

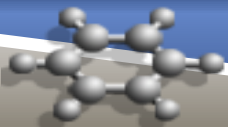
ASSESSMENT OF PETROLEUM HYDROCARBONS IN A REMOTE AND ECO-SENSITIVE ENVIRONMENT USING LASER INDUCED FLUORESCENCE (LIF) AND A LOW IMPACT MOBILE DRILL RIG (LIMB DRIG)

REMTECH OCT 11-13, 2017

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SABLE ISLAND

- ▶ Canada's furthest offshore island
- ▶ Environment:
 - ▶ Dynamic coastal dunes
 - ▶ Fresh water lakes and aquifer
 - ▶ Ecologically unique & important
- ▶ Four centuries of Human Use
 - ▶ 1801 - Canada's first life saving station
 - ▶ 2013 – National Park Reserve



LEGACY IMPACTS



SITE CHALLENGES

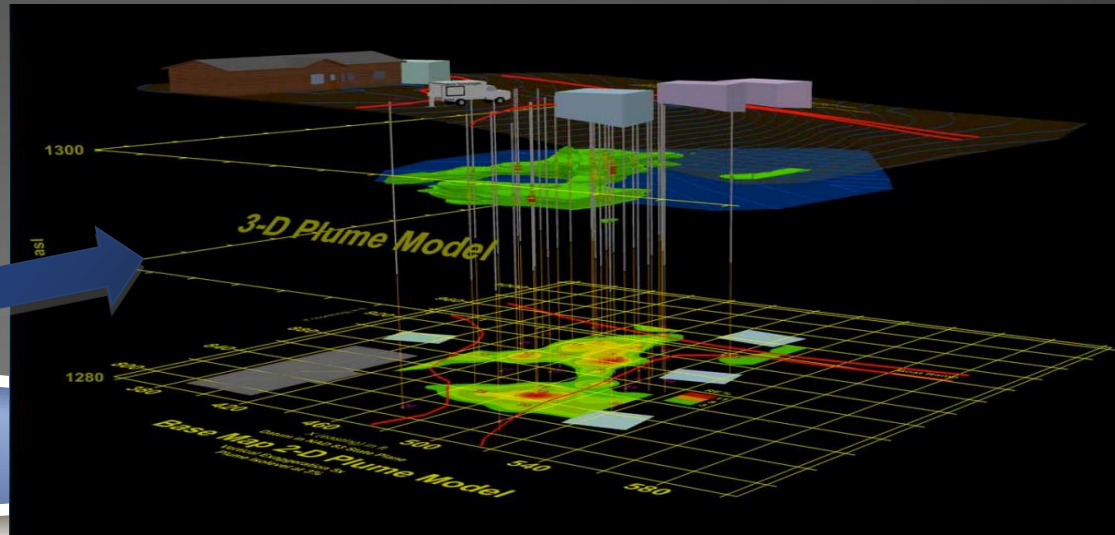
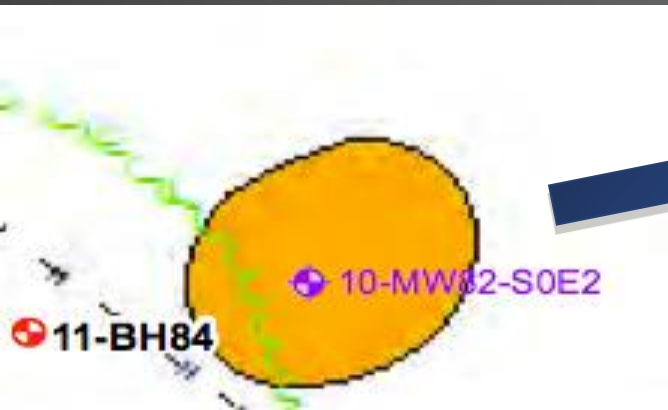
- ▶ Remote Site
 - ▶ Safety, Environment, Community, Logistics, Costs
- ▶ Ecologically Sensitive
 - ▶ Fragile flora, highly dynamic environment
- ▶ National Park Reserve



