



# RTDF Update

A Progress Report on the Remediation Technologies Development Forum (RTDF)



## RTDF

### CONTENTS

NAPL Cleanup Alliance Established .....	1
Bioremediation Consortium Completing Phase 2 Activities .....	2
Sediments Remediation Action Team Meets .....	3
Phytoremediation Team Developing CVOC Protocol .....	3
PRB Team Proposes Two-Year Monitoring Project .....	4
IINERT Team Preparing Report from October 2001 Workshop .....	4

### Current RTDF Action Teams

**Bioremediation Consortium**

**IINERT Soil-Metals Action Team**

**NAPL Cleanup Alliance**

**Phytoremediation of Organics Action Team**

**Permeable Reactive Barriers Action Team**

**Sediments Remediation Action Team**

Newsletter  
August, 2002

#### NAPL Cleanup Alliance Established

The Non-Aqueous Phase Liquid (NAPL) Cleanup Alliance was established early in 2001 by representatives from the petroleum industry, federal and state government, and academia who share an interest in pursuing aggressive technologies for removing large-scale non-aqueous phase liquid (NAPL) contamination. The Alliance's mission is to develop an improved scientific and technical approach to remediation of groundwater and soil at sites contaminated by petroleum hydrocarbons at private industrial and government facilities. These facilities include petroleum refineries, shipping terminals, pipelines, and airports.

The experience of the last fifteen years indicates that remediation of these sites will take many years using existing approaches and technologies without significant risk reduction benefits. The Alliance will address the need for more effective alternatives, which focus on appreciable risk reduction based upon specific site conditions such as geology and contaminant characteristics. A critical component of the Alliance's activities will involve the evaluation of innovative technologies that can contribute significantly to improving remediation of large-scale NAPL contamination. The Alliance has established a Technical Working Group to plan and implement a project to analyze the mobility and behavior of hydrocarbons at a Casper, Wyoming site and to evaluate various cost-effective remediation technologies for potential use at the site. Data from this project will be used as a baseline for developing a decision tree that could be used in other hydrocarbon-contamination scenarios.

#### About the Remediation Technologies Development Forum <http://www.rtdf.org>

The Remediation Technologies Development Forum (RTDF) was established in 1992 by the U.S. Environmental Protection Agency (EPA) to identify what government and industry can do together to develop and improve the environmental technologies needed to address their mutual cleanup problems in the safest, most cost-effective manner. The RTDF fosters public and private sector partnerships to undertake research, development, demonstration, and evaluation efforts focused on finding innovative solutions to high priority problems.

#### Structure

The RTDF establishes self-managed action teams that bring members together to work on their highest priority problems. These action areas and priorities are determined by the members of RTDF Action Teams. EPA facilitates the operation of the Action Teams and contributes its research efforts to the jointly-led projects. Industrial participants help set priorities based on remediation problems they face, serve as co-team leaders, and offer both in-kind and monetary resources to support joint projects. Other federal agencies suggest priorities in their roles as owners of remediation problems, as well as offer sources of funding and make joint research contributions. Universities and other research institutions provide state-of-the-art science and engineering expertise from their existing research bases and help assure that sound engineering and scientific principles are followed.



## Former Casper Refinery Mobility Study

The Alliance's Technical Working Group recently began the second stage of a hydrocarbon mobility study at the Casper, Wyoming site. The first stage of the mobility study, completed in late 2001, involved use of the U.S. Navy's Site Characterization and Analysis Penetrometer System (SCAPS). This truck-mounted system deploys various subsurface diagnostic technologies using cone penetrometer (CPT) tools to provide indirect characterization of subsurface petroleum hydrocarbons. SCAPS utilizes broad-spectrum laser-induced fluorescence (LIF) and fiber-optic technology to provide real-time *in situ* delineation of subsurface petroleum hydrocarbons. High-resolution video imagery (GeoVIS) was also used for visual characterization of soil properties and to estimate hydrocarbon saturations. 160 LIF pushes were conducted on a 200-foot grid spacing over the 160 acre study area. Twenty GeoVIS pushes were conducted at LIF push locations with the highest LIF intensities.

