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Case History of the Use of Cross-Hole Tomography in the Delineation of a Subsurface Hydrocarbon Release

Abstract

This presentation will summarize the technique of tomography and its application in characterizing a contaminant plume in the shallow subsurface. Hydrocarbons from an undetermined source migrated into a storm water sewer and leaked into a sensitive environment. Emergency measures were implemented to contain the spill on the water and included cementing a liner within the sewer to seal off the hydrocarbon seepage. Efforts to identify the source of the release were conducted concurrently. A soil boring program was performed to delineate a suspected hydrocarbon plume that potentially originated from an off-site source. The drilling disproved the presence of a contaminant plume and indicated that the hydrocarbons were possibly migrating along unidentified conduits within a massive subsurface concrete and stabilized sand structure. A field decision was made to place capped PVC riser pipe within the borings for utilization in a cross-hole tomography survey. The tomography survey was conducted between the boreholes to delineate the hydrocarbon source without extensive excavation.

Hydrophones were placed within three of the PVC pipes while an air gun was used as a signal source in the fourth well (centrally located). All hydrophone and air gun leads were wired to a geophysical recording truck, which was used to record and pre-process the field data. The receivers and air gun were alternately placed within all the PVC pipes which resulted in complete three-dimensional coverage of the suspected leak area.

The field data was commercially processed and interpreted. The printed data revealed two velocity anomalies that represented potential accumulations of hydrocarbons. This data was used to direct excavation activities, which later confirmed the presence of the subsurface hydrocarbons and the conduit through which the contaminants were migrating.

Biographical Sketch

ARLIN C. HOWLES, JR. is the vice president and operations manager for Tidewater Environmental Services, Inc. He graduated from Edinboro State University with a BS degree in geology and environmental geology. He entered the University of South Carolina focusing on geological and geophysical evaluation of areas within Indonesia and graduated with an MS degree in geology. He began his geological career with Aminoil in 1984. He joined Groundwater Technology in 1986 where he was a project manager/hydrogeologist. After ten years of employment with consulting companies in the Houston area, he helped to incorporate Tidewater Environmental in 1995. He is currently responsible for marketing and technical management of day-to-day operations. He was past HGS Environmental Committee Chairman ('86-'88) and editor of the Environmental Geology Field Trip of West Harris County. □

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Social 5:30 p.m., Dinner 6:30 p.m.