Soil Gas Hydrocarbon – SGH Analysis

A Geochemical Method for the Exploration and Discovery of Petroleum & Gas Plays

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Soil Gas Hydrocarbons

- SGH – A Geochemical analysis researched and developed since 1996.
- Organic Hydrocarbons are adsorbed on *B*-horizon soil which acts as a long term collector of the soil gas flux.
- The laboratory procedure detects 162 specific organic compounds in the C5-C17 carbon series range at the low parts-per-trillion (ppt) range by GC/MS.
  e.g. C5 = Pentane = a compound made up of a straight chain of 5 carbons.
- SGH covers several organic compound classes.
  75% of the list are robust *"Aromatic"* compounds.

Soil Gas Hydrocarbons

- SGH are not gaseous compounds at room temperature but may migrate to the surface by various processes and may be in a vapour form at depth. SGH is essentially a weak leach of the compounds that are weakly bound to the soil particles.

- Compounds in the C5-C17 carbon range are less affected by weathering by bacterial and UV degradation, or by seasonal water washing. It is thus a significant improvement over previously used soil gas tests using CO2, O2, and C1 through C4 compounds.

SGH ANALYSIS - Why 162 compounds?

- The comprehensive analysis of 162 compounds allows for the assessment of anomalous areas with consistent "SGH Activity". This enhances interpretive confidence.
- Comparison of zonation produced between compound classes can help vector to or *"identify"* the signature of a target.
- The SGH compounds have been specifically selected to have low variability from sampling, shipping, sample preparation, and site cultural activity.

SGH SAMPLING OVERVIEW

- SGH was initially developed for the analysis of soils but has been shown to be capable of analyzing rocks and core (after milling), peat, vegetation, waters and even fully submerged lake sediments.
- Samples are taken from the “Upper B-horizon” for the best response from soils. A fist sized sample is all that is needed and thus this small sample reduces shipping costs.
- Only one trip to the field is necessary to locate and collect the samples. Samples may be drip dried in the field. Tyvec or Ziploc bags are very good containers. Apply the sample ID with a permanent marker. No other preservation is needed for shipping.

SGH SAMPLING OVERVIEW

- To successfully interpret SGH data for the location of a buried petroleum target, at least 50 samples should be obtained for each transect at a spacing of 50 to 100 metres. The transect should directly intersect the potential target. Samples must extend well into background on either side of the target and can be at 100 to 200 metre spacing.

- Although the sampling design may consist of only a single transect a significant improvement in the confidence of the interpretation can be obtained by using two parallel transects, or in a cross formation, that intersect the potential target. This design improves the vectoring characteristics of the SGH classes.

- There must be only one magnetic target to be tested in a transect.

