

Combined Treatment Train to Address Mixed Plume at an Urban Brownfield Site

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Background/Objectives. Environmental investigation, associated with proposed redevelopment of an approximately 27,000-square-foot brownfield in the Williamsburg neighborhood of Brooklyn, New York, identified chlorinated volatile organic compounds (CVOCs) including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene (tDCE) and vinyl chloride (VC) and petroleum contamination in soil, groundwater and soil vapor. Analytical data revealed concentrations of CVOCs exceeding their respective standards in soil samples to depths of up to about 8 feet bgs, and in shallow, and to a lesser extent deep, groundwater samples that exceed their respective standards. Concentrations of petroleum-related compounds in deep well samples above the standard were typically orders of magnitude less than the shallow results, indicating residual impacts of shallower source material. The presence of CVOCs and petroleum contaminants in soil, groundwater, and soil vapor is attributable to historical releases associated with the former auto repair facilities and historical USTs on the site.

A remedial action plan was developed to satisfy requirements of the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health and meet the expedited redevelopment schedule. The remedial plan included a phased remediation consisting of

- Removal of primary contaminant source by decommissioning of ASTs and USTs
- Excavation of impacted soil to about 10 feet bgs
- Installation of depressurization system to address potential SVI
- Direct-injection of a base-activated persulfate to pretreat mixed petroleum/CVOC in groundwater
- Installation of an intricate sub-foundation network of injection/monitoring wells that are accessible via a cellar vault for post-construction groundwater treatment
- Injection of PlumeStop® through the sub-foundation injection well network to treat residual petroleum and CVOC constituents in groundwater

Approach/Activities. A bench-scale study was performed to confirm applicability and determine design parameters for the in situ remedy implementation. Following removal of overburden fill from the site, base activated persulfate was applied to the native sands to reduce contaminant mass prior to groundwater polishing with PlumeStop®. Following ISCO application, a well network was installed to facilitate the overbuild construction prior to completing the phased groundwater treatment approach.

Results/Lessons Learned. The ISCO field implementation was completed in March 2017 and results from the first round of sampling from the monitoring well network show up to two orders of magnitude reduction in total VOCs as compared with pre-treatment concentrations. The well network is complete and PlumeStop® injections are planned for late 2017. Results from the carbon injection will be available for discussion at the conference in May 2018.

Key findings from the project that will be presented include: 1) a combined remedial approach (ISCO and PlumeStop®) was effective at degrading commingled contamination at a brownfield

site below applicable standards, 2) an in situ well network allowed a phased remedial approach that prevented major delays and associated cost impacts to the project and allowed for confidence in the remedial approach should rebound be identified in the future.