



THE GEI MGP Reporter

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TarGOST® – High Resolution MGP Waste NAPL Characterization (Part 1 of 2 Parts)

By Randy St. Germain

Efficient remediation of former manufactured gas plant (MGP) sites is frequently contingent on accurate delineation of non-aqueous phase liquids (NAPLs). These liquids typically consist of coal tar and other hydrocarbon liquids such as carburetion oils.

MGP NAPL delineation and characterization traditionally involves sampling of subsurface soils via test pits, drill rigs or direct push sampling, logging of the boreholes by a geologist, and on- or off-site analysis of soil samples. The delineation process can be time consuming, expensive, and is often just plain nasty due to coal tar's odor and the difficulty of cleaning sampling equipment.

The conceptual site model (CSM) that evolves may range from "okay" to grossly misleading. This is due to factors that follow:

- NAPLs heterogeneous distribution (it often exists in both LNAPL and DNAPL phases);

- The subjectivity introduced by a variety of analytical methods developed over decades;
- A switch from one consulting group to another; and,
- The experience of the geologist examining the soil samples and cores.

However, coal tar NAPLs contain PAH molecules that are fluorescent. These molecules also happen to generate vibrant colors - the world's first synthetic dyes were derived from coal tar in the mid 1800s. The fluorescence, however, is not apparent to humans without a light source and filters that block unwanted light.

The Tar-specific Green Optical Screening Tool (TarGOST®) exploits this fluorescent property; deriving the location and relative concentrations of MGP NAPLs in the subsurface by measuring their fluorescence. TarGOST is essentially a "front-face" fluorometer that sends ultra-fast pulses (three billionths of a second in

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Editorial

Fast and Clean?

By Jerry Zak, GEI Consultants, Inc.

Several years ago I participated in the characterization/delineation of tar impacted sediments in a large, New England lake. Over 20 acres were affected. Analytical data were less important (in this case) than defining the extent of non aqueous phase liquid (NAPL) in the sediments. Characterization and delineation with standard equipment (vibracores) would be time-consuming and costly.

At about the same time, information regarding TarGOST® technology was filtering out from site demonstrations and testing. Word on the street was that (in operable soils/sediments) the TarGOST system could reliably detect subsurface NAPL with sufficient fluorescence rapidly and cleanly, without having to bring up samples.

I called Dakota Technologies, Inc., sole owner/operator of the technology. They were in the mid-west, and were booked for months. We moved ahead successfully with existing delineation methods. I've been waiting ever since to learn why TarGOST hasn't spread across the country.

This issue of the MGP Reporter presents the first of a two-part article that describes the application and use of TarGOST technology for delineation of NAPL at MGP sites. It also provides (next issue) information about the increased availability of TarGOST in the future.

TarGOST does not generate specific organic compound analytical data (though it can differentiate the magnitude of NAPL impacts). GEI is neither endorsing nor critiquing the TarGOST technology, but we do regard it as a characterization tool with potentially high value where identification and location of MGP NAPLs is a primary goal.

MGP Reporter

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Coal Tar History—Sneeze Powder



During World War I, British soldiers used a chemical that made breathing difficult to fend off German forces. In the United States, the same chemical was known as sneeze powder. The powder was discovered by Soren Adams and was the by-product of coal tar dye. When Adams found that the powder caused sneezing and wheezing, he bottled and sold it as Cachoo!, "a harmless fun producer for practical jokers". After Cachoo! Adams came up with itching powder, which was a weed grown in India that induced dermatitis. While funny at the time, today these gags are no laughing matter as the ingredients in them have been banned since 1940.

Source: National Post, April 1, 2008

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duration) of laser excitation light down a fiber optic cable, through the drill rod string and into the drive head where it exits a sapphire window. The laser light strikes the soil matrix as the probe is steadily pushed or jack-hammered into the subsurface. Fluorescence emitted by coal tar (and some laser light that is scattered off the soil) is collected by a second optic fiber and returned uphole to the instrument for detection, analysis, and storage of data vs. depth.

