WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: AL4221

Title: Development of Geophysical Assessment Tools for a New In-Situ Groundwater Remediation Process

Focus Categories: Groundwater, Toxic Substances

Keywords: Anaerobic Treatment, Hydrogeology, Heavy Metals, Geophysics, Bacteria, Biological Treatment, Groundwater Quality

Start Date: 03/01/2001

End Date: 02/28/2002

Federal Funds: $24,935

Non-Federal Matching Funds: $67,992

Congressional District: Third

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Abstract

Groundwater is contaminated by a number of toxic heavy metals, and metalloids at thousands of sites in the United states. These sites largely are associated with industries such as electroplating facilities, battery recycling plants, foundries, coal mines, and base and precious mines. Similar contamination problems occur at government sites. Bioremediation has largely been thought of as a technique for treating organic contaminants; however, this technique appears to be well suited for both inorganic and organic contaminants, or mixtures of both. In 2000, researchers from Auburn University began a research endeavor using a new groundwater remediation process at a highly contaminated Alabama industrial site in southeastern Alabama. The company legally responsible for the site is Sanders Lead, Troy, Alabama. Sanders Lead contaminated groundwater at the site in their early days of operations, which involved the recycling of old car batteries to recover lead, sulfuric acid and plastic. Sanders Lead is the largest employer in Pike County and produces approximately 15% of the U.S. lead consumption. Groundwater at the site is acidic and contains high levels of lead, cadmium, zinc, copper, and sulfuric acid. Shallow contaminated groundwater discharges to a natural wetlands on the site and has caused extensive killing of natural vegetation. A large scale conventional "pump-and-treat" remediation scheme has been ongoing for a decade at an estimated cost to date of $7 million. It has shown little success in improving water quality. In 1999, our research group approached Sanders Lead with the concept of a passive in-situ bioremediation process at their site. The process involves the stimulation of naturally-occurring anaerobic bacteria to remediate, in-situ, contaminated groundwater in an innovative way. Preliminary results indicate that the technique is very promising; however, the process of remediation is currently monitored only by direct measurements taken near the injection site. A realistic groundwater flow model that can be used to accurately predict the

migration of the plume is lacking and cannot be tested without a better assessment of the actual flow and plume migration. The researched proposed is aimed specifically at developing surface geophysical techniques (electromagnetic, electrical resistivity, and magnetic) to track the progress of bioremediation in the subsurface, in areas where monitoring wells are absent or too far apart for proper assessment of remediation progress.