234b Optimization of Insitu Chemical Oxidation Via the Elucidation of Key Mechanistic Processes Impacting Technology Maturation and Development of Effective Application Protocol

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Over the past several years, insitu chemical oxidation (ISCO) has become a viable remediation option for the treatment of organic pollutants. This process involves the application of chemical oxidizers (for example, Fenton's Reagent and ozonation) into soil resulting in the degradation of pollutants within a contaminated aquifer. While insitu chemical oxidation has recently been proven to be both economically and technically feasible for some sites, little research has been directed towards the understanding of functioning mechanisms and soil-oxidizer-pollutant interactions that dictate both the economic and technical performance of the process from site to site. Because of these current limitations, this research was undertaken to address this lack of knowledge related to ISCO application. The results of this effort are being used to develop design guidance and application protocols for ISCO.

Using past research, several key known oxidizer scavengers were selected and soil specimens collected from across the US that have extremely high levels of one of the targeted scavengers and low levels of the others. This allows the project team to focus on which scavenging species is problematic to soil remediation using ISCO. Soil types under evaluation include ozonated filter sand (control), a high iron content soil, a high calcium content soil, a high organic content specimen, a biologically stimulated soil, a high pH soil, and an “average” soil. Each soil specimen is tested using both batch slurry reactors and packed columns. The following parameters are measured to evaluate soil-oxidizer compatibility impacts: soil bacterial levels, sorption capacity, permeability, oxidizer concentrations, and humic fraction composition and concentration. Recent work has focused on determining the amount of O2 gas produced during ISCO treatment. We have also generated a biologically stimulated soil from the average soil and determined the impact of oxidation on its microbial populations and characteristics.