CASE STUDY: E-REDOX® IN SITU REDUCTION AND ENHANCED MASS REMOVAL OF CHLORINATED SOLVENTS IN GROUNDWATER

Location: Former adhesives production site in South Carolina, USA
Contaminated Matrix: Groundwater and saturated soil
Primary Contaminants of Concern: Chlorinated ethenes
Project Objective: Full-scale *in situ* contaminant reduction and mass removal using the E-Redox® technology coupled with dual-phase extraction (DPE)
Case Study Description & Results: A full-scale implementation of E-Redox® systems was conducted at a former adhesives production plant site in South Carolina, United States, where subsurface soil and groundwater were contaminated with chlorinated volatile organic compounds (CVOCs). The CVOCs were mostly composed of 1,2-cis-dichloroethene and vinyl chloride. The site went through injections of electron donors and zero valent iron (ZVI) in various locations. However, groundwater CVOCs level rebounded after initial decline after the injections, presumably due to their sorption to the matrix solids and slow desorption into the groundwater. The full-scale implementation of E-Redox® systems consisted of initially 11 electrode wells using pre-existing monitoring and injection wells. Figure 1 shows the installation of the E-Redox® units at the site. Regular 110V power source was used and each E-Redox® unit operated at <50 W electricity consumption.

Figure 2.1: (Clockwise from top right) Site preparation and laying out conduit for wire protection; installation of an electrode in hill-side wells; installation of electrode in primary site area; warehouse sheltering low-intensity power source.

As expected, E-Redox® operation, especially the anodic influence initiated substantial desorption of CVOC into the groundwater in locations with historically low CVOC

concentrations (yet persistent). In one location, the CVOC concentration was 12 mg/L before E-Redox® installation (Figure 2, *top*), but increased to 50,000 mg/L after 26 weeks of E-Redox® operation. At the peak CVOC level, the E-Redox® system polarities were switched to initiate and sustain reductive degradation, decreasing concentration of CVOCs sharply to near non-detect level within 3 weeks. This demonstrated that one polarity of the E-Redox® can also trigger CVOC back-diffusion and desorption, while the opposite polarity achieves contaminant destruction through a combination of abiotic and biological reductive dechlorination. A DPE system was used for CVOC mass removal that was enhanced by the E-Redox® technology. Overall, the total CVOC concentrations are decreasing with the combined remedy of reductive degradation and enhanced mass removal (Figure 2, *bottom*). The site is now under post-remediation monitoring.

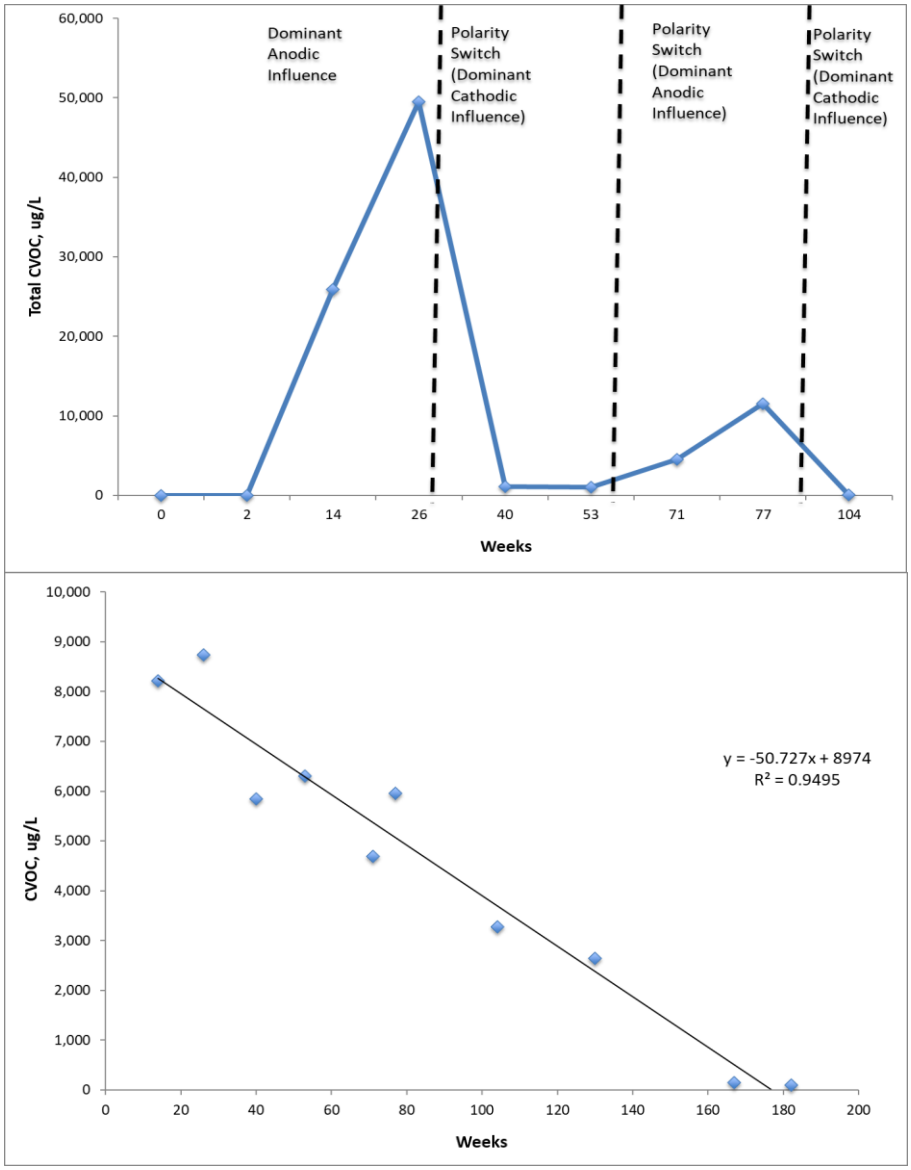

Figure 2. Chlorinated VOCs concentration change in a representative well (*top*), and the overall site chlorinated VOCs concentrations (*bottom*)