Bioremediation of Chlorinated Solvents and Mixtures

Laurie LaPat-Polasko (llapat@mnwe.com) (Matrix New World Engineering, Phoenix, AZ, USA)

Chlorinated solvent contaminated groundwater often contains additional pollutants, which can significantly complicate developing an effective remediation strategy. In situ bioremediation (ISB) has been highly successful at biodegrading chlorinated compounds under anaerobic environments. However, some co-contaminants may not be biodegraded under anaerobic conditions. This project involved using an ISB approach where both anaerobic and aerobic bioremediation was implemented in series to promote biodegradation of chlorinated ethenes and 1,4-dioxane. The ISB system includes a group of injection wells, which were used to inject various carbon substrates and bioaugmentation amendments including *Dehalococcoides* microbial consortium (BAC-9) to promote complete reductive dechlorination of the chlorinated ethenes. The second phase of the ISB program involved air sparging along with the injection of *Pseudonocardia dioxanivorans* CB1190 and nutrients to biodegrade 1,4-dioxane and some CVOCs.

Within one quarter after injecting the carbon substrates, the total organic carbon concentrations significantly increased in impacted site monitoring wells, which corresponded to a major decline in competing electron acceptors and chlorinated ethene concentrations in groundwater. Post aerobic biostimulation and bioaugmentation using CB1190, there was a major increase in dissolved oxygen and nutrients along with a significant increase in the CB1190 microbial population. This led to a significant reduction in cis-1,2-dichloroethene, vinyl chloride and 1,4-dioxane in groundwater. This presentation will discuss how the distribution of the various amendments significantly impacted the biodegradation of the chlorinated ethenes and 1,4-dioxane in groundwater, and how advanced molecular tools were applied to monitor and evaluate the effectiveness of the biostimulation and bioaugmentation amendments.