

RISK REDUCTION THROUGH DIRECT HYDROCARBON DETECTION

GORE™ Amplified Geochemical Imaging Technology

The World's most technically advanced surface geochemical mapping tool

May 4-8, 2009



Calgary CSPG CSEG CWLS Convention

CONVENTION INVITATION:

VISIT GORE™ @ Booth #1119

AAPG Annual Convention & Exhibition,
Denver, Colorado; June 7th to 10th.

Environmental Site Assessment

In today's business environment of asset acquisition, **THINK OF A WORLD** where an *accurate cost effective environmental site assessment* can be conducted on the asset. This assessment would minimize **environmental risk** and establish an **environmental baseline**. If facilities are involved, the assessment would be particularly valuable to complete the required **due diligence**.

Applications

Site Assessment

Whether it's a property transfer or regulatory response, a GORE™ survey helps to quickly shift assessment effort from exploration to confirmation.

Property Transfer

Assign liability at the time of sale, for long-term risk management. Ideal for gas & oil facilities, pipelines, manufacturing facilities, gas stations, strip malls etc

Terminals / Refineries / Pipelines

Sample around tanks and along pipelines to pinpoint leaks so that remediation efforts are focused and cost-effective.

Industrial

Deploy one easy-to-use tool consistently, inside buildings as well as outside, for a high-resolution data set that helps define source and delineates aerial extent.

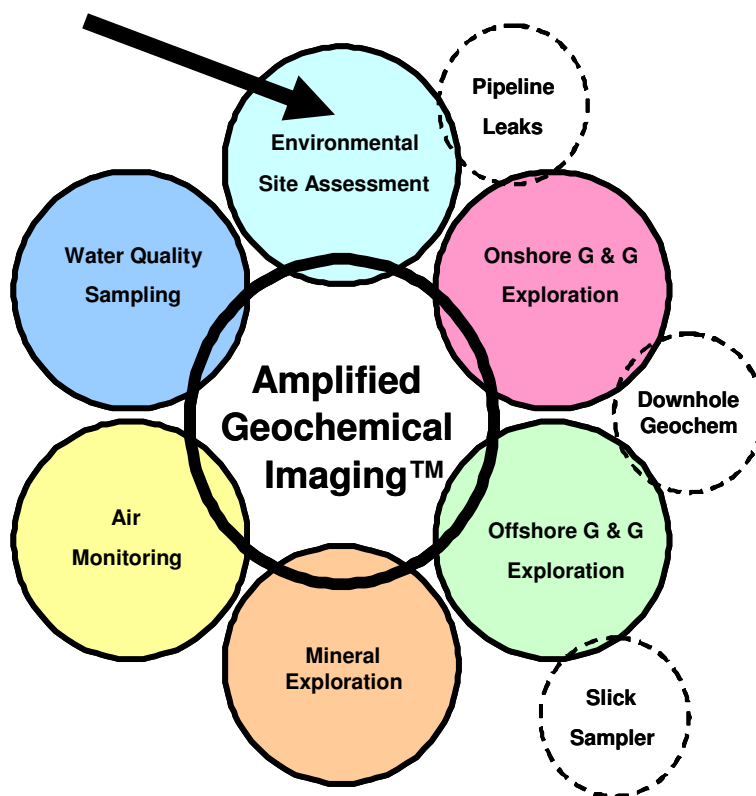
Landfills

Identify a host of unknowns that may be escaping from refuse.

Risk Assessment

Strengthen vapor intrusion & indoor air studies with concentration values in the ppt range.

The Amplified Geochemical Imaging™ Circle of Technology



Proven Analysis & Interpretation

Back at the lab is where Gore's nearly 17 years of experience and thousands of surveys kick in. State of the art TD/GC/MS analysis, using modified EPA methods 8260/8270, provide a rich mass data set (60+ compounds) and optional soil gas concentration data. Compound-specific data are reported for vinyl chloride through pyrene, including fuel-related and chlorinated VOCs, SVOCs and PAHs. Strict QA/QC methods are followed throughout the process.