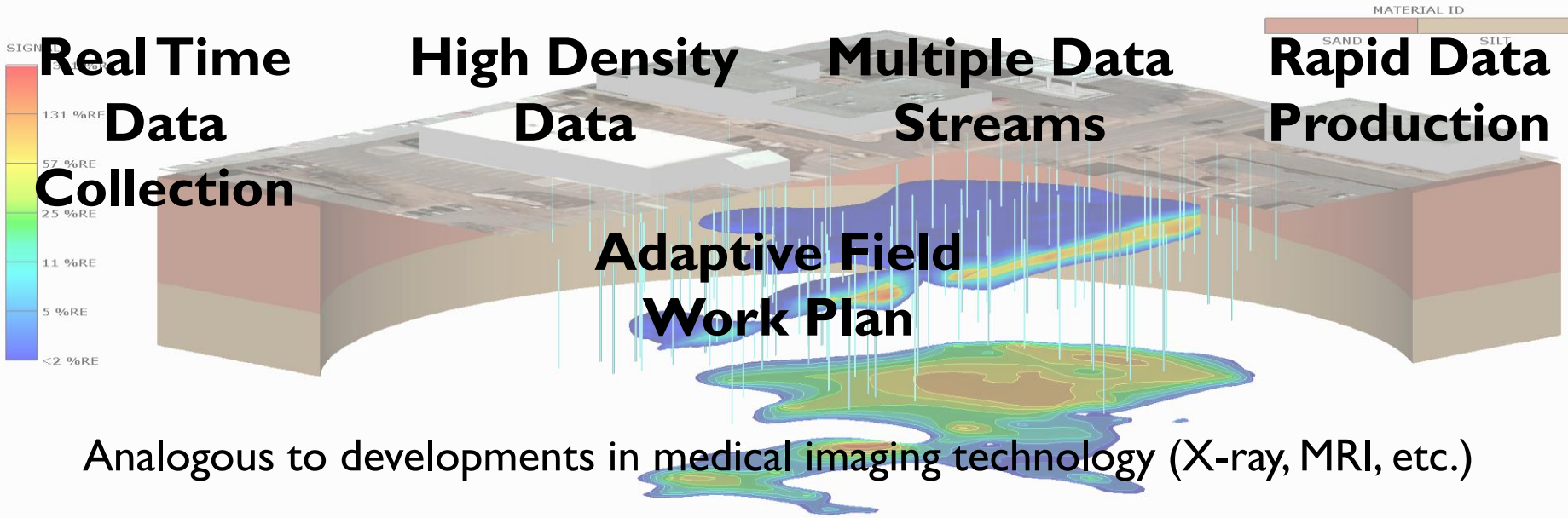
HRSC – Definition

- ▶ USEPA, 2013

“High-resolution site characterization (HRSC) strategies and techniques use scale-appropriate measurements and sample density to define contaminant distributions, and the physical context in which they reside, with **greater certainty**, supporting **faster and more effective site cleanup**.”



GREATER CERTAINTY



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HOW IMPORTANT IS THIS STEP?

- ▶ Managing uncertainty:
 - ▶ Conventional sampling approach
 - ▶ Paradigm shift via HRSC technologies
 - ▶ Marked increase in representativeness
- ▶ Importance of representativeness
 - ▶ “... 70 to 90 percent of data variability was caused by “natural,” in-place variability, with only 10 to 30 percent of variability being contributed by the rest of the data generation process...” (USEPA, 1991 from Crumbling et al., 2003)
- ▶ **COST & TIME SAVINGS - High ROI**

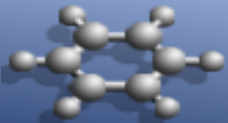
Conventional



HRSC

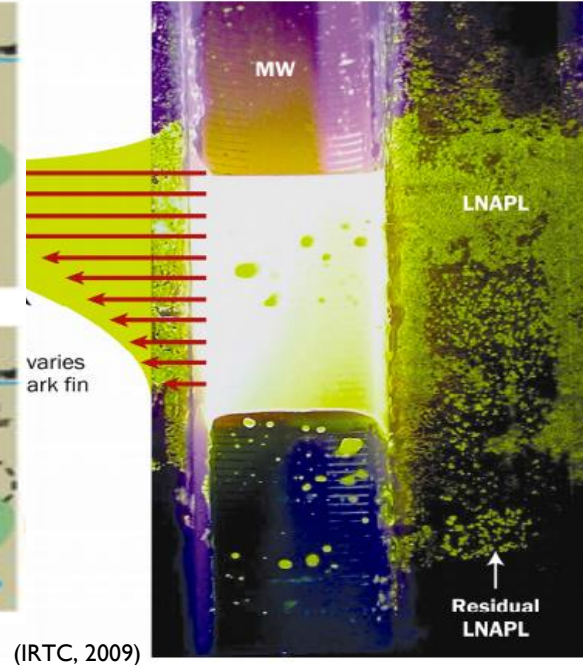
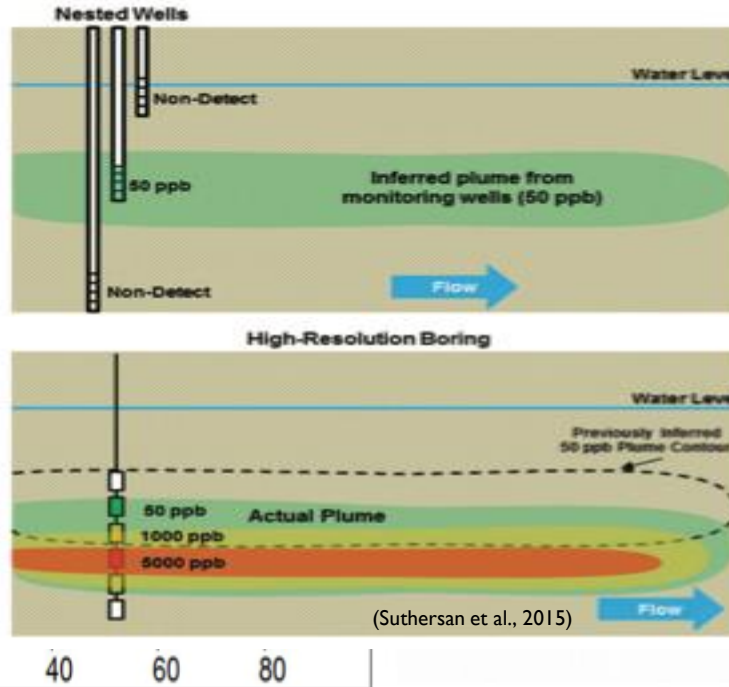
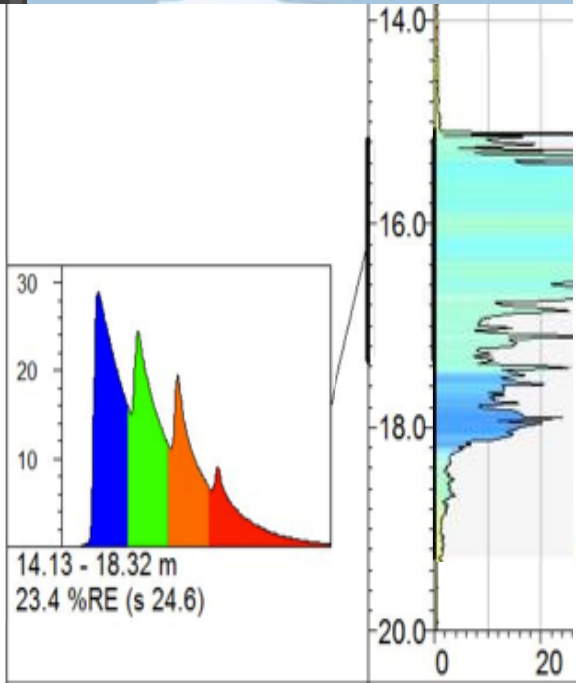


