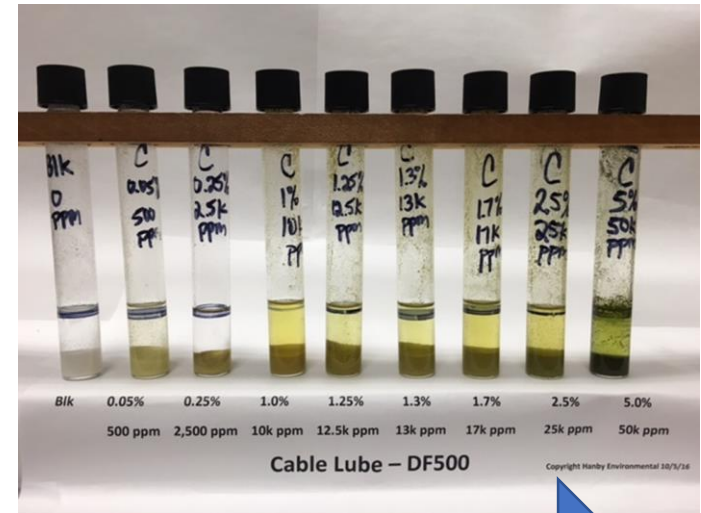


Final Test Results



Business Impact: Con Edison – More than 50% efficiency gain in spill closure

- System and Transmission
Department of Con Edison (one of the largest power supply companies in the US based in New York area) regularly addresses spill issues from its underground power lines
- Typically liquid hydrocarbon Dielectric Fluids (DF 100 and DF 500) are involved in the spill
- Hanby environmental created custom, color calibration for a wide spectrum of TPH concentration for these dielectric liquids
- Now with real time analysis utilizing Hanby kits, Con Edison has significantly increase in efficiency and a better than 50% reduction in duration of open spills



Increasing DF 500 make
white reagent darker

Site closure without Hanby
test kits = 44 days
Site closure with Hanby test
kits = 17 days

New Technology



Water / Soil Kit

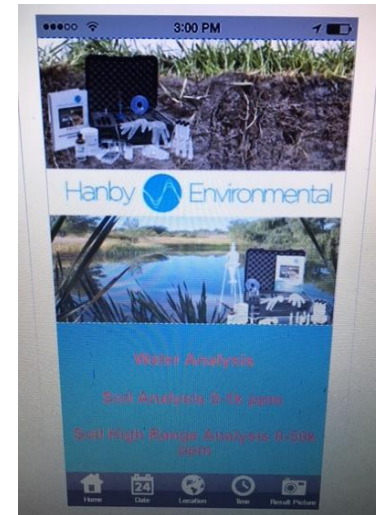


Visual

BLK 40 50 60 80 100 120
GASOLINE in Soil mg/Kg

- Reducing subjectivity
- Improved documentation
- Positive client feedback

Mobile App



Conclusion

- Can we optimize efficiency & cost in TPH investigation and remediation?
- Utilizing a more quantitative measurement, that is easily deployed in the field & also cost effective like Hanby Kits, one can definitely achieve that –
 - More data
 - Improved plume definition
 - Much faster decision
 - Reduction of equipment, personnel, mobilization and de-mobilization cost

**A Special “Thank You”
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