

FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE MEETING
Arlington, Virginia
December 18, 2002

TABLE OF CONTENTS

Action Items	1
Welcome/Opening Remarks	1
Roundtable General Management	1
Cost and Performance Update	1
New Initiatives Beyond Case Studies	2
New and Improved FRTR Website	2
Measurement and Monitoring Technologies for the 21 st Century (21M ²)	2
TCE Health Risk assessment Update	3
DNAPL/FeDTIP Update	4
Preview: 2003/2004 Optimization Conference	5
Decision Support Tools for Remediation	6
Part I: Determining the Nature and Extent of Contamination	6
(FIELDS) Environmental Decision Support	6
Environmental Visualization System (EVS)	7
Discussion of Part I Presentations	7
Part II: Optimizing Existing Systems	8
Optimizing Groundwater Monitoring: MAROS2	8
Optimizing Pump and Treat Systems: Data Assimilation	8
Results of 6 ITRC/AFRPA Optimization Visits	9
Discussion of Part II Presentations	10
Discussion: Next Meeting and Wrap-Up	10

FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE MEETING

Arlington, Virginia

December 18, 2002

ACTION ITEMS

- ▶ Members are to examine agency links currently listed on the FRTR Internet site and provide corrections or additional links from their respective agencies to Jeff Breckenridge (USACE) or Kelly Madalinski (U.S. EPA/TIO).
- ▶ Member agencies are to send to Madalinski an original (not downloaded from the Internet) electronic copy of their agency's logo, or information about how to obtain one, for use in enhancing the FRTR logo used on the website and on FRTR documents.
- ▶ Topics in the "Other Focus Areas" section of the website need a "champion" to be continued. Members wishing to spearhead further work in one or more of these areas are to contact Madalinski to discuss update/maintenance of these topic areas.
- ▶ Members are to contact John Kingscott (U.S. EPA/TIO) with comments on the list of Multi-Site Assessment projects (provided at the meeting) and suggestions for additions to the list.
- ▶ Members wishing to contribute information on specific monitoring and measurement projects, identify projects for additional monitoring/measurement tracking, or identify reviewers for 21M² project proposals are to contact Dan Powell (U.S. EPA/TIO).
- ▶ Members interested in possible participation in bi-weekly DNAPL calls are to contact Skip Chamberlain (U.S. DOE).
- ▶ Agencies wishing to sign on as co-sponsors for the 2003/2004 Optimization Conference or to assist in identifying a contractor or university to manage conference logistics are to contact Kathy Yager (U.S. EPA/TIO) or Mario Ierardi (AFRPA).

WELCOME/OPENING REMARKS

Walt Kovalick (U.S. EPA/TIO) welcomed the attendees and opened the meeting of the Federal Remediation Technologies Roundtable (FRTR) with an overview of the agenda and self-introductions by the participants. He asked participants to think about focus topics for upcoming meetings and to forward suggestions to John Kingscott or any other EPA representative at the meeting. He announced that EPA's Technology Innovation Office, Office of Research and Development (ORD), and Environment Canada are sponsoring the International Applied Phytotechnology Conference on March 3-5, 2003, in Chicago (See <http://www.epa.gov/tbnrmrl/phyto.htm> for more information).

ROUNDTABLE GENERAL MANAGEMENT

Cost and Performance Update

John Kingscott explained that the Roundtable's Cost and Performance Remediation Case Studies database is updated each spring. Thirty-nine new cost and performance case studies and 71 new monitoring and measurement case studies were posted in June. Since then, FRTR has published a new fact sheet describing the case study database, made a CD-ROM version of the case studies available, and published *Abstracts of Remediation Case Studies, Volume 6*. He said that case studies on several Air Force projects, a DOE project, and 26 drycleaner site cleanups are among the new case studies being prepared for 2003. Kingscott said that there is a desire to prepare more case studies on monitoring and measurement projects, and asked that member agencies provide him with points of contact for identifying all new projects.

New Initiatives Beyond Case Studies

Kingscott said the Roundtable is beginning to collect documents on multi-site assessments done by federal agencies and states. He provided participants with a set of criteria for selecting documents and a list of proposed project reports. He asked participants to review the list and provide comments on the worthiness of these projects following the meeting.