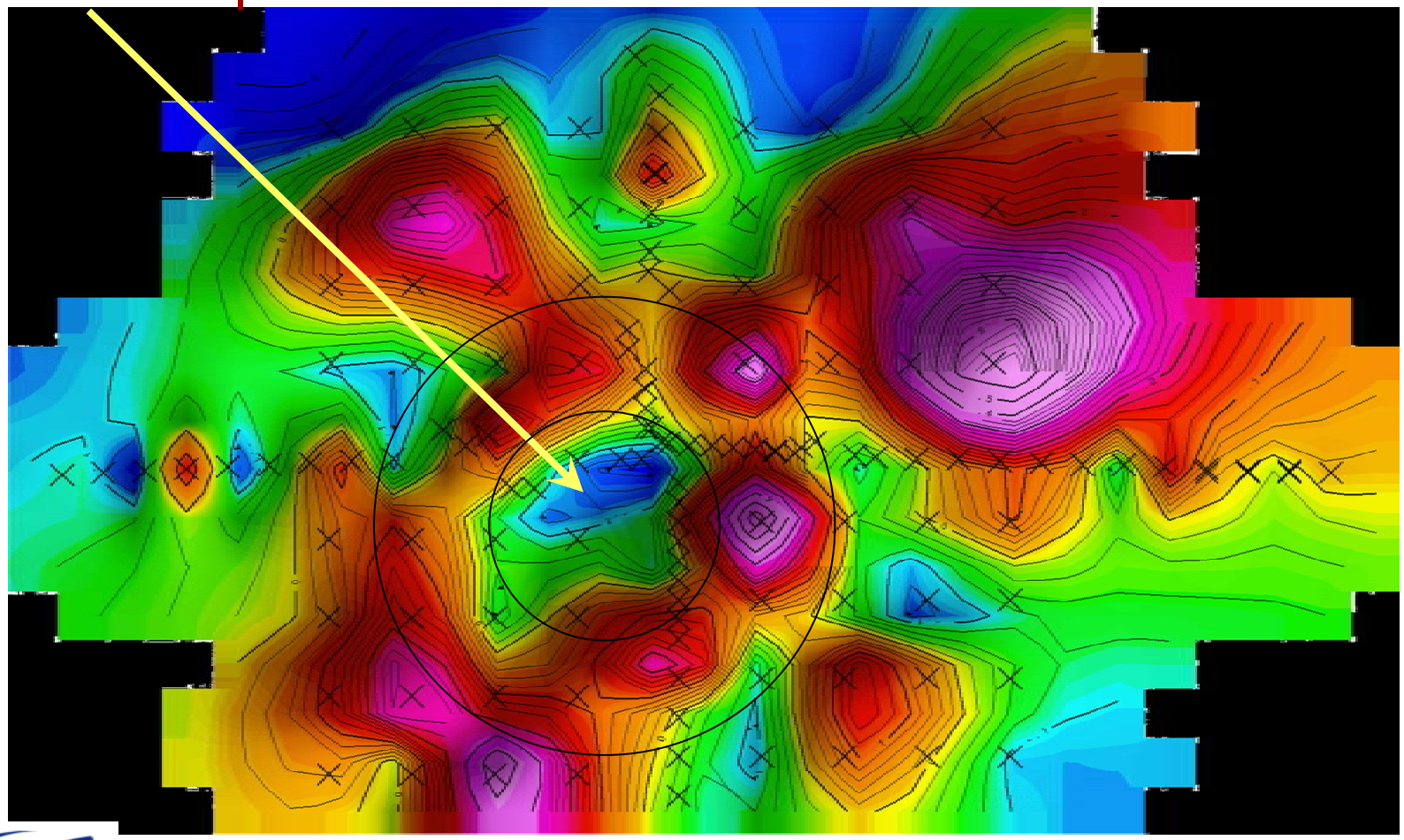
- Sample coordinates (relative or UTM) must accompany the samples when received at the laboratory to enable a report of interpretation without delay.

SGH SAMPLING OVERVIEW

- The following case study illustrates a sampling design that was responsible for the large part to allow a successful interpretation at this site known to be very complex and unsuccessful with other geochemical methods. Although this case study was to detect a Kimberlite pipe, a much smaller target than for Petroleum targets, the two intersecting transects over a single target with more widely spaced infill samples in the four surrounding sectors was a critical factor in the success of this project.

Kimberlite SGH Case Study - Diamondex

Kimberlite Pipe



SGH SAMPLING OVERVIEW

- The best sample preparation is done at Actlabs to take advantage of our quality assured protocols. However, preparation may be done by the client as long as the samples are air dried at <40°C. Samples are then sieved and the fraction that falls through a 60 mesh sieve is collected and packaged. Sieves should be cleaned between samples using a vacuum procedure. Using compressed air may contaminate the samples with hydrocarbons unless an oil-less compressor is used.

- After sieving, Kraft/coin envelopes or Ziploc bags may be used as containers. Sample identifications must be applied with a permanent marker. No other preservation is needed for shipping.

SGH SAMPLING OVERVIEW

- A sample list with contact information on our sample submittal form must accompany the samples. It is preferable to receive sample identifications and co-ordinates as an e-mail attachment. Note that the international shipment of soils must show our Agriculture Canada Permit for Import number, please email us for that information.