(After Crumbling, et al., 2001)



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REPRESENTATIVENESS



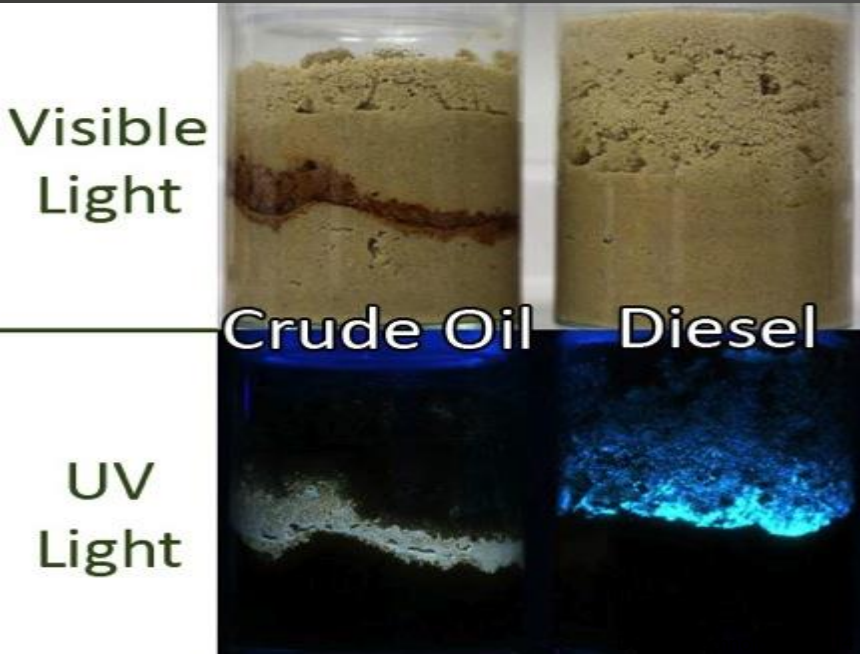
(IRTC, 2014)

Technologies

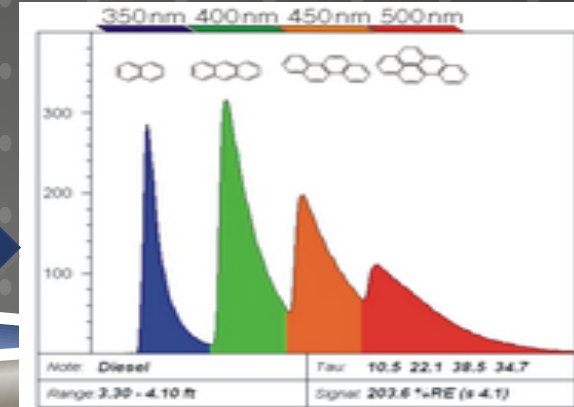


LIF – Laser Induced Fluorescence

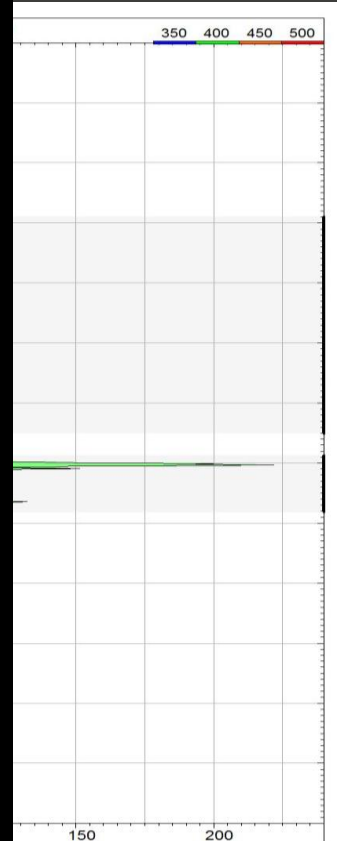
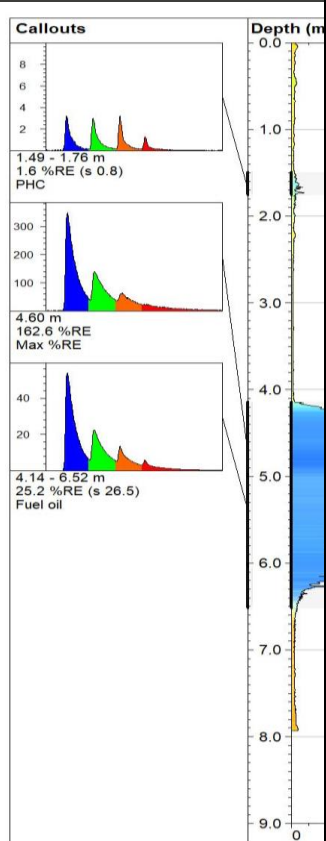
- ▶ Utilizes in-situ fluorescence spectroscopy to locate Free Phase Petroleum Hydrocarbons.
- ▶ Dakota Technologies UVOST, TarGOST, Dye LIF.



