Lessons Learned From Bedrock Blast Fracturing and Bioremediation at a Superfund Landfill

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Abstract

This paper will present the lessons learned from implementation of two technologies (blasted bedrock trench and enhanced biological degradation using Hydrogen Release Compound [HRC™]) to remediate a bedrock groundwater "hot spot" located at the Sidney Landfill Site in the Towns of Sidney and Masonville, New York.

Background

The Sidney Landfill is a Comprehensive Environmental Response, Compensation and Liability Act municipal waste landfill. The landfill was poorly operated and received industrial waste. The United States Environmental Protection Agency conducted a Remedial Investigation (RI) and Feasibility Study for the site and selected a remedy that included capping the landfill, remediation of a groundwater "hot spot" in bedrock, and monitored natural attenuation of site-wide groundwater. The Record of Decision (ROD) for the site specified installation of a blasted-bedrock trench and groundwater extraction and treatment for the "Hot Spot" where, during the RI, non-aqueous phase liquid (NAPL) was identified in a single monitoring well. The NAPL contained high concentrations of chlorinated solvents, fuel-related volatile organic compounds, and polychlorinated biphenyls. Subsequent monitoring events observed only thin layers of NAPL and lower concentrations of chlorinated solvent contamination in groundwater.

Blasted Bedrock Trench for Groundwater Extraction and Treatment

The selected remedial alternative for the "Hotspot" was extraction followed by treatment and discharge to surface water. The remedial option identified in the ROD included a blasted-bedrock trench to facilitate groundwater extraction. A pilot trench was blasted, the trench investigated, and two aquifer pumping tests performed to evaluate groundwater flow. The pumping tests found that the fractured bedrock aquifer showed a low specific capacity and the pumping well either dewatered before the end of the scheduled tests or produced very little water with very low contaminant concentrations.

Following the installation of the blasted bedrock trench, the hydrogeologic conditions of the "Hotspot" were modified by the interconnection of two previously isolated fracture intervals. It was found that under these modified conditions groundwater extraction and treatment in the "Hotspot" would not remove a significant mass of contaminants from the site groundwater. This paper will present the lessons learned from the implementation of the pilot blasted bedrock trench.

Enhanced Biological Treatment

Following failure of the blasted bedrock trench to provide effective contaminant removal from the "Hotspot", enhanced biological treatment was implemented as an alternative technology. The enhanced biological treatment consisted of injection of HRC™ into the bedrock. HRC™ was pressure injected into two fracture zones as well as tremied into the blasted bedrock trench. Conservative fluorescent dye tracers were used to track the hydraulic distribution from each injection location.

Results of the enhanced biological treatment were mixed due to the complex hydrogeologic conditions and low overall concentrations at the "Hotspot". This paper will present the lessons learned from the implementation of the HRC™ injection at the "Hotspot".

Biographical Sketches

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