

Case Studies of In situ Bioremediation

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1.0 Summary

This section is an executive summary of the overall report. It includes (1) an introduction, (2) objectives for performance of the case studies, (3) approach to conducting the case studies, and (4) the conclusions.

1.1 Introduction

This report discusses case studies in six states where institutional and regulatory barriers to implementation of in situ bioremediation (ISB) were overcome. The concept for this project arose out of the Interstate Technology and Regulatory Coordination (ITRC) Work Group, whose mission is to facilitate cooperation among the states when dealing with implementation of innovative technologies. The ITRC Work Group is one of five work groups under the direction of the federal advisory committee to Develop On-site Innovative Technologies (DOIT) for cleanup of federal lands. The DOIT Committee was created, in part, at the request of the Western Governors' Association (WGA) to the federal Departments of Defense, Energy and Interior, and the Environmental Protection Agency (EPA). The overall project is managed by WGA.

1.2 Objectives

The objectives for the conduct of the case studies are two-fold.

- The primary objective is to document and report how state regulatory agencies encourage use of innovative technologies for environmental restoration.
- The secondary objective is to determine whether the case study approach adopted by the Task Group would yield information useful to the states.

1.3 Approach

This subsection addresses the rationale for selection of ISB as the example innovative technology and describes how the case study method was implemented.

1.3.1 Selection of In Situ Bioremediation

ISB was selected by the Case Studies Task Group (Task Group), of the ITRC Work Group, as the vehicle for the case studies, because many members of the ITRC believe that ISB can provide cost-effective, safe, and successful cleanup, yet the technology is not widely utilized. The Task Group perceived that the major impediments to implementation of ISB were institutional and regulatory -- not technical.

Institutional barriers to implementation of ISB tend to be typical of most innovative technologies. Use of an innovative technology creates uncertainties by virtue of the fact that a technology is

innovative. Uncertainties create disincentives to approval, such as risk aversion, desire to expedite cleanup, and desire to maintain the remediation project budget and schedule.

Regulatory barriers to implementation of ISB tend to be unique to ISB. The Task Group further focused on the aspects of ISB that involve injection of additives to ground water, because of the tension commonly found between state agencies responsible for remediation versus agencies responsible for ground water quality. Ground water quality standards can inhibit or prohibit injection of additives that accelerate biodegradation of chemicals in ground water. In some states, the lengthy time required for obtaining a permit for a discharge to ground water discourages use of ISB for non-Superfund cleanups.

1.3.2 Case Study Methodology

Because the objective was to learn from states that successfully overcame institutional and regulatory barriers to ISB (rather than merely to identify the barriers), the Task Group selected a biased and limited sample of states for study. The sample was biased in favor of states with success stories to share, so that other states could gain useful insights. The sample consisted of six states known to the Task Group to have successfully implemented ISB. The states selected for evaluation included Massachusetts, Illinois, New York, South Carolina, Montana, and Oregon. Considered together, these states have had experience with the use of ISB technologies for remediation of petroleum fuel, chlorinated solvents, and wood preservative contaminants.

As the acronym suggests, the philosophy of the ITRC Work Group is premised on interstate cooperation. As a result, the Task Group sent state representatives to interview, face-to-face, colleagues in the selected states. A Colorado Center for Environmental Management (CCEM) representative accompanied the ITRC state representative to the interviews. The Task Group recognized that a focused interview process for such a limited sample of states would provide anecdotal data (rather than statistical data to be used for comparison of approaches adopted by many states).

1.4 Conclusions

This subsection addresses the conclusions of the Task Group and CCEM, and includes (1) the overall findings, (2) approaches that the studied states use to encourage the use of innovative technologies, (3) possible consequences of broad-based state actions on innovative technologies, and (4) approaches used by the studied states to change.

