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Determining the effects of bacterial sulfate reduction in saturated sediments on self-potential and magnetic geophysical measurements

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In situ bioremediation is a non-invasive groundwater remediation technique that stimulates microorganisms to catalyze desirable redox reactions. These redox reactions may be detectable using self-potential (SP) geophysical methods. If the contaminants are metals, chemical changes may also be detectable using magnetic methods. This project explores the suitability of SP and magnetic geophysical methods for monitoring bioremediation of metals contamination. These geophysical methods may be inexpensive, non-invasive alternatives to standard groundwater monitoring practices.

The study is divided into a field component and a laboratory component. For the field study, geophysical data were collected at a metals-contaminated site undergoing *in situ* bioremediation. The data were collected before and after sulfate-reducing bacteria were stimulated by injection of bacterial nutrients into a monitoring well at the site. The collected data were examined for changes in groundwater geochemistry as determined by water sampling.

For the laboratory experiment (in progress), a Plexiglas tank containing autoclaved quartz sand saturated with an iron-rich *Desulfovibrio* (a sulfate-reducing bacteria) media is used to simulate an aquifer. A species of bacteria will be introduced into the tank to remove iron (metal contamination) from the aqueous system. SP and magnetic geophysical data will be collected before and after the bacteria are introduced. The data collected from this part of the study will be compared with the field data to determine if bioremediation processes can be successfully monitored using geophysical methods.