As is common with other reports in the series, cost data are given. Not surprisingly, electroheating adds to the cost; an increase of approximately US$ 500,000 is expected in utilizing electroheating over steam sparging for the hypothetical site.

Consistent with other reports in the series, detailed information in the study is found in the appendices. The appendices in this case only encompass one-half of the book. Appendices contain boring logs, slug test analysis, particle size distribution, working data analytical reports, design manual, Fort Hood demonstration report and analysis of vacuum dissipation data from prefracturing pilot tests.

Gary F. Bennett

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Sequenced Reactive Barriers for Groundwater Remediation

Stephanie Fiorenza, Carroll L. Oubre, C. Herb Ward (Eds.); Lewis Publishers, Boca Raton, FL, 2000, US$ 69.95, 730 pp., ISBN: 1-56670-446-4

This is a report by a University of Waterloo (Ont., Canada) research group of a study performed to degrade chlorinated hydrocarbons. It was conducted under the umbrella-funded Advanced Applied Technology Demonstration Facility (AATDF) Program grant by the US Department of Defense to Rice University (TX, USA).

This is the 10th (largest) and the last book in the series. Having reviewed all these reports, I must state my admiration for the conceptual design of the program by Dr. Herb Ward and his staff at Rice University, the breadth of the remediation topics studied and the quality, extent and depth of the 10 reports.

The goal of this federally-funded project was to test the potential of reactive barriers to minimize long-term operation and maintenance costs while limiting the migration of a contaminated groundwater plume. In this project, the researchers advanced their use of reactive barriers by testing combinations of several technologies in sequence.

Altogether, five technologies were tested including two anaerobic–aerobic sequences as well as an intrinsic remediation option.

In this demonstration project (field study), passive and semipassive in situ remediation technologies were assessed in anaerobic–aerobic sequences for the treatment of a mixed aromatic-contaminated groundwater. Field studies were conducted at Canadian (Armed) Forces Base Borden (Ont., Canada) and the US Naval Air Station (Alameda, CA).

Treatment systems evaluated included the following:

- sequential in situ treatment using granulated iron and ORC^{TM} (oxygen-releasing compound);
- intrinsic remediation — use of natural attenuation to reduce environmental risk posed by groundwater contamination;
- sequential anaerobic–aerobic bioremediation;
- in situ sequential treatment using granulated iron and oxygen sparging.

Based on the results of the study, the team designed and costed two hypothetical full-scale sequential permeable reactive barrier (SPRB). Systems and these costs were compared to pump-and-treat systems designed to capture the same dimensions.

In common with other books in the series, the details of the experiments, analytical results, etc. are found in the extensive appendices.

Gary F. Bennett

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Reuse of Surfactants and Cosolvents for NAPL Remediation

Jeffrey H. Harwell, David A. Sabatini, Chi-Chung Chang, John H. O'Gaver, Thomas J. Simpkin (Authors); Donald F. Lowe, Carroll L. Oubre, C. Herb Ward (Eds.); Lewis Publishers, Boca Raton, FL, 2000, US$ 89.95, 314 pp., ISBN: 1-56670-466-9

This book is best described by the authors who write in the introduction:

> This monograph provides detailed technical information on demonstrations of surfactant recovery arid reuse technologies. Surfactant recovery and reuse includes a group of technologies intended to treat produced fluids and recover surfactant from a surfactant flushing process. The recovered surfactant would then be reused in the flushing processes. Estimated costs for full-scale application and performance of surfactant recovery and reuse technologies are provided. In practice, surfactant recovery and reuse technologies also can be applied to recover cosolvents that are used for soil flushing: however, the emphasis of this monograph is on the demonstration of surfactant recovery and reuse.

A demonstration project it was but a rigorous one being conducted under the Rice University-directed, U.S. Department of Defense-funded, Advanced Applied Technology Demonstration Facility (AATDF) Program for Environmental Remediation Technologies. This book is one of the 10 books that resulted from the 12 funded research demonstration programs.

> In situ surfactant-aided soil flushing is one of the most promising processes for the removal of dense non-aqueous phase liquids (DNAPLs) from aquifers. Surfactant-aided soil flushing is also promising for removing the low volatility, higher molecular weight components of light non-aqueous phase liquids (LNAPLs) from aquifers. Engineering estimates, laboratory-scale tests, full scale simulations, and initial field trials have all indicated that, with proper selection of the surfactant system, use of surfactants could decrease the time required for an aquifer remediation project by an order of magnitude or more.

Since solubilization flushing requires at least 10 pore volumes of surfactant solution to be injected into the contamination zone, recovery and reuse of the surfactant has an impact on the economic feasibility of the remediating large sites.

The objectives of the surfactant recovery program were:

- to evaluate technologies that recover surfactants for reuse in aquifer remediation;
- to demonstrate the most promising treatment system at a field site;
- to perform economic analyses for the pilot-scale and full-scale in situ surfactant-aided soil flushing technologies;