

In Situ Groundwater Remediation of Metals Using Time-Release Metals Remediation Compound

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Remediation of groundwater contaminated with heavy metals, such as arsenic and chromium is a major challenge for numerous hazardous waste sites. While the most common remediation method used is pump-and-treat technology, the total capital and O&M costs are very high, particularly considering the extended period of operation that is often necessary to achieve regulatory groundwater clean-up standards. In-situ remediation of metals in groundwater is an innovative alternate solution, which offers several advantages, such as 1) treatment of the groundwater in the aquifer without the cost of extraction wells, 2) no treatment plant and associated capital costs, 3) no O&M of equipment, and 4) can be applied in a built-up environment site. Laboratory tests had indicated the effectiveness of a slow release metals remediation compound (MRCTM) to remove metals in groundwater. This paper describes one of the first full-scale application of this in-situ method using MRCTM for arsenic remediation in groundwater at an industrial site. Application of this compound and the in-situ method has also been successful in remediation of sites with chromium in groundwater.

The in-situ method involves injection of a non-toxic organo-sulfur polylactate polymer (MRCTM) into the aquifer, using the direct push injection method. It creates in-situ reactive zones, in which the MRCTM compound, on hydration, and biochemical reaction, under low redox conditions, slowly releases the organo-sulfur into the aquifer, which irreversibly reacts with metals like arsenic to produce an insoluble metal-organic complex. The arsenic complex strongly sorbs to the soil matrix in the aquifer, and the arsenic is removed from the groundwater. At this site, the groundwater contained arsenic concentrations ranging from 280 µg/L to 17000 µg/L. MRCTM was injected into the groundwater at multiple points throughout the site. Groundwater monitoring was conducted for arsenic and other parameters such as iron, ORP, pH, metabolic acids to evaluate the effectiveness of this treatment and remediation method.

Results of the monitoring provided valuable information regarding the application of this remediation method using MRCTM compound. The monitoring results have shown significant decrease (75-90%) of the arsenic in the groundwater in a short period following the injection. Results also indicated sustained removal of the arsenic over an extended period, with the active ingredients present. The results demonstrated that it was possible to achieve groundwater clean-up standards within a reasonable time period.