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How Advanced Characterization Improved Full-Scale Bioremediation at a Large, Residual DNAPL Site

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Background/Objectives. The Bountiful/Woods Cross Operable Unit 1 Site (referred herein as the Site) is located in southern Davis County, Utah, roughly 10 miles north of Salt Lake City. The several acre source area is impacted with elevated trichloroethene (TCE) concentrations including residual dense, non-aqueous phase liquid (DNAPL) from past industrial activities. The targeted treatment zone comprises heterogeneous deposits of dense, well-graded sand and gravel alternating with layers of sandy, silty clay. The complex lithology has led to challenges achieving complete contaminant destruction due to the presence of residual DNAPL within the clays.

Approach/Activities. Advanced characterization techniques including membrane interface probe (MIP) were implemented for contaminant delineation and installation of bioremediation treatment system components. The TRIAD approach was applied to allow for real-time data analysis and onsite decision making. Bioremediation treatment strategy is aggressive amendment delivery via a series of closely-spaced, staggered injection wells in the high concentration source area, which has seen concentrations of total chlorinated compounds exceed 100 parts per million (ppm). Amendment injections were performed every other year, and then quarterly, to establish adequate reducing conditions to promote reductive dechlorination. Bioaugmentation with an active dechlorinating culture was also completed. Performance of the remedy is monitored quarterly to semiannually using a series of monitoring wells.

Results/Lessons Learned. The presentation conveys the importance of thorough subsurface investigation, especially in areas with residual DNAPL or extremely high contaminant concentrations. A variety of advanced characterization techniques are available to obtain this essential data in a timely, efficient manner, and proper application of tools and a flexible approach toward investigation can result in improved remedy performance. At this site, use of MIP in a TRIAD approach allowed for better delineation of a high concentration source, and therefore improved delivery of amendment to the area of concern through revisions to the bioremediation treatment system, including modifying electron donor and installation of new injection wells. This site also demonstrates the importance of continuous assessment of data and the value of allowing flexibility in remedial approaches, which is critical to the successful remediation of complex groundwater sites. Modifications to the approach have resulted in improvement to the dissolution of contaminant mass, as well as a nearly 10-fold increase in generation of ethene. Furthermore, complete contaminant destruction is being achieved within 100 feet downgradient of the greater-than-100-ppm hot spot due to proper selection of injection well locations, as guided by MIP.