Implementing a Rapid Response Action during a Remedial Design Phase to Protect an at-Risk Municipal Wellfield

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Background/Objectives. A rapid response was implemented for the installation of 13 deep injection and extraction wells into a drinking water aquifer utilizing real-time groundwater hexavalent chromium (CrVI) analyses, groundwater profiling, and geological interpretation to properly locate injection wells and screens; followed by the injection of approximately 466,000 lbs of 60 percent sodium lactate mixed with five million gallons of extracted groundwater. The Puchack Wellfield Superfund Site is located in Pennsauken Township, New Jersey. Metal plating operations resulted in CrVI groundwater contamination in three aquifer units at depths ranging from 90 to 200 feet below the ground surface (bgs) and resulted in closure of a municipal water supply wellfield. EPA selected in situ geochemical fixation through reducing agent injection to treat groundwater with total chromium concentrations exceeding 70 ppb. The reducing agent (lactate) changes the aquifer's geochemistry to reducing conditions and causes the CrVI to form an immobile trivalent chromium precipitate. The remedy is being implemented in two phases.

An operating municipal wellfield was at immediate risk and was therefore addressed early in Phase 1 while designing the overall long-term (Phase 2) groundwater remedy. The Site groundwater model indicated that a small portion of the Site's CrVI plume had rapidly extended into an area under the influence of the wellfield. Subsequent sampling confirmed the model's findings. The model showed that if the highest concentration of the CrVI plume was not remediated quickly, it would quickly move to the municipal wellfield and potentially cause a risk to human health. An interim approach was designed to intercept the area of contamination that posed a threat to the wellfield.

Approach/Activities. The objectives were met by utilizing Sonic drilling in conjunction with groundwater profiling and real-time CrVI analysis to properly locate well screens in the field. Injection objectives were met by injecting at two locations simultaneously and using higher capacity pumps to decrease injection time. Hexavalent chromium concentrations were measured in unamended and amended samples dosed with lactate to demonstrate the immediate decrease in CrVI prior to injection. A comprehensive monitoring and sampling program was established to evaluate forthcoming results.

Results/Lessons Learned. This operation used rapid real-time techniques to install injection well networks, and therefore significantly shortened the time from discovery of the contamination to implementation of a remedy. Specific lessons learned throughout the operations include:

- Difficulty of sonic drilling in angular sand formations;
- Limitations and advantages of Push-Ahead™ in fine-grained sands (no sampler advance) and/or ISO-flow profiling sampling in silts or clays (no sample); and,
- Potential CrVI field analysis interferences once lactate is in solution.

The first round of performance monitoring results are due in early 2018.