TerraCert™

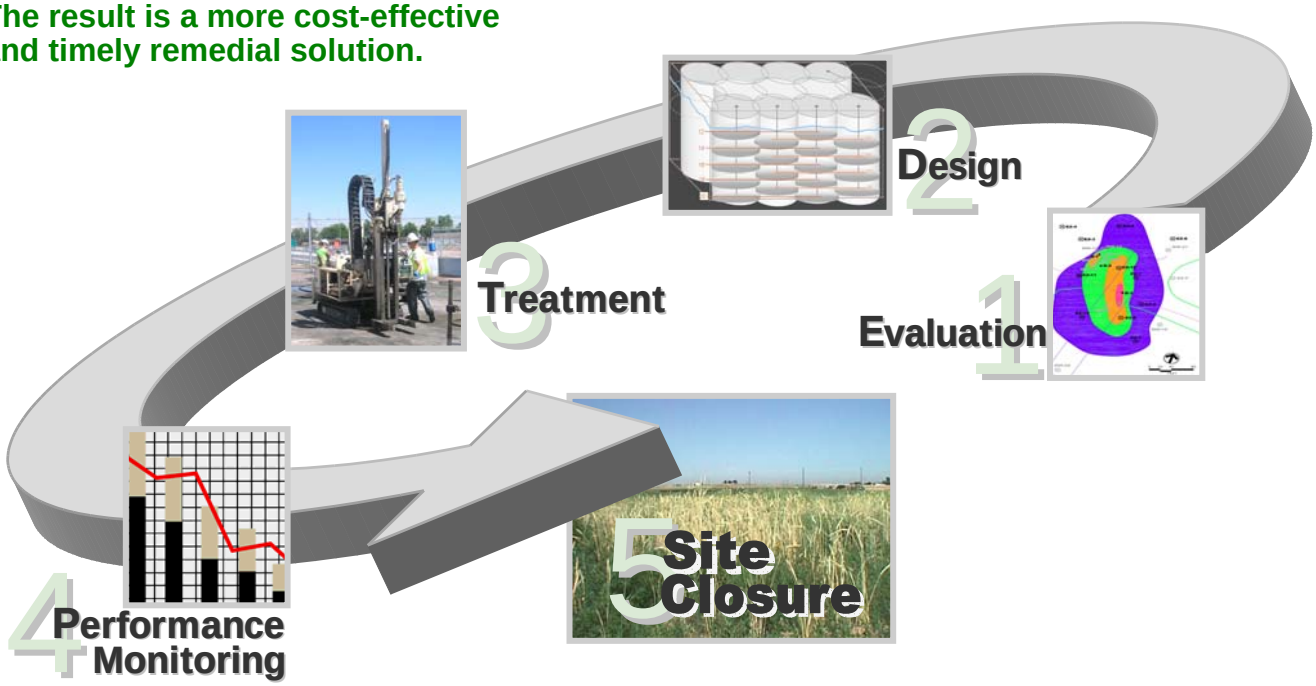
A Precision Remediation and Site Closure Program

LTE recognizes the value of rapid evaluation, remediation and closure of contaminated soil and groundwater sites. LTE's goals are to reduce client liability and expense, satisfy environmental regulators, and achieve site closure. To this end, LTE has employed a variety of remediation technologies including traditional excavation and above ground water treatment (pump & treat); *insitu* mechanical systems (air sparging/soil vapor extraction/dual phase extraction); monitored natural attenuation; and *insitu* injection treatments. Recently, client specific requirements have matured, dictating that remedial actions achieve the stated goals and reduce life cycle costs, while also diminishing the impacts to facility operations.

The **TerraCert™** program, employing injection technologies and treatment, is the next generation of remediation techniques capable of achieving rapid closure with minimal impact to facility operations. ***Terra***, meaning "earth" and ***Cert*** meaning "without doubt, reliable, certain" describes the time-tested results you will achieve when applying the **TerraCert™** program to your subsurface contamination problems.

LTE's years of experience establish us as a leading expert in *insitu* remediation. We realize there is no one silver bullet injectate or process that guarantees successful remediation and closure at every site, every time. **Smart evaluations** that determine each project's unique solution are the key to success. Our **methodical engineered approach** provides a detailed understanding of contaminant distribution and geologic conditions, enabling us to develop accurate, realistic site models.

The result is a more cost-effective and timely remedial solution.

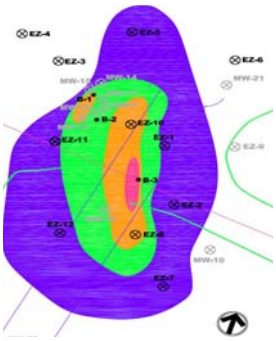


Precision ✦ Site-specific ✦ Timely

We will get your site closed quickly, no excuses!

