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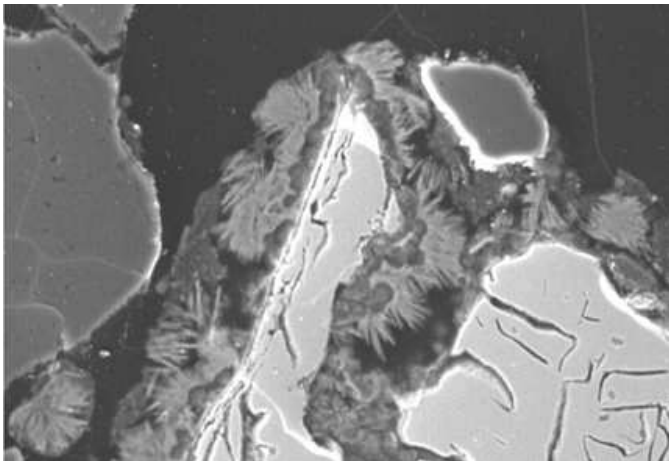
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
GROUND WATER AND ECOSYSTEMS RESTORATION RESEARCH

PRB Strategies and Performance Monitoring for Remediation of Inorganic Contaminants

Background

A permeable reactive barrier (PRB) is a zone of granular reactive material that extends below the water table to intercept the flow of contaminated ground water. As organic or inorganic contaminants pass through a PRB, they are ideally reduced to non-hazardous compounds or immobilized to less soluble or less toxic forms. Research is focused on assessing the geochemical, hydrogeological, and microbiological factors that govern the performance and functioning of PRBs. Understanding these factors is necessary in order to predict the longevity of PRB systems, conduct economic analyses, and to optimize the implementation of this ground water cleanup technology for a wide variety of hazardous compounds.

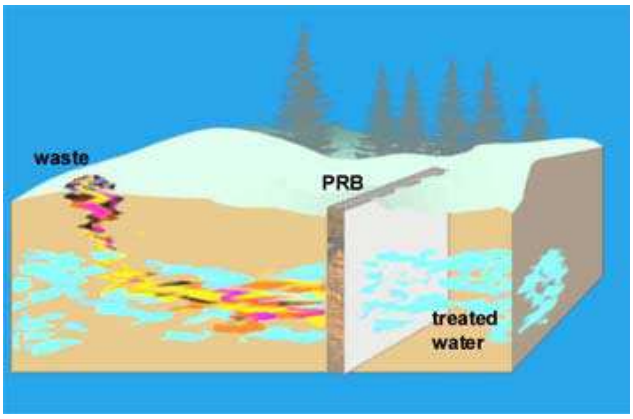


Objectives

As of 2002, the oldest zero-valent iron PRB systems were about 10 years old. In order to reach the best possible technology-selection decisions and to optimize PRB design parameters for ground water cleanup at contaminated sites, information is needed to identify the site-specific factors that govern continued PRB performance. Two PRB systems installed in 1996 (one at the U.S. Coast Guard Support Center, Elizabeth City, North Carolina; the other at the Denver Federal Center, Lakewood, Colorado) have been extensively monitored to track and evaluate system behavior through time.

Approach

This project includes both field and laboratory research components. Detailed performance monitoring data on full-scale PRBs installed to treat contaminated ground water have been collected at two different sites. The PRBs investigated in this project are among the oldest full-scale systems available for study and provide an opportunity to analyze the performance of systems with more than 5 years of field history. In addition, the PRBs examined here have contrasting design and hydrogeochemical characteristics that are useful for gaining insight about the factors that govern PRB longevity and long-term performance.



Geochemical studies include conventional low-flow ground water sampling and analysis, and solid-phase characterization investigations. Laboratory batch and column tests using reactive media are conducted to determine the effectiveness of reactive materials, such as zero-valent iron to treat a variety of hazardous substances. Contaminant-removal mechanisms will be identified in careful water chemistry, geochemical modeling, and solid-phase characterization studies.

Accomplishments

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Collaborators

Federal Tri-Agency Research Initiative (Department of Defense, Department of Energy)

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