1.4.1 Overall Findings

- In most states, ground water quality standards and permitting procedures were the primary barriers to deployment of ISB. Application of ground water requirements to specific sites was highly variable among the states in which case study analyses were conducted. The degree to which a state maintained a flexible approach to implementation of ground water protection requirements (e.g., using risk-based cleanup levels, downgradient points of compliance, or temporary waivers or variances), was determinative of the degree of implementation and support of ISB in that state. A trend toward flexibility and a relaxation of ground water requirements was observed among the states.
- A potential barrier to use of ISB and other innovative technologies is the observed trend among the states to reduce or eliminate a preexisting statutory preference for treatment in favor of containment or institutional controls. However, in the case of ISB, containment is often utilized with ISB treatment of ground water to assure no migration of contamination or other additives occurs.

- Most states that have approved use of ISB technologies have resolved fundamental differences between the water quality and site cleanup programs regarding injection of additives into ground water. Because the Environmental Protection Agency (EPA) does not regulate ground water (except under the Underground Injection Control [UIC] program), each state independently has had to develop its own approach to resolving internal conflicts without any national guidance.
- State agency managers determined the degree to which ISB and other innovative technologies, in general, are demonstrated and deployed in their state. In a few of the states, managers initiated an innovative technologies program. In other states, managers were responsive to the regulated community and/or staff requests to do what was necessary to test ISB.
- Experience gained through use of ISB has allayed many of the concerns of water quality protection staffs. Also, proactive education of regulators by experts has helped gain more ready acceptance by regulators of innovative technologies.

1.4.2 Approaches that States Have Used to Encourage Use of Innovative

Technologies

- Discrete innovative technology or technical support group formed within state environmental agency to support remedial programs.
- Interagency committee created to address specific innovative technology.
- Evaluation of dual remedies (conventional and innovative) concurrently during feasibility study phase of Superfund cleanup.
- Selection of dual remedies (innovative with backup of conventional remedy or enhancement).
- State financial guarantee to cover costs of replacement technology if innovative technology does not meet program goals.
- Waiver of permit requirement for injection of additives into ground water.
- Flexible permits that anticipate occasional amendments to incorporate demonstration and use of innovative technologies.
- Flexible regulations that allow for site-specific waiver or variance from ground water quality standards or points of compliance.
- Delayed action based on observing how technology works at other sites.
- Centralization of cleanup authority into one state agency.

1.4.3 Possible Consequences of Broad-based State Actions on Innovative

Technologies

State legislation, rules, and administrative policies that are not specifically directed toward the use of ISB or innovative technologies can have an indirect or unintended effect on their use. The following broad-based state actions, noted during the interviews, could have an effect on the use of ISB and innovative technologies.

- Deletion of preference in state Superfund statute for treatment in favor of co-equal consideration of containment, institutional controls and treatment.
- Amendments in state cleanup statutes that make cleanup levels in soil and/or ground water health risk-based.
- Indirect state oversight through licensed professionals, who are not state employees, but are state certified.

1.4.4 Approaches to Change

A state that is considering how to enhance its support for ISB or other innovative technologies can obtain guidance from these case studies. The approaches to change include legislative, regulatory, organizational, and policy changes. Legislation is a powerful means of creating incentives or disincentives for the use of innovative technologies. But, change may be well within the administrative powers of the regulatory agencies, in the form of regulatory, organizational or policy reform, without the necessity of legislative amendment.

1.4.5 Usefulness of Case Study Methodology

Collection of anecdotal data, from a limited sample, through a case study approach, could have value beyond the primary objective of this report. Such an approach could be used to guide states regarding resolution of institutional/regulatory barriers not only in regards to ISB and other innovative technologies, but also with respect to other troublesome issues (e.g., incineration and containment of spiraling remediation costs).

The Task Group discovered that the approach of interviews by state representatives made for more candid dialogue than could otherwise be achieved. Face-to-face interviews between colleagues created an opportunity for trust. Also, the ITRC lent credibility to the process as being the sponsoring organization and provided the opportunity to showcase each state's success story.