- UTM or Relative coordinates must accompany the samples to enable the interpretation.

- Once the samples are received in our Organics Department from our Sample Receiving and Sample Preparation building in Ancaster, Ontario, a small sub-sample is taken, accurately weighed, and an extraction is done analogous to a weak leach.

SGH ANALYSIS OVERVIEW

- The extracted samples are then analyzed by a Gas Chromatograph / Mass Spectrometer (GC/MS). These instruments have very high resolution fused silica capillary columns in the gas chromatograph (GC) to optimize the separation of the compounds in the sample.

- Using the high resolution separation and a special highly sensitive mass spectrometer (MS), each sample is analyzed for 162 target hydrocarbons that have been specifically picked to eliminate interferences from sampling, shipping, handling and from general cultural activities.

SGH ANALYSIS OVERVIEW

- This GC/MS method is thus highly specific and highly sensitive. Each compound has a "Reporting Limit" of 1ppt (parts per trillion). A "Reporting Limit" is 5 to 10 times greater than a detection limit, thus all data may be used with confidence.
- The results are presented as raw data in an Excel spreadsheet without any statistical processing applied.
- SGH covers several compound classes which form the basis of a signature unique to different types of petroleum plays or mineralization.
- Activation Laboratories then conducts an interpretation using the specific mineral or petroleum signatures that have been developed from over a decade of research. This is provided in a separate report that has a "rating" for the target surveyed.

SGH INTERPRETATION

- The determination of the identity and location of buried petroleum or wet gas plays with SGH is very similar to the Forensic process of the identification of trace hydrocarbon signatures for ignitable liquids in fire debris using 51 compounds (another Actlabs specialty)

- The SGH signature is used for target identification just as we use fingerprints for human identification. SGH is most similar to Forensic DNA signatures but actually uses more data in identification than standard DNA.

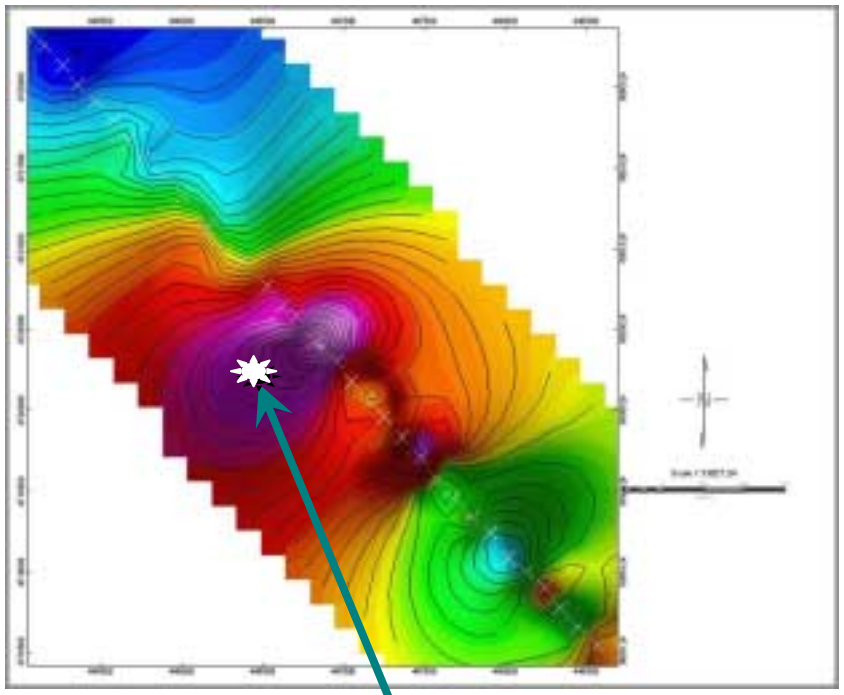
PETROLEUM TARGET

- In February of 2005 sampling was conducted by Activation Laboratories on behalf on a junior company in South-Western Ontario. Some of the sampling locations proved difficult requiring the use of a pick-axe to penetrate the frozen water-saturated top layer of soil. There were a total of four transects sampled. Two of the initial transects were test lines taken from the road right-of-way in areas adjacent to gas producing wells.