- ▶ Operation is based on two principles:
 - Fluorescence – PAHs
 - NAPL & PAH partitioning



LIF —

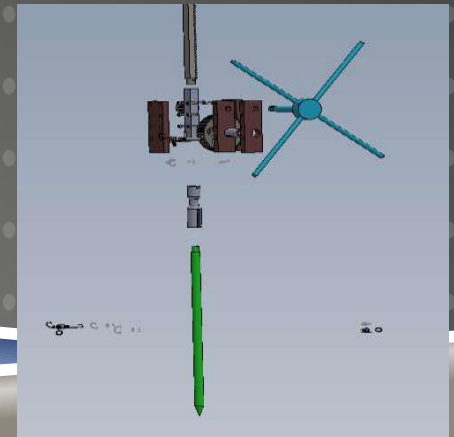
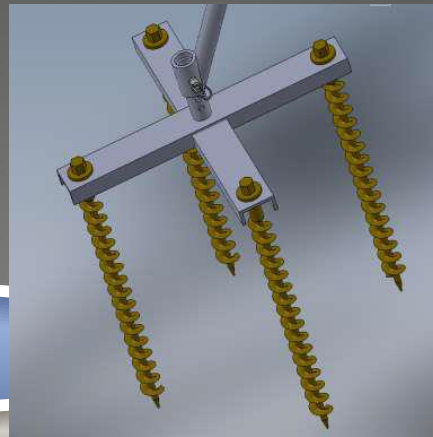
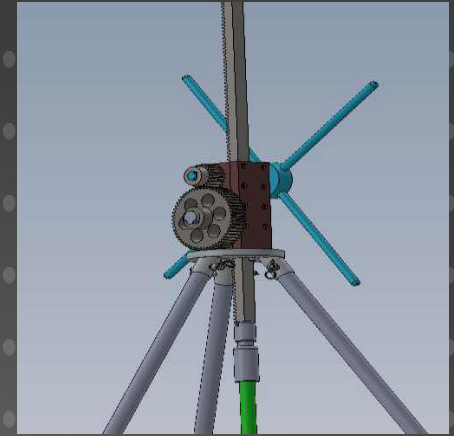
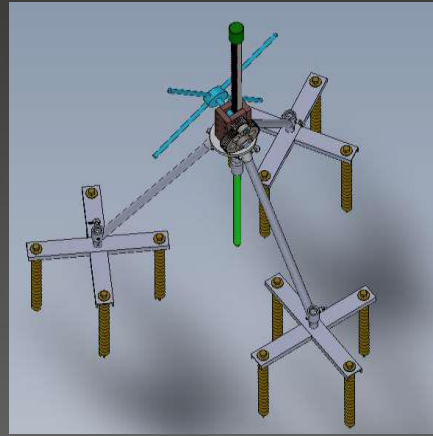
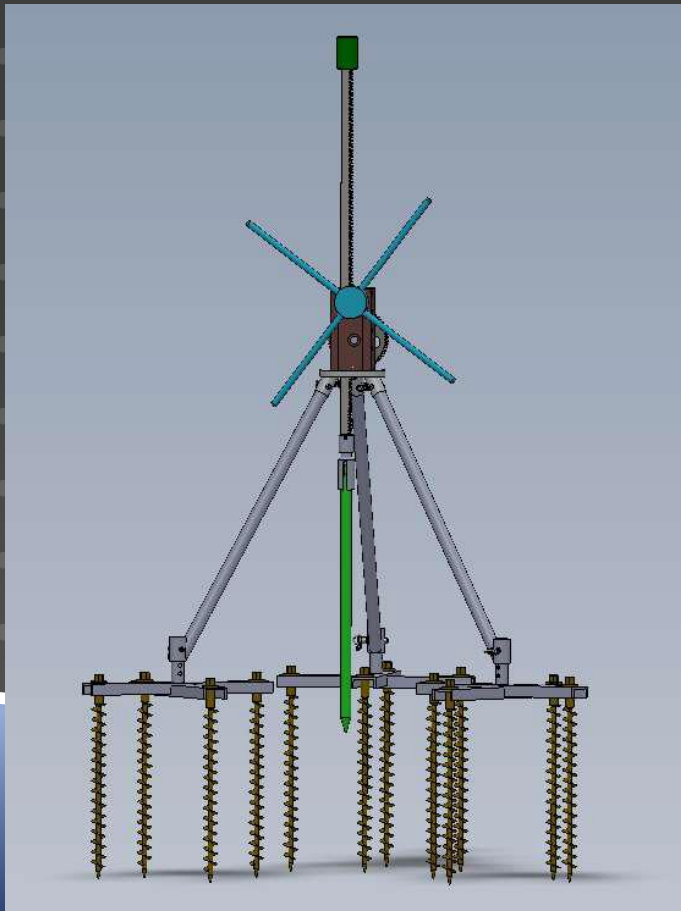