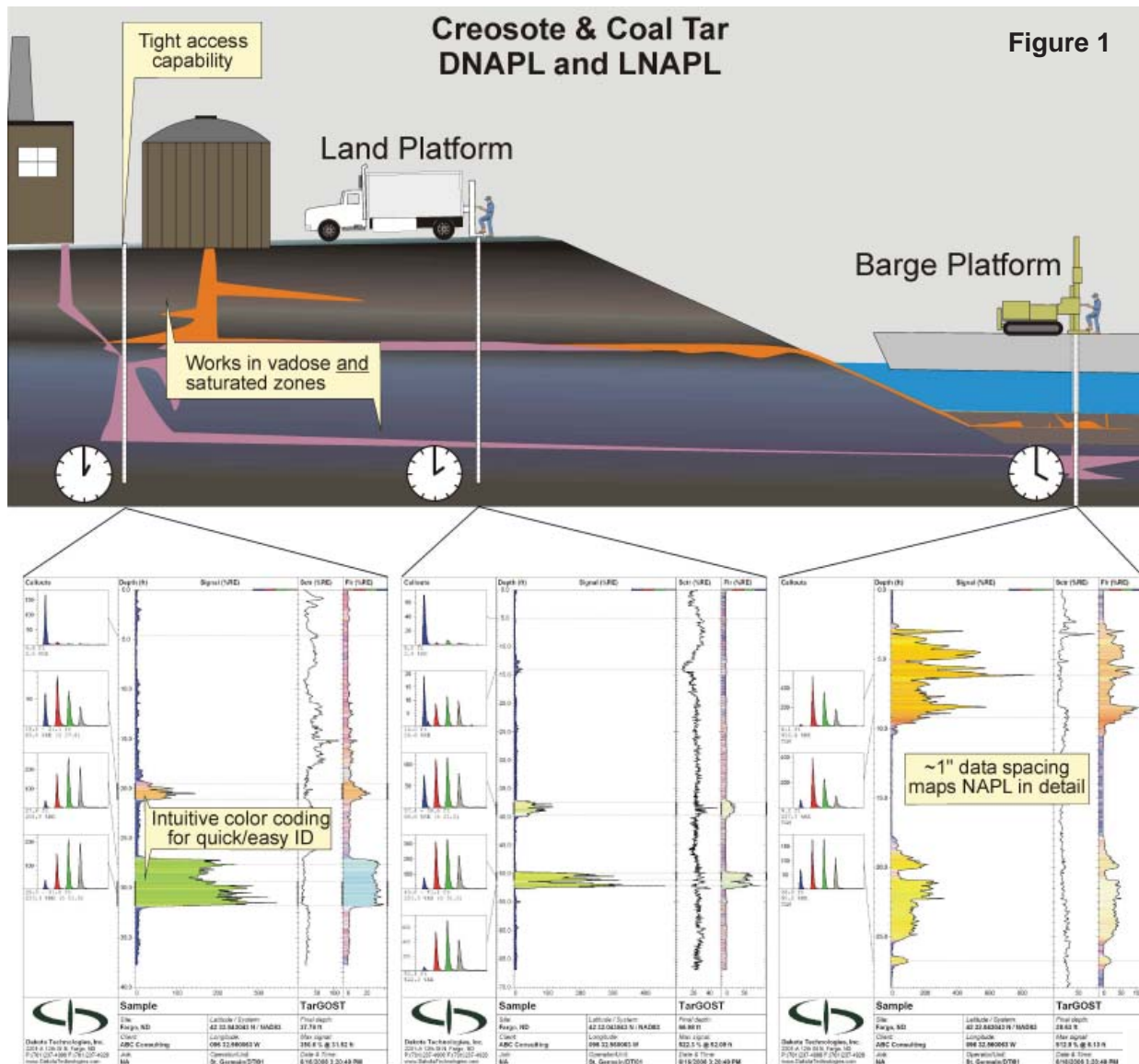
Maximum achievable depth is dependent on the geology. The deepest known run to date is 156 feet below ground surface, but total depth generally follows that of typical direct push sampling tools.

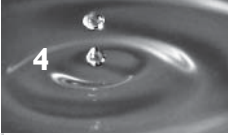
As the tool progresses, approximately one second's worth of measurements are averaged, downloaded, and stored along with current depth – resulting in a continuous log of fluorescence/scatter vs. depth. Data densities average between 15 and 20 data points per foot (directly dependent on probe speed). Once the desired depth is achieved, the log is immediately printed to paper (for field use) and/or to electronic image (JPG) for data transfer back to the office.

Figure 1 illustrates the broad concept of TarGOST investigations. TarGOST is used on both land and water (from barges) using any direct push machine such as Geoprobe[®] or Pow-

In general, the system can be adapted to work with any drilling rig, though percussion delivery is the most common platform.

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Dresden, Germany

Highlights of MGP2008: Gasworks Europe

MGP2008 Gasworks Europe was held in Dresden, Germany from March 4-6, 2008. This international conference was sponsored in part by the Saxon (Germany) State's Ministry of Environment and Agriculture. It brought together 150 attendees from eleven different nations including the United States, England, the Netherlands, and Australia. Conference attendees included representatives from the Federal and state levels of the German government, consultants, industry specialists, and academia. The theme of the conference was "Redevelopment, Site Management and Contamination Issues of Former MGPs and Tar Oil Contaminated Sites." It covered such issues as remediation technologies, risk assessment, legal considerations, and integrated strategies.