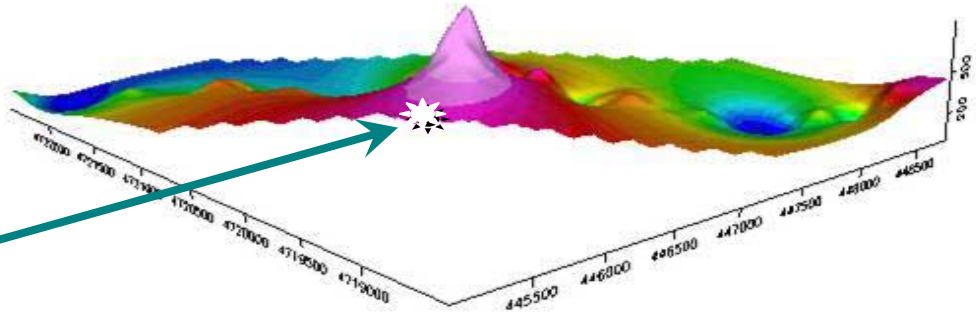
- The client was extremely pleased with the sampling and the results of the SGH analysis. They have graciously allowed Activation Laboratories to show the following two case studies.

- Although these samples were taken within 5 metres of secondary paved roads, there was no interference to the SGH analysis from vehicular deposition that may compromise other types of analyses.

Wet Gas Play – Line A- Southern Ontario

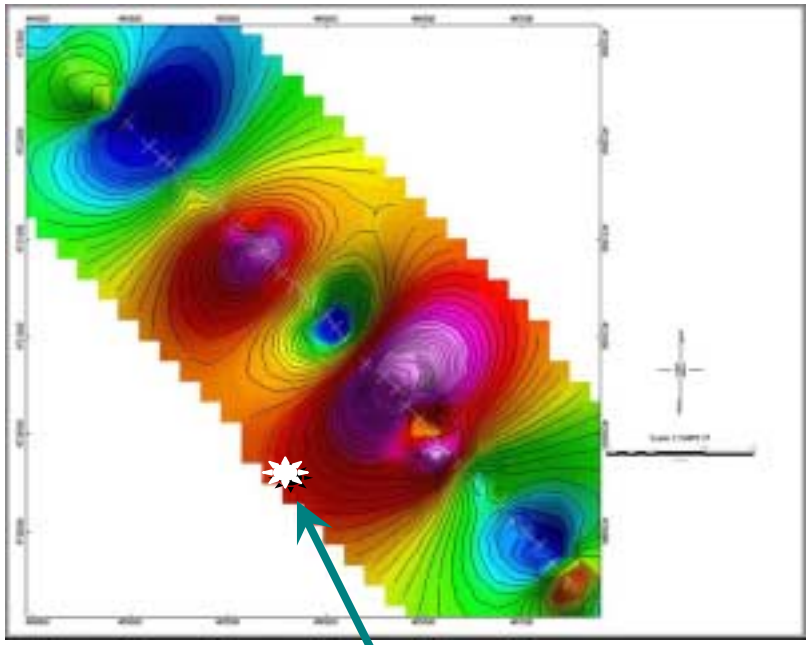


Gas well intersected two zones at 410m and 535m depth that reached down into the Grimsby formation. SGH anomaly was definitive.



