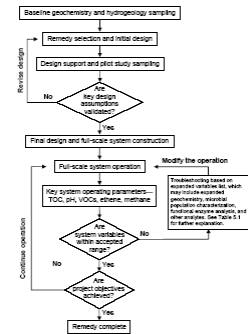
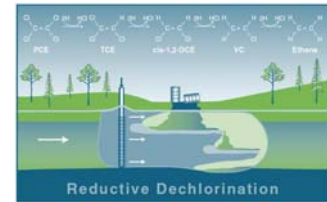


### *In Situ Bioremediation of Chlorinated Ethene: DNAPL Source Zones*

This ITRC guidance provides a systematic understanding of the technical and regulatory considerations for in situ bioremediation (ISB) of chlorinated ethene dense, nonaqueous-phase liquid (DNAPL) source zones in the saturated subsurface. The guidance provides the user with information related to site characterization, applicability of ISB, design criteria, process monitoring and optimization, performance monitoring, and regulatory issues. ISB involves stimulating the activity of microorganisms already present in the saturated source zone, or, in some cases, adding selected microorganisms to the source zone. ISB of DNAPL source zones proceeds best under anaerobic conditions via reductive dechlorination. The technology has two main components:

- enhanced dissolution and or desorption of nonaqueous- and/or sorbed-phase contaminant mass
- biological degradation to nonchlorinated, nontoxic end products



## Background

DNAPLs, primarily those containing chlorinated ethenes, are one of the most widespread and challenging types of contamination at Superfund sites. Many current DNAPL remediation technologies require large amounts of energy, fluids, or oxidants to recover or degrade DNAPL. A potential advantage of bioremediation technology is that microorganisms—which can attack the contaminant at or near the DNAPL/water interface and thereby minimize the need for and extent of mobilization—may provide an effective, efficient, and low-cost approach to DNAPL source zone remediation.

## Benefits

- ▶ Green technology
- ▶ Guidance prepared by regulators from nine states, consultants, public stakeholders, and academia
- ▶ Reduces the site remediation time frame
- ▶ Compatible with other treatment technologies
- ▶ Treats comingled contaminants
- ▶ Fewer health and safety concerns compared with other source-zone technologies
- ▶ No secondary waste stream
- ▶ Can be low maintenance
- ▶ Minimal disruption of existing site infrastructure and activities
- ▶ Lower capital cost than for other source-zone treatment technologies in most cases

## Actions

The ITRC requests that environmental programs at your academic institution:

- ▶ Refer this guidance to all environmental science and engineering instructors

- ▶ Use this guidance in environmental science and engineering curricula
- ▶ Announce opportunities for environmental science students to attend Internet-based training on bioremediation of DNAPLs
- ▶ Report to ITRC, via your Academic representative, any use of ISB of DNAPL source zones facilitated by this guidance
- ▶ Report to ITRC, via your Academic representative, any successes or concerns related to this guidance

## Resources

### Documents

- ▶ *Overview of In Situ Bioremediation of Chlorinated Ethene DNAPL Source Zones*, BioDNAPL-1, 2005
- ▶ *In Situ Bioremediation of Chlorinated Ethene DNAPL Source Zones: Case Studies*, BioDNAPL-2, 2007
- ▶ *In Situ Bioremediation of Chlorinated Ethene DNAPL Source Zones: A Resource Guide*, 2007
- ▶ *In Situ Bioremediation of Chlorinated Ethene: DNAPL Source Zones*, BioDNAPL-3, 2008

### Links

Go to [www.itrcweb.org](http://www.itrcweb.org) and click on “Guidance Documents” to order or download documents. For more information and useful links about ISB of chlorinated ethenes, go to [www.itrcweb.org/teampublic\\_BioDNAPLs.asp](http://www.itrcweb.org/teampublic_BioDNAPLs.asp).

## Training

ITRC has developed a FREE Internet-based training course for *In Situ Bioremediation of Chlorinated Ethenes: DNAPL Source Zones*. This guidance and training provide detailed requirements necessary to support the realistic determination of goals for ISB of a DNAPL source zone.

ITRC’s Internet-based training courses assist potential users of the ITRC guidance document in understanding when and how to use the document, associated technologies, and approaches. Participants can take the training “live” from the comfort of their offices or can access archives of past classes at their convenience. Training sessions last approximately two hours, cover technical and regulatory information specific to environmental technologies and innovative approaches, and are supported by consensus-based ITRC guidance documents.

**Cost:** Sponsored by ITRC and EPA with no cost for the participant

**Registration:** <http://clu-in.org/studio/seminar.cfm> (opens 4–6 weeks prior to class date)

**Associated guidance documents:** Available from [www.itrcweb.org](http://www.itrcweb.org)

If you have questions after completing the online registration, call (402) 201-2419 or send an e-mail to [training@itrcweb.org](mailto:training@itrcweb.org).

### Contacts

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## Regulatory Acceptance for New Solutions

Documents, free Internet-based training, contact information

[www.itrcweb.org](http://www.itrcweb.org)