SITE CHALLENGES

- ▶ Remote Site
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LIMB DRIG – PHASE I



LIMB DRIG – PHASE II

- ▶ Add dynamic component
 - ▶ ~10,000 lbs of down force
 - ▶ Hammer capable
 - ▶ 120 lbs
 - ▶ Fits into a hockey bag!
 - ▶ Assembled and delivered by hand



FIELD TESTING

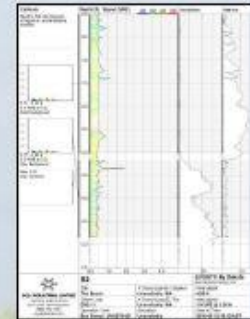
Successful field trial completed May 12, 2016



Hand assembled



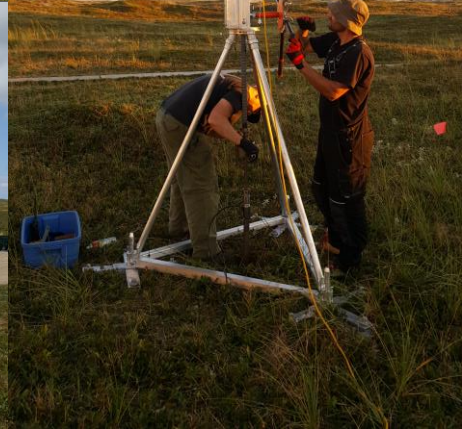
Integrated with LIF



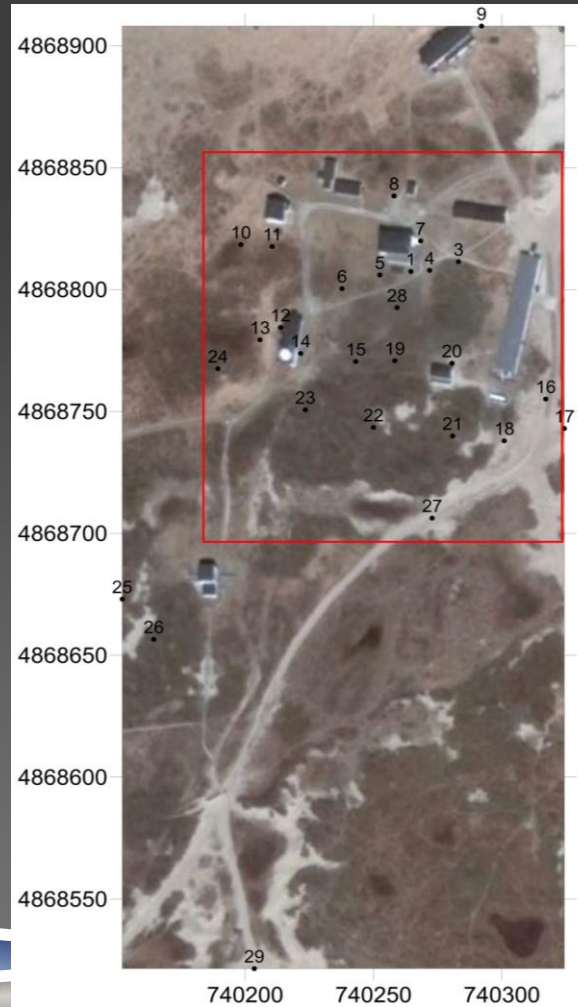
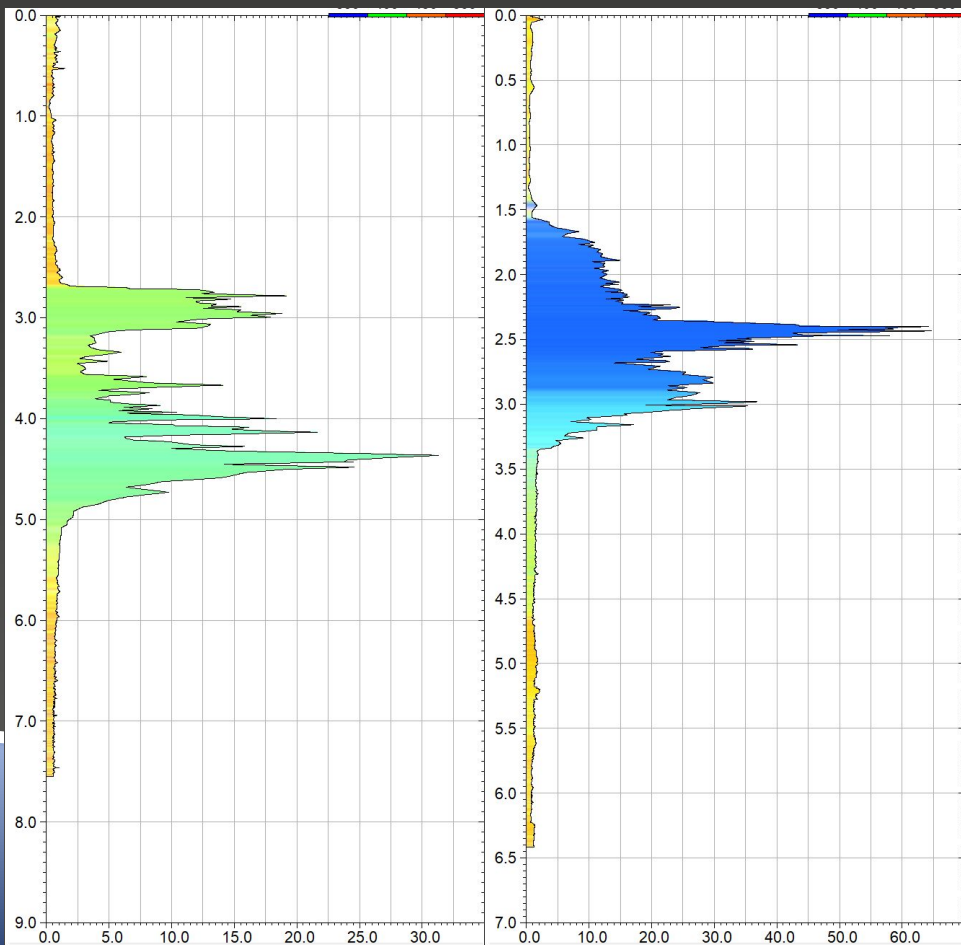
Not only did the device push through Sand -> it pushed through heavy clay.