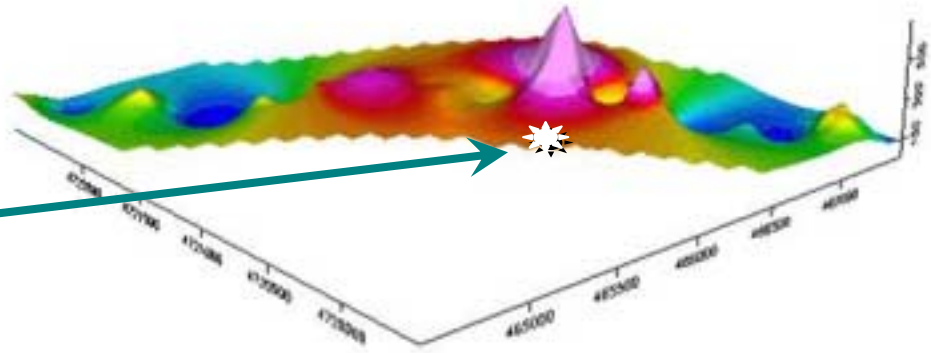
Producing Gas Well

Wet Gas Play – Line C- Southern Ontario



SGH anomaly was directly adjacent to another gas producing well from this roadside sampling conducted in the same township as Line A.

Producing Gas Well

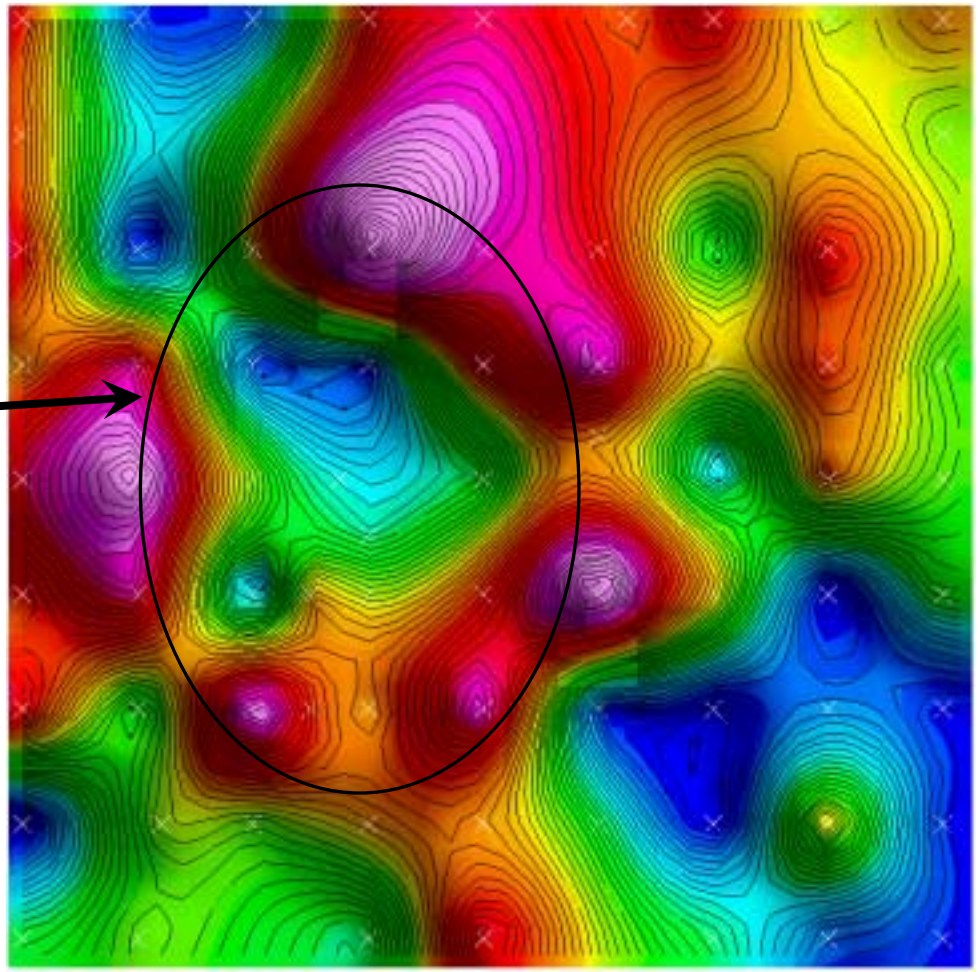


PETROLEUM TARGET

- The signatures of these “wet-gas” targets were consistent over these four transects and the aromaticity of the wet-gas condensates were diagnostic to the type and location of the targets.
- Four additional case studies are shown in the following slides