The LIF data have been analyzed for signal intensity and wavelength, which are functions of hydrocarbon distribution and type, respectively. The LIF intensity and wavelength data were cross-plotted with lithologic data obtained from the CPT cone pressure and sleeve friction data to develop soil-hydrocarbon combinations. These soil-hydrocarbon combinations were then used to correlate general soil types with the most common LIF wavelength signatures to identify soil-hydrocarbon combinations that characterize contaminated portions of the aquifer within the study area.

During the second stage of the study, the soil-hydrocarbon combinations were used to determine locations and intervals for soil core collection. A total of 37 aquifer soil cores were collected, flash-frozen in the field, and delivered to a petroleum engineering laboratory for analyses of the soil and NAPL. Analyses currently in progress include grain size distribution, relative permeabilities, capillary pressure, fluid saturation, and other parameters that influence the mobility of petroleum hydrocarbons in porous media. A report documenting these analyses will be posted to the RTDF web site in Summer 2002.

Over the next few months, the Working Group will compile the petroleum engineering analytical data to develop fluid saturation profiles and calibrate the API Brooks-Corey van Genuchten Model to each soil-hydrocarbon combination identified. These data will then be correlated with LIF data over the entire study area to develop NAPL saturation and mobility maps that will serve as a basis for selection and deployment of pilot-scale remediation systems.

## Bioremediation Consortium Completing Phase 2 Activities

The Consortium held their semi-annual meeting on May 1-2, 2002 in Washington, DC. Consortium members discussed the status of ongoing research, demonstration, and reporting efforts and plans for future activities. More information on the meeting is available on the RTDF web site.

The Consortium is completing three studies on bioaugmentation, cometabolic bioventing, and intrinsic biodegradation under Phase 2 activities. Field demonstrations were conducted at Kelly Air Force Base, Texas from the fall of 1999 through December 2000 to evaluate the applicability of accelerated anaerobic bioremediation via bioaugmentation to treat chlorinated ethenes in groundwater. Results were published in a paper, "Successful Field Demonstration of Bioaugmentation to Degrade PCE and TCE to Ethene," available on the RTDF web site and published in *Bioaugmentation, Biobarriers, and Biogeochemistry: Proceedings of the Sixth International In Situ and On-Site Bioremediation Symposium, Vol. 8, 2001*.

The Consortium has been conducting a field demonstration of co-metabolic bioventing of TCE (with DNAPL ganglia present) at Operable Unit 2, Hill Air Force Base, Utah. Injections of propane co-substrate began in August 2000, and field work is scheduled to be completed by Summer 2002. The Consortium is also developing a laboratory treatability protocol for bioventing and a model and users guide to help predict performance of bioventing based on site-specific conditions.



**The SCAPS system  
deploys various  
subsurface  
diagnostic  
technologies using  
CPT tools to provide  
indirect  
characterization of  
subsurface  
petroleum  
hydrocarbons.**

At the Bell Aerospace/Textron Site in Niagara Falls, New York, the Consortium is studying intrinsic biodegradation of a DNAPL source area in fractured bedrock. Field work has been completed, and the project is in the data analysis and modeling phase. The Consortium is developing a detailed groundwater flow and contaminant fate and transport model for the site.

In addition to the published article on the Kelly demonstration, two other published articles were added to the Consortium's list of technical documents on the RTDF web site: "Using a Molecular Approach to Monitor a Bioaugmentation Pilot," also published in *Bioaugmentation, Biobarriers, and Biogeochemistry: Proceedings of the Sixth International In Situ and On-Site Bioremediation Symposium, Vol. 8, 2001* and "Molecular Analysis of *Dehalococcoides* 16S rDNA from Chloroethene Contaminated Sites throughout North America and Europe," published in *Applied Environmental Microbiology, Vol. 68, No. 2, 2002*.

EPA and the Consortium's industrial partners are in the process of revising the Cooperative Research and Development Agreement (CRADA) for third-phase activities. As part of this phase, the Consortium is considering implementing two studies: bioremediation of dense nonaqueous phase liquids (DNAPLs) and degradation at the groundwater/surface water interface. Anyone who may be interested in participating in this work may contact one of the co-chairs through the RTDF web site.

