

EMPLOYMENT OF AN *IN-SITU* CHEMICAL OXIDATION (ISCO) PROCESS TO CHARACTERIZE AND REDUCE THE MASS OF NATURAL GAS CONDENSATE AND LUBE OILS IMPACTING A COAL BEARING SEAM AT A FORMER PIPELINE COMPRESSOR STATION

J. Bradley Stephenson*

Conestoga-Rovers Associates
14998 West 6th Avenue Frontage Rd #800
Golden, CO 80403
Voice: 720-974-0942
Fax: 720-974-0936
bstephenson@croworld.com

William Lundy

Deep Earth Technology
Alsip, IL

A number of unusual challenges impacted the remediation of this former natural gas compressor station. Although excavation was considered as perhaps the most straight forward remedy, the sheer size of the contaminant plume and the presence of free phase condensate and dissolved phase hydrocarbons impacting a coal seam aquifer rendered this option uneconomical. An analysis of remedial options was conducted to determine if a field tested and proven in-situ technology was available that could effectively treat the liquid condensate without excessive oxidation reactions within the coal. The analysis revealed that such a process had been developed and that it had been successfully employed to treat gasoline and diesel range (GRO/DRO) organics co-mingled with peat at two widely separated sites. An additional benefit that was not a condition of the technology evaluation is the ability of the process to provide a real time site characterization function. During the application work foam is produced by the reaction of the oxidizer with organic contaminants. A small quantity of this artifact appears at the surface as the DPT tooling is withdrawn after injection of the oxidizer. This phenomenon signals the presence of high concentration dissolved phase or free phase hydrocarbons indicating that a source has been located. This proved to be very quick and economical tool at locating potential groundwater impact areas.

The technology (the Cool-Ox™ Process) was applied to the site in August 2009. The vertical treatment interval included both the vadose and the saturated zones. The vadose zone soil was impacted with free phase (NAPL) natural gas condensate and lube oil. Because of the elevated concentrations of the two contaminants at the soil/groundwater interface, significant reactions were observed that allowed the technology to easily track the extent of the NAPL. This process revealed that the NAPL extended to the east beyond the anticipated treatment area. The NAPL source was tracked until observable reactions ceased and the area mapped. Injections into groundwater in a coal-bearing aquifer that contained significant concentrations hydrocarbon constituents were also completed. Subsequent groundwater and soil samples were collected and analyzed for the chemicals of concern (COCs). Initially, reductions were observed in NAPL levels and groundwater contaminant concentrations. Unique aspects of the technology will be discussed including the economical advantages of using the process to locate previously undefined contaminant sources and reconfigure the injection areas as the application is on-going.

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