DEPLOYMENT

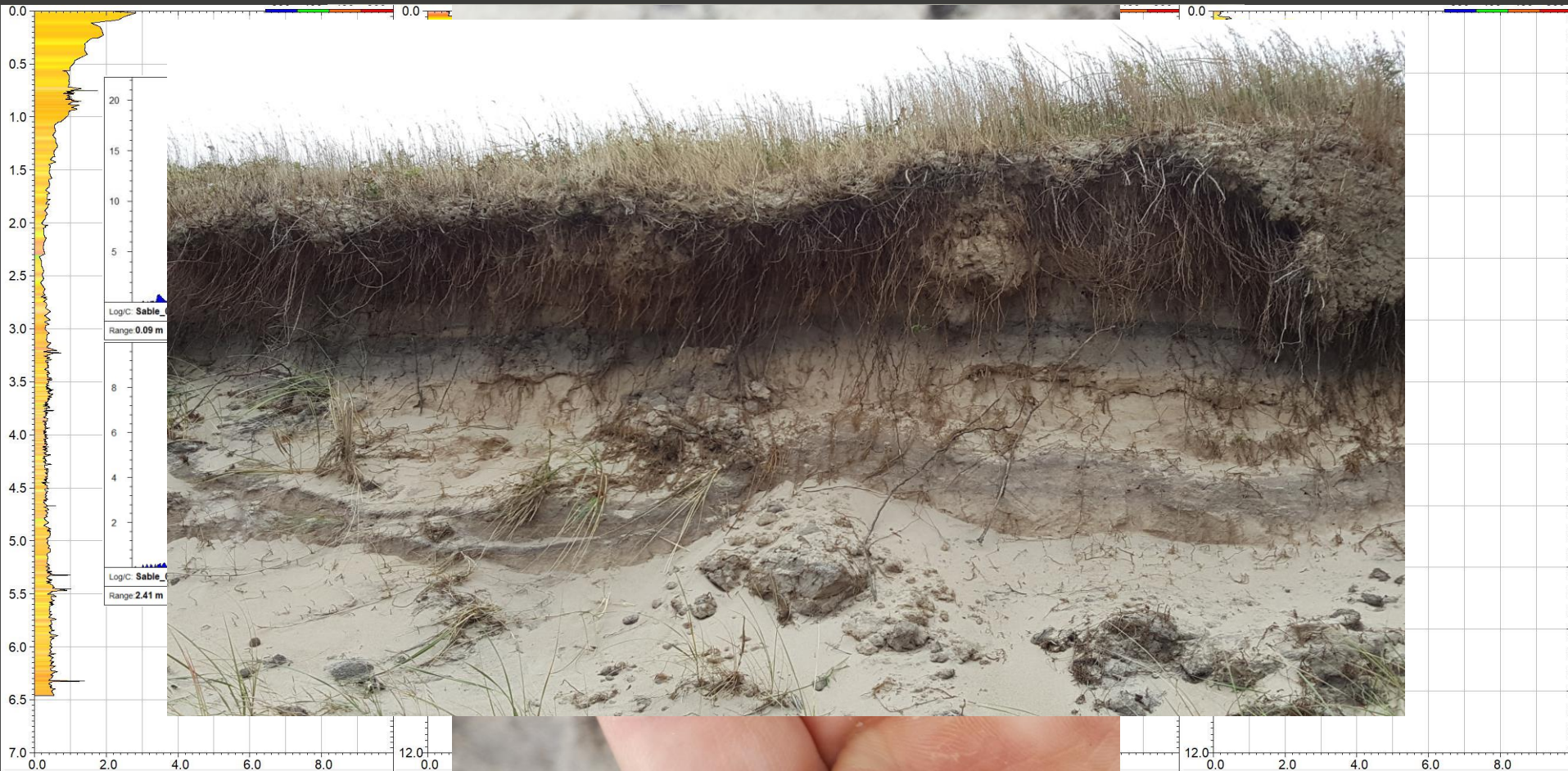
- ▶ Seven days – five active
 - ▶ 29 LIF + EC logs
 - ▶ 11 hand augured bores
 - ▶ 18 analytical samples