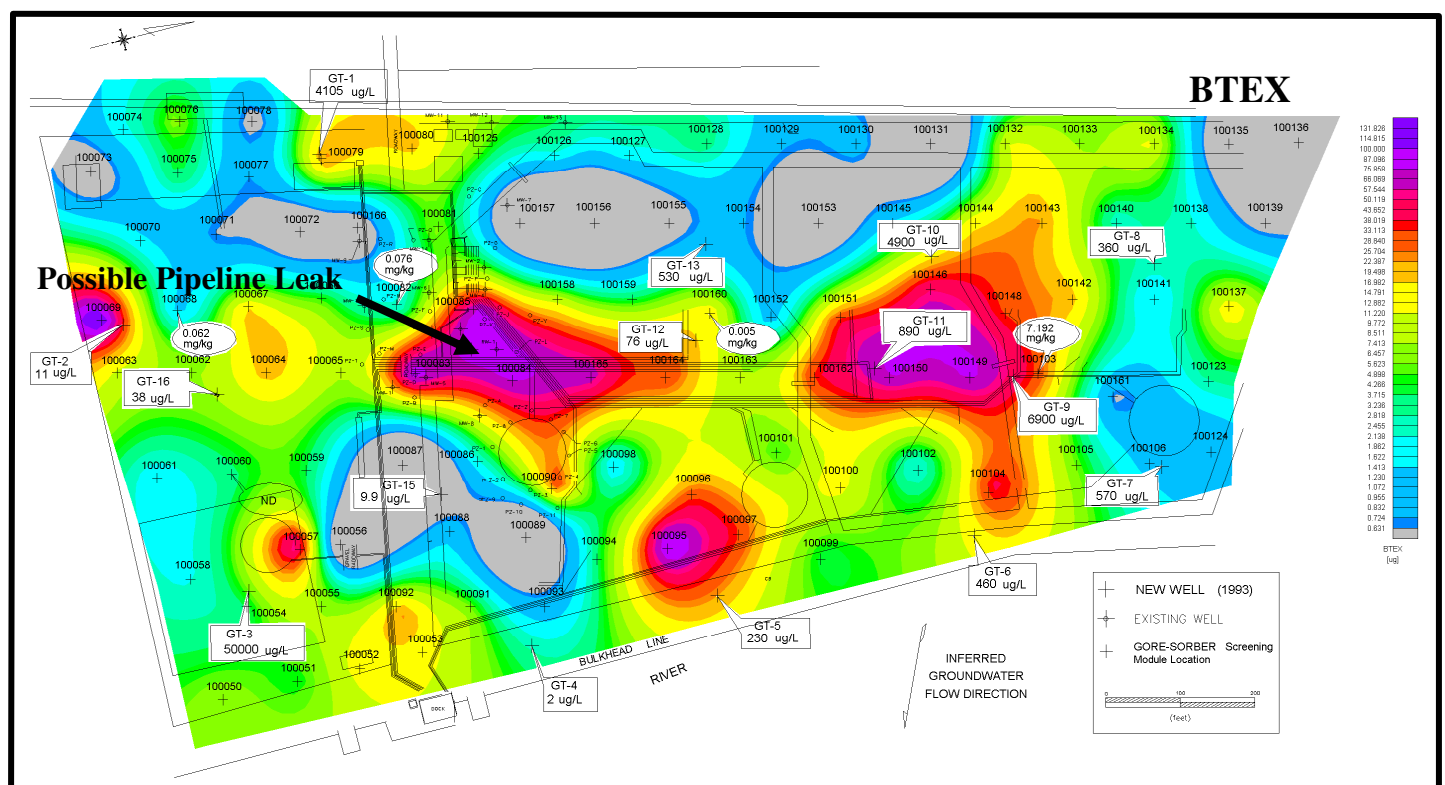
The final report includes project information, data tables and color contour maps of compound distribution. Integration with additional site information is available, as is consultation with our project manager every step of the way.

