Geo-Cleanse Remediation Summary
South Carolina
Confidential Site
Petroleum Hydrocarbons

Overview:

An active compressor station in South Carolina was impacted by volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO) after a scrubber line leaked. The leak impacted two areas of the site that were separated by a 6 ft diameter above ground natural gas line and a retaining wall, which created access limitations. The depth to groundwater at the site is approximately 20 feet below ground surface (ft bgs) and the soil matrix consists predominately of clayey sands. The vadose zone at this site was addressed with excavation and therefore did not require treatment. The treatment goal for this program was to reduce groundwater concentrations to below the groundwater cleanup criteria specified by the state, which is outlined on Table 1.

Treatment Program Design:

Geo-Cleanse International, Inc. (Geo-Cleanse) was contracted to conduct an in-situ chemical oxidation (ISCO) treatment program to address the two impacted areas of the site. Based upon our review of the site conditions, access limitations, and treatment objectives, Geo-Cleanse proposed an ISCO approach that utilized alkaline activated sodium persulfate (ASP) applied via permanent injection wells. Due to the access limitations, multiple ASP injection events were anticipated to reach the groundwater goals. Twelve injection wells were installed in the upper area and four injections wells were installed in the lower area. The vertical treatment zone in the upper area extended from 19 to 28 ft bgs, while the lower area had a vertical treatment zone extended from 12 to 20 ft bgs.

Remediation Operations:

Permanent injection wells were a cost-effective and efficient option compared to temporary direct push injection points. The permanent injection wells provided the ability to revisit locations between phases and collect groundwater data during our field process monitoring, which insured distribution of the reagents and that the proper pH conditions had been established. Phase I and Phase II injection programs have been conducted at the site thus far. The Phase I injection program was implemented in October and November of 2012 and included the injection of approximately 14,200 gallons of ASP. The Phase II injection program was implemented in November 2013 and included the injection approximately 12,400 gallons of ASP.

Treatment Results:

Process monitoring during active injection indicated that appropriate pH conditions were established and sodium persulfate was distributed throughout the areas of concern. Geo-Cleanse saw reductions below the cleanup criteria in the upper area (MW-3 was the target well) following the Phase I injection program. Pre-treatment data is not available for the lower area and therefore, reductions cannot be

evaluated; however the only contaminant remaining above the cleanup criteria was benzene with a concentration of 34 ug/L. Geo-Cleanse is waiting for post-treatment data following the Phase II injection program.

Table 1. Compressor Station Project		Baseline		Post-Injection	
Well ID	LOC (µg/L)	MW-3	MW-3	MW-3	MW-3
Date Sampled		03/16/09	12/17/09	02/26/13	08/20/13
Petroleum Related Organic Constituents					
GRO (C_6-C_{10})	**340**	**940**	**890**	**290**	**250**
DRO (C_{10}-C_{20})	**340**	**690**	**1,100**	**420**	**270**
DRO (>C_{12}-C_{16})	**340**	**400**	**690**	**150**	**<100**
Volatile Organic Compounds (VOCs)					
Benzene	**5**	**55**	**35**	**5.6**	**1.4**

This summary sheet is intended to provide a general overview of the referenced site. For more detailed information, please contact us at (732) 970-6696 or at www.GeoCleanse.com.