TerraCert™

TerraCert™



1 Evaluation - *Conduct Evaluation with "Closure in Mind"*

Value engineering principles define best remedies based on:

- Contaminant properties
- Client parameters
- Third party impacts
- Geology
- Regulatory requirements
- Cleanup standards
- Time sensitivity
- Risk level

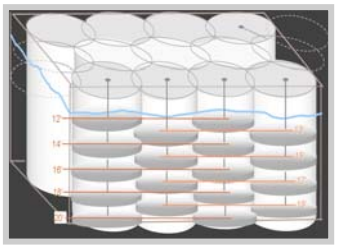
LTE's assessments characterize the geologic and groundwater quality conditions, define the nature of the contaminant, and delineate solute distribution (horizontally and vertically) thus increasing the remediation success ratio. Detailed vertical profiling of both soil and groundwater enhances understanding of the chemical and geological nature of the distribution within the solute plume.

LTE's cost-effective investigative tools include:

- Direct push drilling
- Real time monitoring instrumentation
- Temporary well points
- On site laboratories

Smart Assessment
Accurate Information
Site-Specific Design

Lower Installation & Treatment Cost



2 Design - *Ensuring Sufficient Contact Time*

Success of an injection remedy requires that the injectate contact the contaminant for a sufficient length of time to allow the treatment (chemical or biological) to eliminate the contaminant.

TerraCert™ evaluations provide the detail necessary to establish and design for site-specific contact time. Vertical profiling provides critical information about the specific horizons in which the solute travels. This enables the design to be very target-selective and ultimately reduces the volume of injectate needed to treat the plume.

Successful designs include the following:

- Health and Safety Plan to ensure personnel field safety
- Injection Rule Authorization application (for regulatory permitting)
- Detailed Injection Plan

LTE's Designs predict injectate distribution and volume in order to meet the critical contact time requirement

3 Installation and Treatment
Achieving Desired Contact Time

Installation of *insitu* injection treatment chemicals is achieved using direct push drilling. LTE has extensive experience using this technology in diverse conditions including alluvium and shallow fractured claystone and sandstone bedrock.

TerraCert™ Program Success

- **Injection pressures & volumes** adjusted in real-time
- **Star grid patterns** to establish horizontal overlap
- **Confirmation monitoring** ensures injection precision
- **Appropriate treatment material**

2 Classes of Treatment Materials

Biological (Biotic)
microbes treated carbon O_2 molasses

Destroys contaminants using biological mechanisms

Chemical (Abiotic)
nanovalent iron peroxide permanganate

Destroys contaminants via chemical reactions including oxidation or reductive dechlorination

LTE is the national leader in successful application of Activated Carbon-based products that quickly remove petroleum & chlorinated hydrocarbons from the subsurface. The activated carbon component of the injectate ***traps*** the contaminant, while the addition of microbes or select chemicals ***treats*** the contaminant.

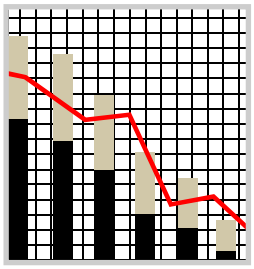
Carbon is inert, non-toxic, non-degrading, and traps virtually all organics, whether in vapor or aqueous phase.

Activated Carbon, an industry accepted hydrocarbon absorber, co-locates contaminants such as BTEX, GRO, DRO, and oils with introduced bio-amendments for more effective and faster treatment. This results in a robust environment for the microbes to **break down petroleum hydrocarbons faster than introducing bio-amendments only.**

Reductive dechlorination using nanoscale iron is an industry accepted treatment for chlorinated hydrocarbons. The combination of the activated carbon trap and the reductive dechlorination treatment is what makes the carbon-based injectate such an effective eliminator of chlorinated solvents in the subsurface.

LTE has successfully completed carbon-based injection projects to solve a variety of subsurface contamination issues including:

- Impacted soil and groundwater
- Barrier to vapor intrusions in buildings
- Source area treatment
- Barrier to plume migration
- Groundwater impacts in clay and fractured bedrock



4 Performance Monitoring

Results are not valid until they are documented

LTE prides itself on its ability to demonstrate success. Performance monitoring documentation is critical to the **TerraCert™** program.

Frequent confirmation sampling enables LTE to demonstrate that the necessary distribution of the material has been achieved. LTE negotiates with regulatory agencies early in the process, to pre-define specific "clean closure" criteria. **This important step informs the design process and, many times, lowers treatment costs.**

To assess **TerraCert™** effectiveness based on the closure requirements, LTE conducts post-installation sampling on the effected media for up to one year.

5 Closure – *The Goal of every LTE remediation project*

Obtaining a "No Further Action" (NFA) letter from a regulatory agency is a primary goal of any remedial action involving contaminated soil and groundwater.

The ability to achieve this rests on the basic principles of the **TerraCert™** program:

- Evaluation conducted with closure in mind
- Design and installation using appropriate treatment technologies
- Documentation of the technology performance

TerraCert™ is a program which ensures that cost-effective site closures are quicker and less intrusive than traditional remediation approaches.

TerraCert embodies the next generation of techniques and injection technologies capable of achieving rapid closure with minimal impact to facility operations.