Case Study – Site Assessment

Petroleum Terminal, Philadelphia

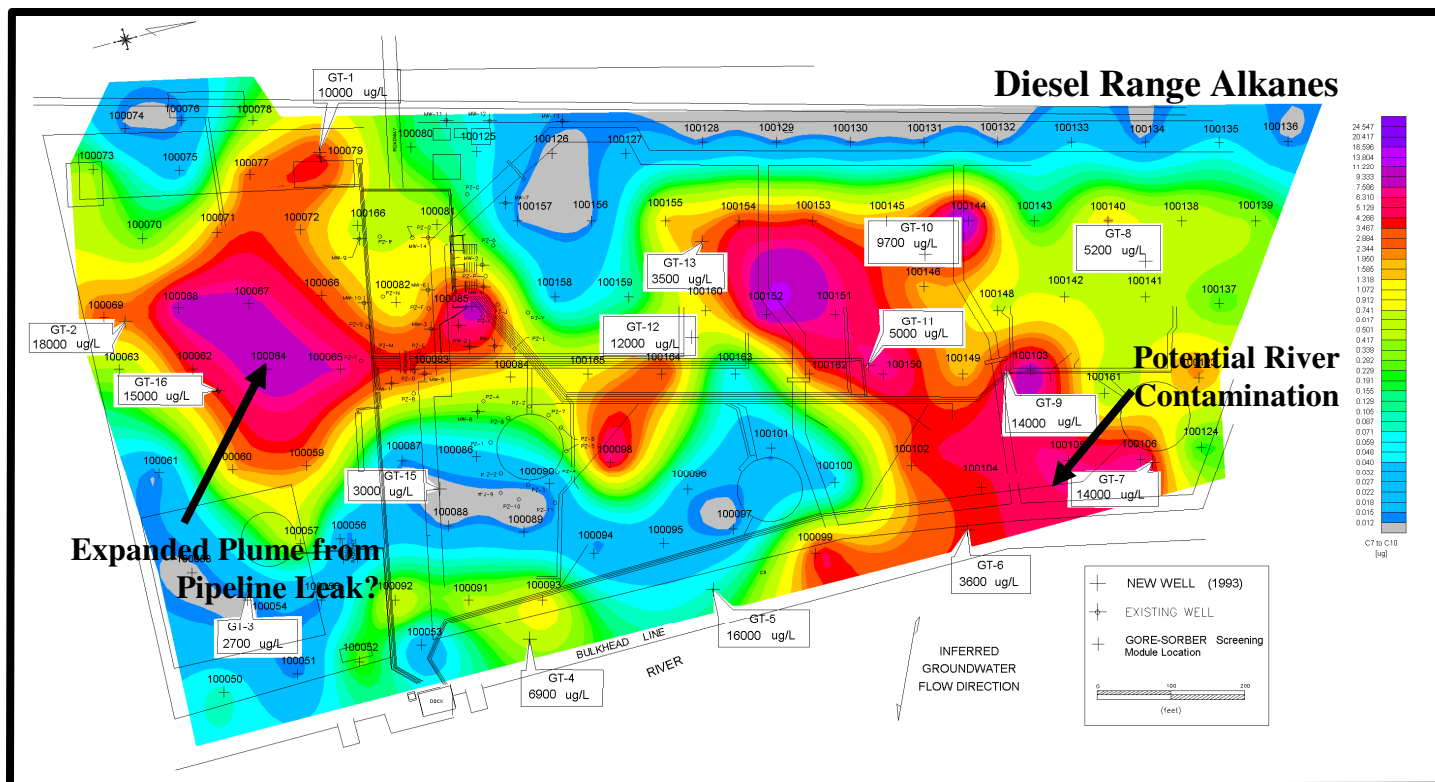
A GORE™ survey was conducted over a 33 acres petroleum terminal from which the tanks had been removed. The site was located along a river. Numerous product pipelines connected the tanks to the dock located on the bank of the river. The site soils consisted of silts and clays and the depth to groundwater ranged from 4 feet along the river to 20 feet away from the river. Inferred groundwater flow direction was toward the river. A total of 100 GORE™ modules were installed in a **regular grid with a spacing of approximately 100 feet**. The easy installation and retrieval allowed for **sample collection in areas normally not accessible** by more intrusive sampling methods or equipment.

The primary objective of the survey was to reduce the number and expense of drilling monitoring wells by identifying potential contaminated areas and delineating their aerial extent. Fuel related compounds were observed and contour maps of BTEX (gasoline) and Diesel Range Alkanes were prepared.



BTEX distribution in soil gas (μg), along with corresponding groundwater ($\mu\text{g/l}$) and soil (mg/kg) data.

The BTEX map indicted two large potential source areas (anomalies) in the center of the survey area. Because of the concentration of product pipelines in the area of the left-central BTEX anomaly, the possibility exists that the anomaly could be related to leakage from the pipelines. No monitoring wells were subsequently drilled in the area of this anomaly.



Light diesel range alkanes distribution in soil gas (μg), along with corresponding groundwater ($\mu\text{g/L}$) data

The anomalies indicated on the Diesel Range Alkanes map are similar to and maybe related to the same causes as the BTEX anomalies. The Diesel anomaly on the left-central portion of the above map, potentially related to the same pipeline leaks as the BTEX anomaly, has doubled in size and extended to the left (south). The right-central anomaly was must larger than the BTEX anomaly and appears have extended to the river bank in approximately the same direction as the inferred groundwater flow. The map strongly implies **contamination of the river with diesel range alkanes**. Groundwater measures (white callouts) from monitoring wells support the right-central anomaly and communication with the river (GT-7).

Anomalies **do not appear** to be related to the location of the tanks that had been removed.

The results of the GORE™ Survey gave the regulator the confidence needed to reduce the number of proposed monitoring wells from 33 to 15. The savings on not drilling, developing and sampling the undrilled 18 wells was estimated at \$155,000US in the first year, and \$100,000 per year thereafter. More than \$1 million have been saved since the GORE™ Survey was conducted at this site.

For further information regarding **Amplified Geochemical Imaging Technology**, contact Bob Potter, Geochemtech Inc. at (403) 863 9738 or ropotter@geochemtech.com

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