RESULTS

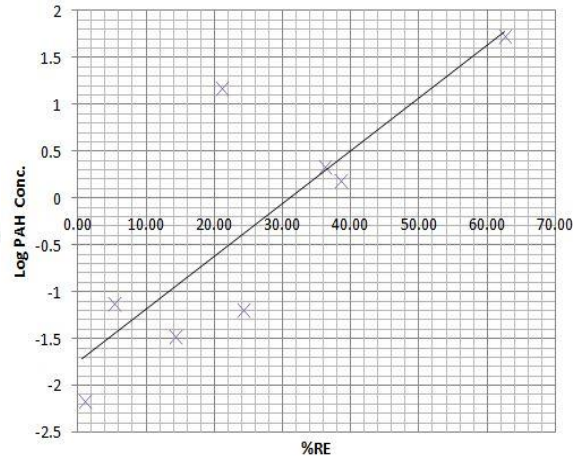
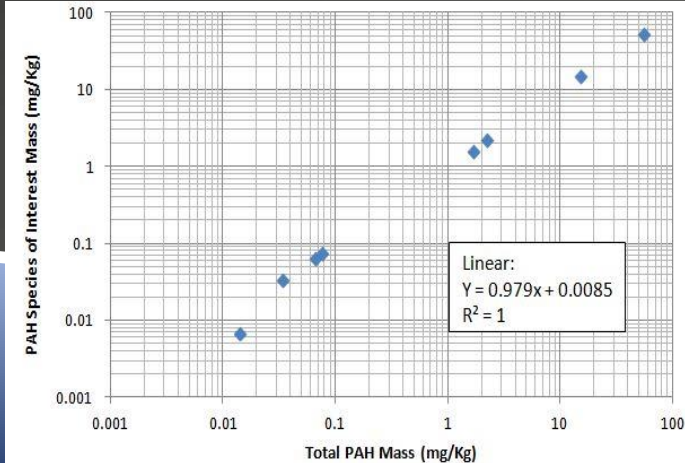


RESULTS

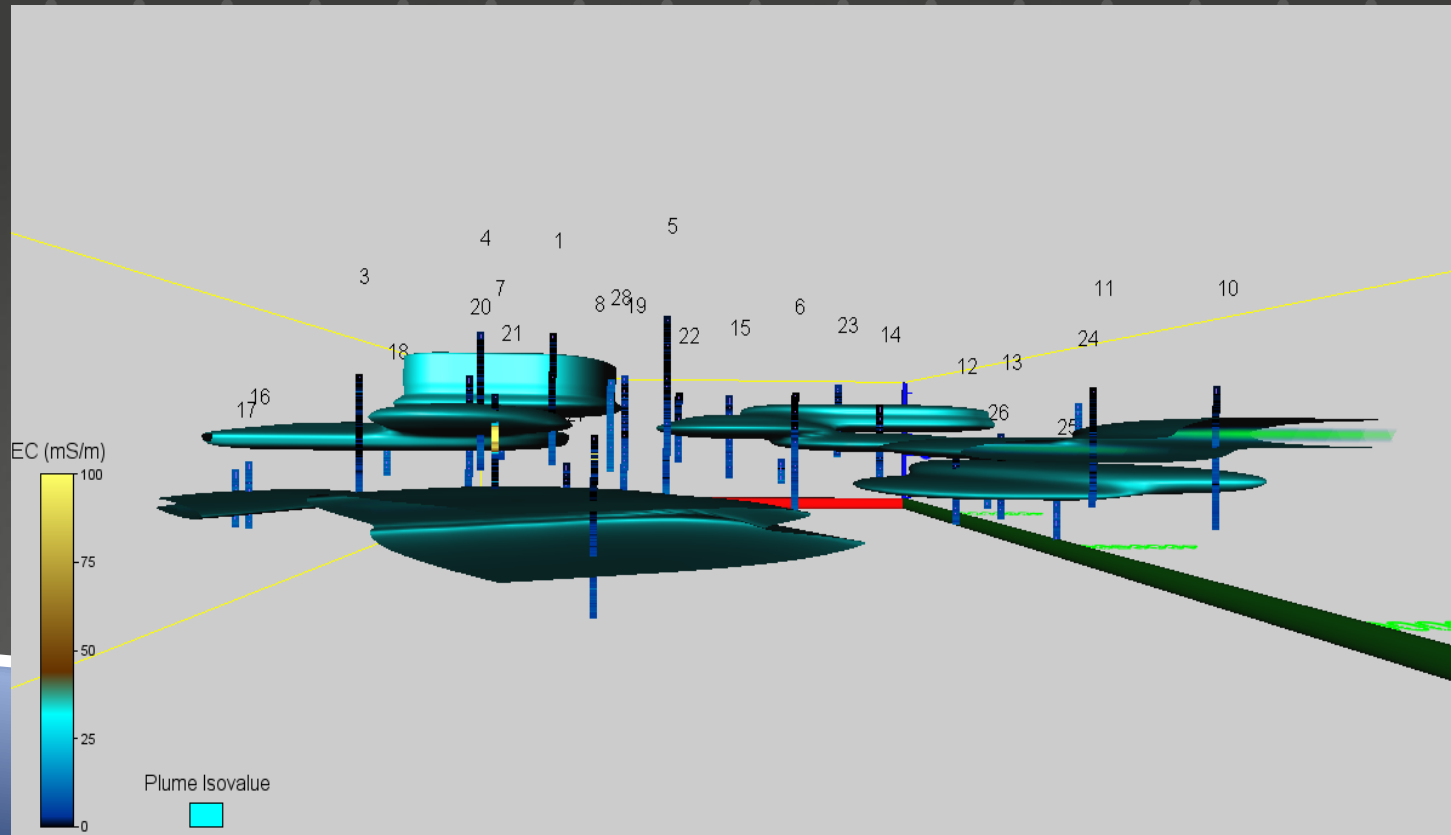


RESULTS

- ▶ BTEX, Fractional, PAHs
- ▶ Targeted samples to LIF logs
- ▶ Correlation
 - ▶ Practically difficult to achieve
 - ▶ Qualitative vs. Quantitative



