Natural And Surfactant Enhanced Dissolution Of Field DNAPLs

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Abstract. Understanding and quantification of dissolution of entrapped DNAPLs such as Trichloroethylene (TCE) and Tetrachloroethylene (PCE) under natural groundwater flow is necessary in design and implementation of cleanup strategies for DNAPL contaminated field sites. It is expected that field samples are generally mixtures of other compounds that change physical characteristics such as density, viscosity and dissolution rates. A study is underway with the goal of developing decision tools to manage DNAPL contaminated sites. The feasibility of using partitioning tracer techniques for the determination of DNAPL saturations is also evaluated. As a part of this study, DNAPLs collected at a field site was characterized to develop mass transfer models that will get incorporated into a numerical transport model. A set of dissolution experiments were conducted in soil columns using the field DNAPL and well characterized test sands. The DNAPL contained about 40% TCE. The columns were residually saturated with either field DNAPL or pure TCE. The residual DNANPL saturations of the columns were estimated with partitioning tracer technique at the beginning of the dissolution process. The break through curves resulting from both natural and surfactant enhanced dissolution experiments were analyzed to obtain mass transfer correlations. These correlations were incorporated into a numerical model to predict the concentrations in the dissolved plume downstream of the source zone. The plumes resulting from pure phase TCE and the field DNAPLs are compared.

Keywords-dissolution, saturation, transport, partition tracer, simulation