The conference got off to an interesting start, as a one-day strike by Lufthansa workers delayed the arrival of several of the presenters. Once underway, conference sessions covered Risk Assessment and Sediment Management, Site Investigations and Natural Attenuation, NSO-Heterocycles (nitrogen, sulfur, and oxygen containing aromatic compounds of high solubility and mobility in water) Cyanides, Permeable Reactive Barriers, Remediation, Remediation and Modeling, and a poster session.

There were three keynote lectures at the conference. The opening lecture was presented by Jörg Frauenstein of the German Federal Environmental Agency titled "The Upcoming European Soil Framework Directive – Consequences for Management and Remediation of Contaminated Soil." This talk focused on the challenges faced by the European Union in developing a framework for managing soil cleanup criteria. The second keynote lecture by Jochen Grossman was titled "Interactive Use of Modern In Situ-Investigation Techniques for Efficient Site Investigation – Preconditions for an Effective Remediation Planning," and dealt with the importance of using in situ techniques, 3-D modeling, and effective communication in a successful remediation effort. The fi-

nal keynote, "Remediation of Manufactured Gas Plant Sites in the United States" opened day two of the conference, and was given by John Ripp of GEI Consultants, Inc. (GEI).

Highlights of the conference included Dr. Andrew Coleman's (Electric Power Research Institute - EPRI) "Best Practices Manual for Managing and Investigating Coal Tar DNAPL in Bedrock," which discussed the importance of characterizing fractures, bedding planes, and faults in impacted bedrock to determine the direction of DNAPL flow.

Dr. Philip Mulvey of The University of Western Australia (UWA) presented "The Nature of Bonding to Black Carbon – A Re-evaluation of Risk of MGPs" in which he argued that current models overestimate carbon bioavailability and hence the risk posed by tars and PAHs from MGP sites. According to Mulvey, "black carbon," also known as "soot carbon" effectively binds PAHs and renders them unavailable for uptake.

Dr. David Nakles (ENSR) echoed this hypothesis in his talk "Management Framework for Coal Tar DNAPLs at Manufactured Gas Plant (MGP) Sites"

The conference ended with a trip to the Dresden Panometer, a former tar holder that has been restored and converted to a museum celebrating 18th century Dresden, when the Baroque city was called "the Florence on the Elbe." The highlight of the Panometer is a 360° mural of Dresden in 1756, depicting the city and its architecture at its zenith.

Final conference remarks included the announcement of MGP USA 2008, which takes place September 23–25, 2008 in Mystic, CT. For more information on the conference, please visit the conference web site at www.mgpusa2008.instep.ws.



International Symposium and Exhibition
on the Redevelopment of
Manufactured Gas Plant Sites

MYSTIC, CT | SEPTEMBER 23-25, 2008

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erProbe™ (percussion-based systems) and cone penetration test (CPT) rigs. In general, the system can be adapted to work with any drilling rig, though percussion delivery is the most common platform. CPT delivery provides simultaneous geotechnical information. Geoprobe® electrical conductivity (EC) capability is currently being developed to provide simultaneous geotechnical capability for the smaller and more generally available percussion delivery platforms.

Site models for heterogeneously distributed NAPL sites can be improved by generating more data – even of “screening” quality (as advocated by EPA’s Triad approach). This is a key strength of TarGOST. Logging rates generally vary between 250 and 500 feet per day, spread across an average of 10 to 15 locations. Again, geology dictates production. Rubble, cobbled gravels, certain glacial tills, and boulders are common limiting factors and bedrock is an obvious “no go”.

For conventional subsurface investigation rigs, generating more data usually means increased sampling/lab costs, increased amounts of investi-

gation derived waste (TarGOST’s are near zero), and increased data reduction and management costs. However, TarGOST logs are printed immediately and the data are stored in non-subjective electronic data files. Mating these files with the latitude, longitude, and elevation of each location provides a comprehensive data set that is readily incorporated into 2D and 3D visualization software systems. An average depth (25 feet) TarGOST location is typically completed in 30 minutes, including retrieval of the rod string from the ground. Even without visualization software, a competent consulting engineer/geologist with TarGOST log printouts and a site map can optimize subsequent sampling locations in real time and make targeted enhancements to NAPL delineation.

Randy St. Germain is President of Dakota Technologies, Inc. Part 2 of his article will be in the next issue. Should you have any questions/comments about TarGOST, please contact Randy St. Germain at stgermain@dakotatechnologies.com.

WebWatch

Websites of Interest

MGP USA 2008 conference registration and details
<http://www.mgpusa2008.instep.ws>

