Project Title: ***In Situ*** **Ferrous Iron Reactive Zone for Treatment of Cr(VI) in Ground Water**

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Problem Definition: Zero valent iron in the form of iron filings has to date been the most commonly used PRB media for treatment of reducible metals (e.g. hexavalent chromium) and chlorinated hydrocarbons (e.g. TCE). Although effective, the installation of iron filings based PRBs can be costly particularly at depths greater than 30 ft. In addition, iron-filings based PRB systems are rigid systems that offer limited flexibility with respect to installation design and post-installation refinement. Alternative PRB systems may be warranted in cases where installation of zero valent PRB systems considered too costly or technically challenging.

Background: Ferrous iron is an effective reductant for treatment of contaminants such as hexavalent chromium (Cr(VI)) and uranium. It also can be effective for treatment of chlorinated hydrocarbons such as TCE under appropriate conditions. Ferrous iron is normally difficult to effectively deliver into the subsurface due to its tendency to rapidly precipitate out of solution. The rapid precipitation of the injected iron may cause well and aquifer formation clogging. However, in the presence of an oxidant inhibitor such as sodium hydrosulfite (dithionite), the ferrous iron be stabilized in solution for an extended period of time to allow for its effective dissemination within the subsurface without compromising the hydraulic conductivity of the formation. in the path of a contaminant plume . Existing iron in the subsurface formation is also reduced through contact with the injected sodium hydrosulfite thereby adding to the total ferrous iron reserve within the reactive zone.

Objectives: The objectives of the study are to determine whether ferrous iron in the presence of sodium hydrosulfite can be effectively disseminated within a Cr(VI) impacted aquifer, whether it can be injected without adversely impacting the hydraulic conductivity of the aquifer formation, and whether the injected ferrous iron can effectively form a reactive zone capable of treating incoming dissolved phase Cr(VI).

Approach: Ferrous sulfate was injected in combination with sodium hydrosulfite into a native aquifer formation in the path of a dissolved phase Cr(VI) plume at the Macalloy Corporation site in Charleston, S.C. Monitoring well transects were installed up gradient, within, and down gradient of the injection wells. Groundwater samples were analyzed over time for multiple parameters including cations, anions, ORP, pH, conductivity, alkalinity, total sulfur, and ferrous iron. Comparison of data up gradient, within, and down gradient of injection points was used to evaluate performance of the ferrous iron based treatment system. Hydraulic conductivity testing within the ferrous iron reactive zone was used to evaluate hydraulic conductivity changes, if any, over time.

Accomplishments to Date: The pilot test has been completed showing that injection of ferrous iron in the presence of sodium hydrosulfite is able to provide sustained *in situ* treatment of dissolved phase Cr(VI) for a period of at least 1020 days.

Near Future Tasks: Pilot test data is being compiled and publication of the findings is pending.