

Partitioning Electron Donors (PEDs) for Improved Source Zone Bioremediation: Field-Scale Application

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Background/Objectives. Partitioning electron donors (PEDs) are water soluble substrates that can partition into dense non-aqueous phase liquids (DNAPLs), are slowly released and readily fermented at the DNAPL: water interface. The project objective is to demonstrate the application of a PED to improve the biologically enhanced dissolution rate of DNAPL. This is an ESTCP (CU-0715) project. This presentation will present the field component of the project and the laboratory component is presented in a companion submission by Cápiro et al.

Approach/Activities. Based on laboratory studies, n-butyl acetate (nBA) was selected as the PED for application at Launch Complex 34, in a TCE source area identified as Hot Spot 1. Hot Spot 1 has a zone of high concentration TCE in a low conductivity layer at a depth of approximately 40 feet below ground surface (ft bgs). Implementation included the extraction of groundwater above and below the low conductivity layer with PED injection in, above and below the low conductivity layer. The groundwater recirculation system consists of a pair of extraction wells in the center of the treatment area, screened above and below the low conductivity layer, and a set of five peripheral injection well pairs, similarly screened, used to create an inward hydraulic gradient and promote horizontal flow across the top and base of the low conductivity layer. Groundwater concentrations in the treatment area are monitored using three monitoring well clusters (each with six depth intervals) and existing monitoring wells in the treatment area. The groundwater recirculation system was operated, without addition of PED, for approximately four weeks to establish the baseline flux condition.

PED was introduced to the plot by injecting 34,000 gallons of a solution containing nBA (3,000 mg/L) and conservative tracers (bromide and iodide) using direct push (DPT) at 20 locations from approximately 23 to 62 ft bgs. Confirmation sampling (DPT groundwater sampling) was conducted to assess the PED distribution after injection activities. The recirculation system remained off after PED injection for approximately four weeks to allow the PED to partition into the DNAPL and to facilitate the acclimation and establishment of biomass within the plot. The recirculation system was restarted and groundwater sampling was performed regularly to assess flux and microbial reductive dechlorination.

Results/Lessons Learned. The primary assessment of mass flux of is based on the concentration trends at the central extraction wells, with supplemental data collected from the monitoring well network throughout the treatment area. In addition, baseline soil sampling data will be compared to soil sampling results at the end of the active phase (Dec 2011) to assess the removal of volatile organic compounds from within the treatment area. Complete field results will be provided at the time of presentation with links to the laboratory studies completed.