



## LAND RESEARCH PROGRAM

### RESEARCH PROVIDES CLEANUP SOLUTIONS FOR LEAKING UNDERGROUND STORAGE TANKS

#### Issue:

The U.S. Environmental Protection Agency's underground storage tank (UST) regulations require that contaminated UST sites must be cleaned up to restore and protect groundwater and create a safe environment for those who live or work around these sites.

Over 450,000 releases from leaking underground storage tanks (LUST) sites were confirmed in the last year, with new releases continuing to occur. This has required states to spend nearly \$1 billion annually for site remediation efforts.

The Land Research Program in EPA's Office of Research and Development (ORD) is providing the science for innovative, cost-effective, and efficient cleanup solutions to LUSTs.

#### Scientific Objective:

The research program is providing the methods, models, and tools, needed to remediate underground storage tanks and address fate and transport issues of leaking contaminants. This research includes the following:

- Determining the fate and transport and biodegradation of fuel oxygenates and other fuel additives
- Developing methods for the use of monitored natural attenuation and assessment of its effectiveness
- Conducting controlled field studies to determine the potential impact of ethanol in extending petroleum hydrocarbon plumes in ground water
- Conducting bench-scale studies to assess the biodegradability of broad range of oxygenates and their metabolites

- Developing and licensing an innovative ex situ biological treatment for oxygenates
- Developing online calculators for improved site assessment
- Assessing gasoline composition, including analysis and modeling of LUST sites and determining the physical properties of gasoline
- Determining the impact of gasoline regulations and use of alternative fuels on gasoline composition. Assessments include identifying federal and state regulations requiring reformulated and conventional gasoline and seasonal impacts on composition.

#### Application and Impact:

- ORD's research is assisting EPA, states, and industry to improve characterization of LUST sites and develop better cleanup remedies. Researchers have developed a number of proven models to assess fate

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and transport. Following are a few examples and associated Web sites:

- HSSM simulates flow of the Light Non-Aqueous Phase Liquid (LNAPL) phase and transport of a chemical constituent of the LNAPL from the surface to the water table, radial spreading of the LNAPL phase at the water table, and dissolution and aquifer transport of the chemical constituent. [www.epa.gov/ada/csmos/model/s/hssmwin.html](http://www.epa.gov/ada/csmos/model/s/hssmwin.html).
- OWL is a simple tool to evaluate existing monitoring well networks and assist in the selection of new monitoring well locations. [www.epa.gov/ada/csmos/model/s/owl.html](http://www.epa.gov/ada/csmos/model/s/owl.html).
- UTCHEM is a general purpose NAPL simulator that incorporates physical, chemical, and biological process models. [www.epa.gov/ada/csmos/model/s/utchem.html](http://www.epa.gov/ada/csmos/model/s/utchem.html).
- Modeling tools for determining fate and transport of fuels have been developed. [www.epa.gov/athens/learn2model/part-two/onsite/diving.html](http://www.epa.gov/athens/learn2model/part-two/onsite/diving.html).
- The Plume Diving Calculator estimates the prospects for

plume diving based on simplified flow in a water table aquifer.

[www.epa.gov/athens/learn2model/part-two/onsite/diving.html](http://www.epa.gov/athens/learn2model/part-two/onsite/diving.html).

- The Concentration Uncertainty Model can be used to assess uncertainty in parameter estimates by entering ranges of values for the transport parameters and source definition. [www.epa.gov/athens/learn2model/part-two/onsite/uncertainty.htm](http://www.epa.gov/athens/learn2model/part-two/onsite/uncertainty.htm).
- Site assessment calculators for improved site characterizations have been developed. [www.epa.gov/athens/onsite/](http://www.epa.gov/athens/onsite/)
- Research on gasoline composition can be found at: [www.epa.gov/AthensR/research/regsupport/gasoline.html](http://www.epa.gov/AthensR/research/regsupport/gasoline.html)

### Remedial strategy research includes the following:

- Determining the impact of ethanol on the movement of petroleum hydrocarbons in groundwater. <http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2006/40/i19/abs/es060505a.html>
- Development of monitored natural attenuation approaches

for management of MTBE plumes.

<http://www.epa.gov/ada/download/reports/600R04179/600R04179.pdf>

- Development of membrane-based bioreactors for ground water contaminated with petroleum hydrocarbons and oxygenates. <http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2006/40/i06/abs/es051593m.html>

### ADDITIONAL REFERENCE:

Office of Solid Waste and Emergency Response  
Underground Storage Tanks  
Web site: [www.epa.gov/OUST](http://www.epa.gov/OUST)

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