

Bioremediation of Petroleum Hydrocarbons

Overview

In situ bioremediation technologies rely on the capabilities of indigenous or introduced microorganisms to degrade, destroy or reduce the toxicity of objectionable chemicals in soils or ground water. The *In Situ* Bioremediation Technology Task Group of the ITRC recognized that given appropriate conditions, ISB can remediate contaminants more cost effectively than conventional technologies.

Description of the Protocol

Use of this document is intended to offer the proponent of the demonstration multi-state acceptance of the data generated during the demonstration project. It also offers an early opportunity for tribal and community stakeholders to understand the intent of the demonstration and discuss their concerns and sensitivities with the proponent before the demonstration is in its final design. The document emphasizes the establishment of objectives, criteria and measures so that work plans can be designed consistent with those measures, and results can be verified.

This protocol presents an outline containing the essential elements the proponent of an *in situ* demonstration must address when initiating a demonstration. The outline represents a compilation of concerns gathered by the ITRC states.

Table 1 of the protocol identifies the parties responsible for verifying demonstration results and transferring those results to other states for acceptance..

In addition, as a guide to the proponent, ITRC has included examples of recommended technology-specific protocols which have been developed by industry and tested in field applications. These Technology-Specific Protocols have been evaluated by members of the ISB Group. Use of these protocols will increase the likelihood that the essential information required by the states has been included in the design of the demonstration and test plan

Description of Class of Technologies

In Situ Bioremediation uses aerobic or anaerobic micro-organisms to degrade organic contamination by the addition of nutrients or oxygen. *In situ* bioremediation includes: Bioventing (increasing the flow of air through the unsaturated zone to stimulate indigenous aerobic micro-organisms) and ground water recirculation (extraction and treatment of contaminated ground water followed by addition of nutrients, oxygen and sometimes cultured bacterial strains and re-injection). Most current applications utilize indigenous micro-organisms.

Intended User

State and Federal Regulators, consultants, PRPs and community Stakeholders

Potential and Intended Uses of this Product

The General Outline contained in this Protocol provides guidance to the proponent during

development of the initial proposal for a demonstration. The proposal should contain enough detail so that the other parties can identify the applicable regulatory requirements for the project, the innovative nature and scope of the project, the advantage this technology might have over conventional technologies and the sensitivities the participants might have with this technology. These participants include host states, participating states, proponents, tribes and community/public Stakeholders.

Potential Barriers

- Cleanup levels, and the approaches used by various jurisdictions to derive those numerical criteria, vary among state and federal agencies. Although a single set of concentration based cleanup levels cannot be developed to apply to all jurisdictions, it is recommended that a work group be established to formulate policy recommendations for changes that encourage consistency in approach, if not numerical criteria.
- Factors beyond the jurisdiction of the state regulatory agencies often dictate the type of remedial technology that is deployed. These factors include addressing the concerns of participants in real estate transactions and the financial institutions lending on such transactions and the public's opposition and fear of a technology. These pressures often discourage the deployment of cost-effective techniques and technologies, particularly natural attenuation and bioventing, and thus reduce the potential market for affordable remedial measures.
- Natural attenuation for petroleum hydrocarbons, particularly benzene, toluene, ethyl benzene and xylene, is well demonstrated as a remedial option for ground water. For all sites where remediation is deemed necessary, particularly fuel tank sites, the appropriate agencies should evaluate natural attenuation as a remedy, referencing their agencies to consider the ITRC work-product concerning this topic and the various technical guidance documents and references now available in the literature.

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