

Decision Support System to Evaluate Effectiveness and Cost of Source Zone Treatment

Background:

The approach to groundwater remediation has undergone dramatic shifts as a better understanding of source zones has developed. Initially, environmental professionals assumed that contaminants in the saturated zone occurred only in the aqueous or sorbed phases, so groundwater remediation was based on pump-and-treat systems. In the late 1980s and early 1990s, it was realized that Dense Non-Aqueous Phase Liquids (DNAPLs) are a secondary source of contamination. By the late 1990s, almost all chlorinated solvent sites were assumed to contain a continuing DNAPL source, even at sites where DNAPL was not directly observed. Better technologies that can remove or destroy residual DNAPL were developed in response. However, most of these methods are not commonly used as their benefits are difficult to assess and justify. Thus, there are two competing general site remediation options: (1) application of aggressive but emerging source treatment technologies to remove DNAPL or (2) application of long-term, low intensity containment alternatives that leave the DNAPL in place and focus on long-term management of the DNAPL dissolution products. If DNAPL removal does not achieve a meaningful reduction in plume size or plume lifetime, then those resources may better be used for other risk control measures.

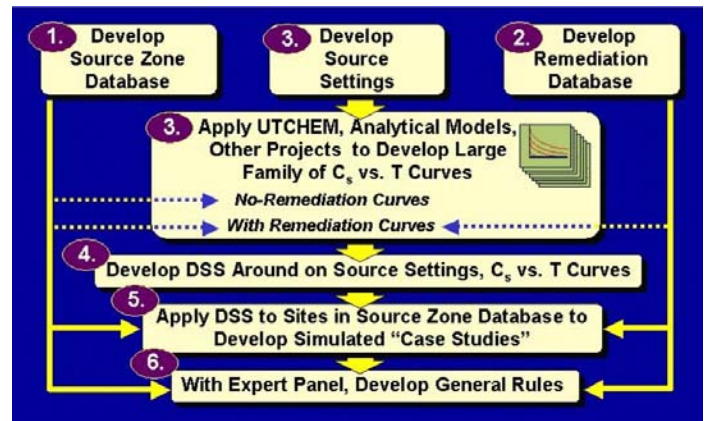
Objective:

The objective of this research is to gather key knowledge and develop new, easy-to-use tools that will help the groundwater community decide whether or not source zone DNAPL remediation is economically and technically justifiable at a particular site.

Summary of Process/Technology:

In this project, a Source Zone Database consisting of 20-30 sites that have sufficiently well characterized DNAPL sources will be developed. A Source Remediation Cost and Performance Database will also be developed to include capital and long-term operating and monitoring costs for DNAPL remediation, using past cost experience and data from the literature. A family of “source settings” that show long-term concentration vs. time predictions will then be developed. Each “source setting” will consist of a subsurface DNAPL distribution that is often encountered at impacted sites. These modular “source settings” will form components of complete “source settings” that model actual sites. The concentration vs. time behavior of each individual “source setting” will be predicted using analytical and numerical models of DNAPL dissolution and groundwater transport. Once developed, the “source-settings” will be applied to sites in the Source Zone Database for three different cases of source treatment. From the cost of DNAPL remediation at each of the sites in the database, site data, and the modeling

results, the project team and expert panel will compile a list of general rules regarding when and what type of intensive remediation is appropriate, and when some form of long-term plume management should be pursued. A decision support system will also be developed to assist environmental professionals in evaluating cost effectiveness of source zone remediation at sites where application of general rules is difficult.



Decision Support System Development

Benefit:

This project will produce general rules and a decision support software system that users can consult in evaluating site-specific source remediation problems. An uncertainty module will be developed to help users evaluate the uncertainty in the problem-solving process and provide statistical tools to evaluate uncertainty. The general rules and decision support system will allow environmental professionals to explore the technical feasibility and cost effectiveness of intensive source remediation, allowing the most efficient use of limited remediation resources.

Accomplishments:

This project began in FY 2002. Accomplishments will be noted upon completion of the project. For information on the project's status, see the [timeline of tasks and deliverables](#).

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