Deep Ordovician Oil Pool – Bromhead -SE Sask

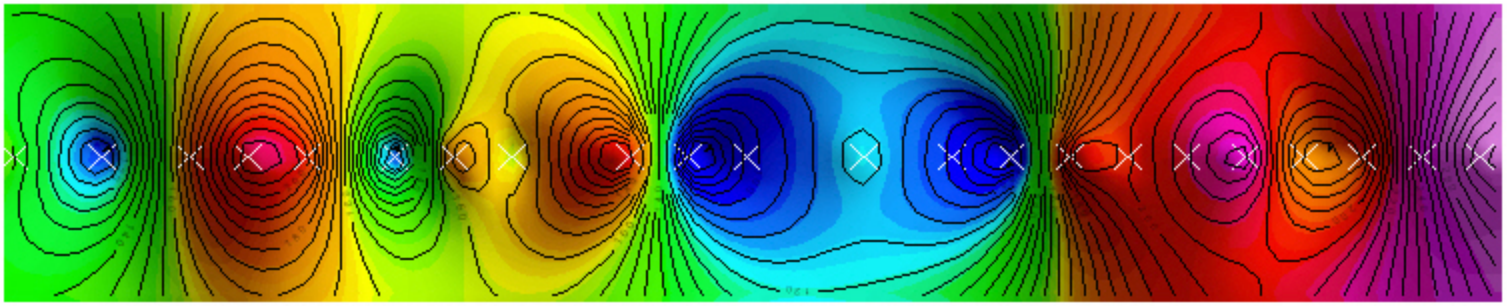
Vertical Projection of Oil Pool



Depth =2850m

Oil Pool – Hillman Oil Field SW Ontario

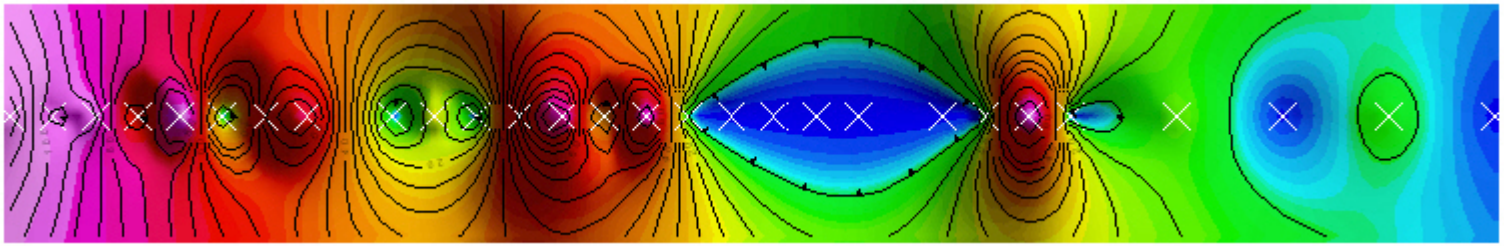
Samples from Road Right-of-Way



Oil Reservoir

Oil Pool–Clearville Oil Field,Ontario

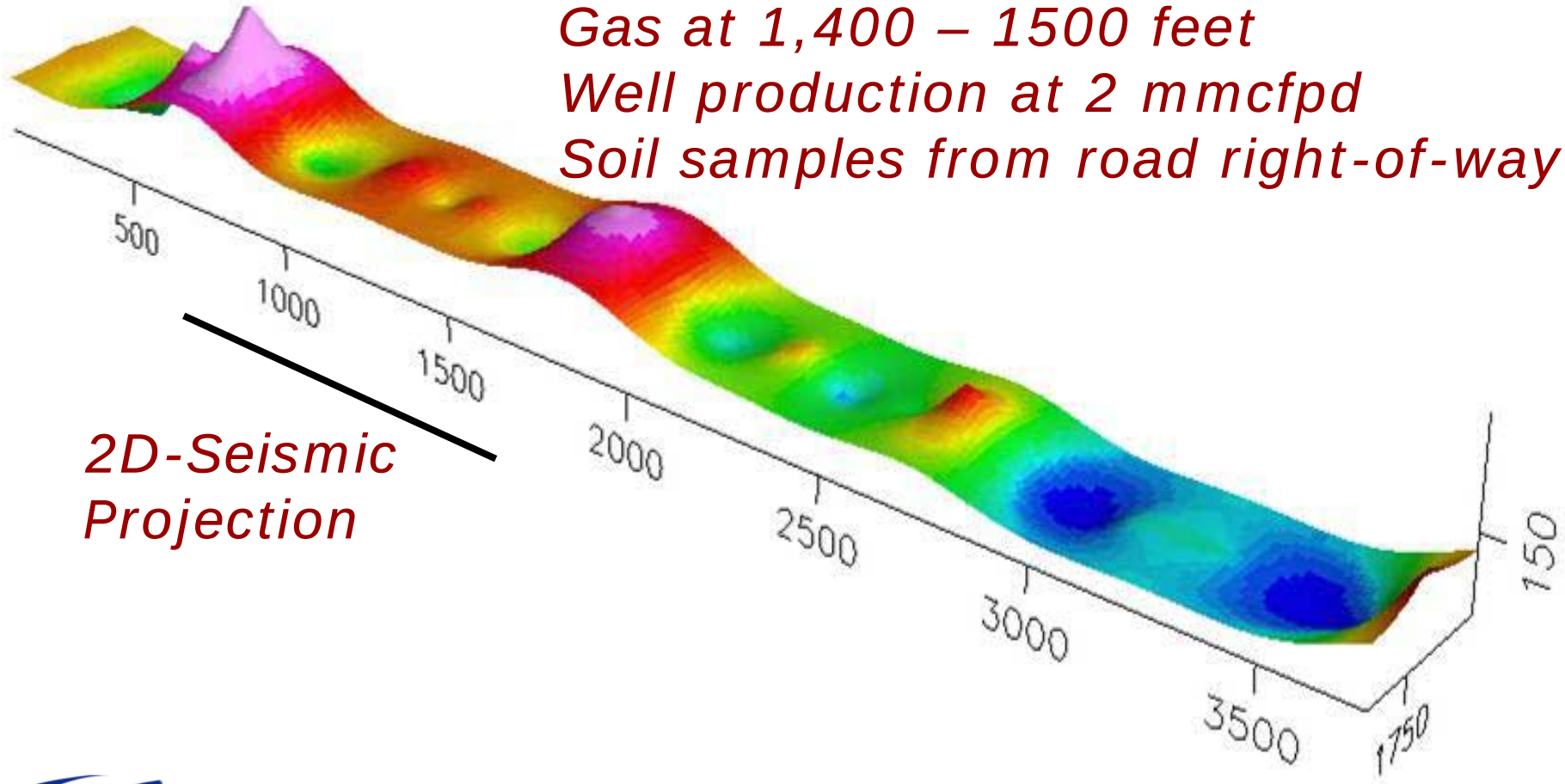
Samples from Road Right-of-Way



Oil Reservoir

Hensel Graben Gas Play
Wyandot County, Ohio

Gas at 1,400 – 1500 feet
Well production at 2 mmcfpd
Soil samples from road right-of-way



2D-Seismic Projection

SGH – SOIL GAS HYDROCARBONS

BENEFITS

- Unobtrusive with only one field visit required
- Easy sampling – B-Horizon Soils
- Easy shipping – small samples
- No special preservation
- Has been shown to be an excellent “Redox Cell” locator
- Has been successful at locating mineralization at over 500 metres below surface.

SGH – SOIL GAS HYDROCARBONS

BENEFITS

- Analysis is rugged to sampling procedures
- Analysis is rugged to geographical features
- Analysis is rugged to cultural activity
- Built in data redundancy
- Highly sensitive and highly specific
- Very cost effective
- Excellent results

ACTIVATION LABORATORIES LTD

For more information on our locations and services please visit our website at:

www.actlabs.com

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