

## **CHARACTERIZING LONG-TERM CHANGES IN GROUNDWATER CONTAMINATION USING DATA FROM MULTIPLE SOURCES**

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### **ABSTRACT**

This paper will describe a data analysis approach that maximizes the value of data collected during different phases of site investigation work performed for different purposes. During the Remedial Investigation (RI) at a U.S. Environmental Protection Agency (EPA) Superfund site in New York State, groundwater quality data from the RI and data collected by other agencies under separate phases of work were combined to characterize changes in groundwater contamination at the site over a period of five years. For many sites, such a combination is not possible because the only data available were collected during the RI. At this site, the RI data collected over one year, 2007, were combined with data collected from 2003 through 2008 by other agencies to characterize long-term plume behavior.

Groundwater samples were collected from residential wells from spring 2003 through spring 2008 by EPA and the New York State Department of Environmental Conservation. CDM collected samples from residential well in 2007 during the RI. The data were graphed and mapped to determine the trends in the concentrations at different locations within the plume. Data from a group of wells perpendicular to the direction of ground water flow were evaluated to characterize plume migration.

Because trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA) occur most frequently and at the highest concentrations in groundwater samples, these compounds were used to define the plume. In the summer of 2007, the plumes of TCE and 1,1,1-TCA contaminated groundwater were, respectively, about 8,200 and 8,700 feet long. The plume impacts groundwater underlying a residential area. The residential area is located in a valley filled with complex unconsolidated glacial deposits, up to 100 feet thick, which is underlain by bedrock. The plume geometry is primarily controlled by small, discontinuous preferential flow paths, which are not easily located and sampled using conventional monitoring wells. Rather, long-term trends in concentrations were analyzed using results from residential well samples. This analysis addressed plume migration and the potential future risk to downgradient groundwater users.

The characterization of long-term contaminant changes showed that: 1) concentrations of TCE and 1,1,1-TCE in the core of the plume have steadily dropped over time from 250 micrograms per liter ( $\mu\text{g/L}$ ) to 90  $\mu\text{g/L}$ ; 2) the highest concentrations are dispersing or diffusing and are not being detected downgradient; and 3) concentrations of TCE are beginning to be detected above the maximum contaminant level at some locations at the distal end of the plume, indicating the movement of TCE in groundwater.

**KEYWORDS**

Groundwater; glacial geology; trichloroethene; TCE; 1,1,1-Trichloroethane; 1,1,1-TCA; residential well; remedial investigation, U. S. EPA, New York Department of Environmental Conservation; long-term trend; Superfund; New York State