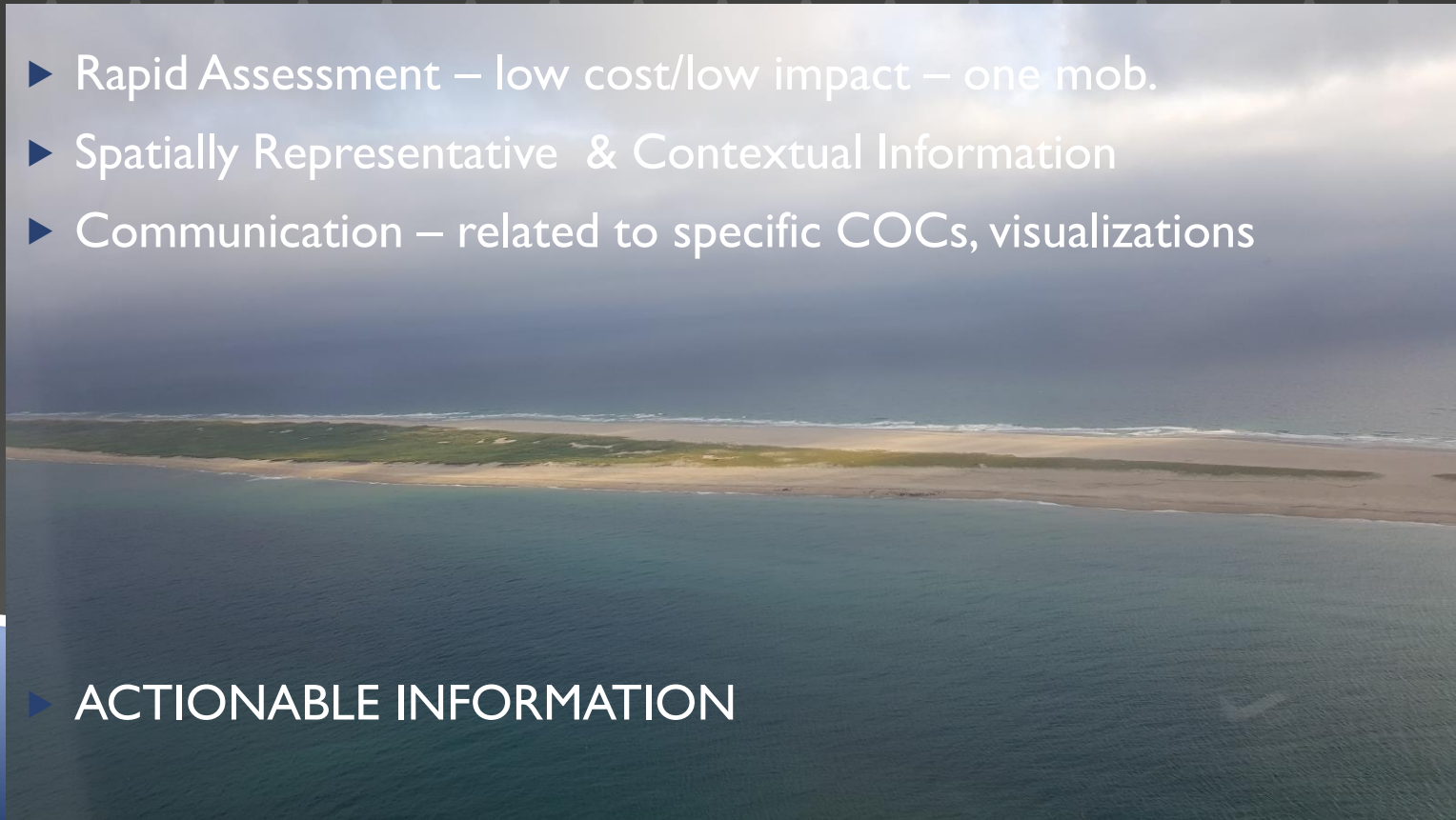
SITE CONCEPTUALIZATION



HOLISTIC ASSESSMENT

- ▶ Rapid Assessment – low cost/low impact – one mob.
- ▶ Spatially Representative & Contextual Information
- ▶ Communication – related to specific COCs, visualizations

- ▶ ACTIONABLE INFORMATION



NEXT STEPS

Incorporation into risk assessment & management strategy

Additional HRSC:

Freshwater Aquifer

Delineation

LIMB DRIG 2.0:

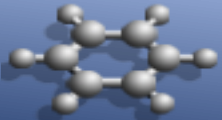
Power addition



QUESTIONS?

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- ▶ www.scgindustries.com
- ▶ 1 (506) 674-1081

THANK YOU.



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