

Benefits and Limitations of Aggressive Source Removal and Treatment at a Chlorinated Solvent Site

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Background/Objectives. State and federal regulatory agencies in the US acknowledge that groundwater remediation to achieve drinking water standards is not practical at some sites. Active remediation is often still required to reduce the source of contamination. The extent of source reduction and the benefits of source reduction are debated among regulators and those responsible for the clean-up. To provide insight into this debate, this presentation examines a specific chlorinated solvent site where aggressive source removal/treatment measures were completed. The benefits and limitations of source removal/treatment are presented. The site is located in Rhode Island. Chlorinated solvents (primarily 1,1,1, trichloroethane) were present in soil, overburden groundwater, and in deep (<400 feet) bedrock groundwater. Chlorinated solvents in groundwater exceeded 600,000 micrograms per liter (ug/L). 1,4 dioxane was present at 2,500 ug/L. Light non-aqueous phase liquid (LNAPL) was present (2-foot thickness) in the overburden and bedrock. Dense non-aqueous phase liquid (DNAPL) was also indicated. The source area is 50 feet by 200 feet in size. The depth to groundwater is 2 feet. Depth to bedrock ranges from one to ten feet. Source removal to the extent practical is required for regulatory closure. A pump and treat system is downgradient to contain the plume.

Approach/Activities. Source removal included excavation of all soils, removal of loose fractured bedrock, pressure washing of bedrock, extended pumping of open excavations, and use of an amendment in the backfill to provide on-going treatment of groundwater. The development and testing of backfill amendments to treat both chlorinated solvents and 1,4 dioxane will be presented. In total, 2,500 tons of soil/rock was removed and 80,000 gallons oil/water was treated. The backfill amendment was zero valent iron and a specialty product (activated carbon with a surface coating). Following source removal, four quarters of groundwater monitoring were completed.

Results/Lessons Learned. Details and results of the full-scale source excavation/treatment effort will be presented. Results include trend analysis of one year of post-excavation/treatment monitoring. The source removal/treatment had the following benefits **1.** The full-scale remedial action lowered chlorinated solvent and 1,4 dioxane levels in the overburden groundwater by more than 90%. **2.** LNAPL has not been detected since source removal **3.** Potential risks were eliminated for utility workers coming into contact with soil, LNAPL and groundwater **4.** Air testing in a nearby utility tunnel indicates improvement. **5.** Contamination levels in deeper bedrock (below the excavation depth) are also trending lower. The source removal/treatment was not expected to and did not reduce contaminant levels down to the drinking water quality criteria. Further reduction by natural processes is expected but will be very slow. Use of groundwater will remain prohibited in the immediate area. The downgradient pump and treat system will have to remain operational indefinitely. Regulatory closure with application of a Residual Zone is anticipated.