### **Sediments Remediation Action Team Meets**

About 60 participants attended the March 11-13 meeting of the Sediments Remediation Action Team in Baltimore, Maryland. The agenda included a Team business session, rapid assessment workshop, renewable disposal workshop, and an overview of the Anacostia Watershed Toxics Alliance's (AWTA) work on its *Contaminated Sediment Management Strategy* (CSMS). AWTA held a separate meeting in Annapolis, Maryland on March 14 that focused on the monitoring section of the CSMS document and was attended by several Team members.

The rapid assessment workshop focused on sampling methods, but also discussed using data to determine additional sample locations and quality differences between laboratory and field data. These two topics, as well as the application of rapid assessment to brownfields and habitat assessments, may be covered in greater detail during future meetings.

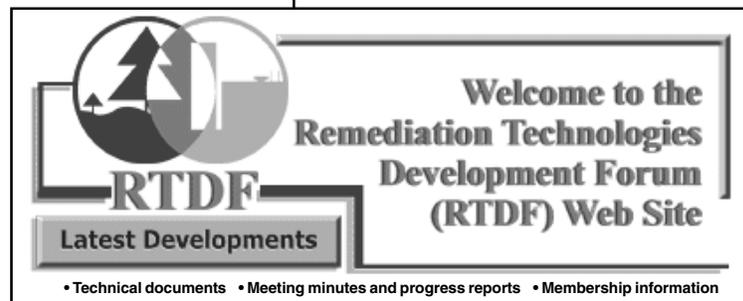
The renewable disposal workshop presented information on *ex situ* treatment methods using both high- and emerging low-energy technologies. Attendees also discussed the New York/New Jersey harbor sediments dredging treatment processes, potential uses for manufactured (treated) sediment, and options for Chicago's near-capacity confined disposal facility.

Members of the Team's Natural Recovery Subgroup continue to be involved in Anacostia River site evaluation and remediation activities. Sampling and monitoring efforts to better classify pollution sources, cleanup needs, and remedial options are currently planned for 2002, with phase 2 field construction planned for 2003.

### **Phytoremediation Team Developing CVOC Protocol**

The Chlorinated Solvents Subgroup of the Phytoremediation of Organics Action Team is developing a protocol that will describe how to determine whether phytoremediation is appropriate to use at a given site with chlorinated solvent contamination and how to evaluate the technology's performance. A revised protocol was completed in April 2002, and Subgroup members are currently working on a final draft. After completion, the Subgroup plans to use the protocol in assessing specific sites, subject to funding availability.

The Team's Total Petroleum Hydrocarbons (TPH) in Soil Subgroup is finalizing its second annual report and expects to post it on the RTDF web site by early Fall 2002. Work continues on the 13 TPH field demonstration sites, with several sites approaching the end of the three-year data collection period initially established by the Subgroup. However, sample collection efforts will continue at two sites based on available funding. Additional sites will be





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individually evaluated for extended sample collection periods when they reach the end of the three-year collection period. Periodic updates on each of these sites is included in summaries of the Subgroup's conference calls, and more detailed information is available in each annual report, both available on the RTDF web site.

### **PRB Team Proposes Two-Year Monitoring Project**

The Permeable Reactive Barriers Action Team has outlined the scope of work for a two-year monitoring project to assess PRB performance and is identifying potential funding sources. Candidate sites for the proposed project would include Alameda Point (CA), the U.S. Coast Guard Support Center in Elizabeth City (NC), Denver Federal Center (CO), the Somersworth Sanitary Landfill (NH), and Seneca Army Depot (NY). The number of sites chosen for the project will depend on available funding.

A three-year, collaborative, long-term performance study conducted by the U.S. EPA, Department of Defense, and Department of Energy is nearing completion. Team members are developing a document that summarizes the activities of the three agencies, which may be issued as a tri-agency document. EPA is finalizing a second document on the study that is expected to be published in the Summer of 2002.

### **IINERT Team Preparing Report from October 2001 Workshop**

The In-Place Inactivation and Natural Ecological Restoration Technologies (IINERT) Soil-Metals Action Team is preparing a report summarizing results presented at its October 2001 symposium, held as part of the 2001 annual meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. Once finalized, the report will be submitted for publication in *Science*, *Environmental Science and Technology*, or *Environmental Health Perspectives*.

**For more current information, visit the RTDF web site:**  
<http://www.rtdf.org>