New and Improved FRTR Website

Kingscott reported that the update of the FRTR website – www.frtr.gov – is almost complete and contains an improved capability for searching the cost and performance case studies. He asked that participants review the agency links listed on the website and provide corrections or additional links from their respective agencies to Jeff Breckenridge or Kelly Madalinski. He explained that the topics in the “Other Focus Areas” section of the site contain outdated information and asked for volunteers to serve as points of contact for updating and maintaining the areas. Kingscott also asked member agencies to provide new versions of their respective agency logos. He explained that the original FRTR logo was created using second-generation artwork that, in some cases, was downloaded from the Internet. Because downloaded images are not as sharp as original artwork, reproduction of the logo over time has resulted in a logo that appears fuzzy. He encouraged member agencies to provide an original (not downloaded from the Internet) electronic copy of their logo, or information about how to obtain one, to Kelly Madalinski.

Measurement and Monitoring Technologies for the 21st Century (21M²)

Dan Powell provided a brief overview of EPA’s 21M² project, which focuses on identifying and deploying promising measurement and monitoring technologies to address needs in all EPA waste cleanup programs. He explained that TIO has worked closely with EPA’s Small Business Innovation Research (SBIR) program to leverage the 2.5% of Agency funds set aside for SBIR projects so that some of these projects will benefit waste cleanup programs. To date, the project has conducted a needs analysis, “seeded” selected projects from EPA Regions with \$30,000-\$50,000, and established a website (www.clu-in.org/programs/21m2/). In addition, the project is lending support to several EPA projects, including:

- New analytical methods development and validation, such as capillary zone electrophoresis (CZE) method(s) for polar organic compounds and an MTBE/oxygenate method.
- Sediment sampling projects, including a USGS project in EPA Region 1 and diffusion sampler projects at eight sites.
- Vertical subsurface profiling, including a demonstration using steam at Loring Air Force Base and work on a borehole tool to help monitor natural attenuation’s effects on water quality in EPA Region 5.
- Open-path monitoring, such as an EPA Region 1 project using Fourier transform infrared (OP-FTIR) spectroscopy to get a better picture of landfill leaks.

In addition to the project’s website, the Sensor Technology Information Exchange (SenTIX) website (www.sentix.org) serves as a clearinghouse for sensor projects and provides a vehicle for increasing

communication among sensor developers, vendors, and users. SenTIX was developed and is maintained by WPI™ through a cooperative agreement with EPA.

Powell suggested that the Roundtable can become involved in the measurement and monitoring initiative by offering sites/projects at which the 21M² team can perform additional tracking; providing comments to refine the waste program needs list; identifying reviewers for proposals; and getting their respective agency's SBIR programs to focus on these types of projects.

In answer to a question, Powell indicated that EPA has developed linkages with USGS, DOE, and the Interstate Technology Regulatory Council (ITRC) for this project. Skip Chamberlain (U.S. DOE/EM) indicated that there is potential for linkage with the Strategic Environmental Research and Development Program (SERDP).

Several participants raised the issue of "information overload" and suggested that better mechanisms for transferring information to site managers in a useable format are needed. Kovalick suggested that a "screening matrix" for measurement and monitoring technologies, like the one on remediation technologies developed by the Army, may be an option for consolidating and presenting information in a format that is useable at the site manager level.

TCE Standards Update

Jim Cogliano (U.S. EPA/ORD/NCEA) reported that the Trichloroethylene (TCE) Health Risk Assessment has been completed and peer reviewed during the last year. After the final assessment is released in 2003, EPA's air, water, and waste regulatory programs will decide whether the findings of the new assessment warrant changes to their standards are warranted.. In addition to updating the cancer risk assessment for TCE, the assessment development process included use of toxicokinetic and mechanism-based modeling and qualitative and quantitative uncertainty analyses, and consideration of sensitive populations, differential risks to children, and cumulative risks (see Attachment A).

Cogliano said that the assessment process led to several important findings, including:

- TCE can affect neurological, liver, kidney, endocrine, and other systems, and can be involved in several different types of cancer.
- TCE acts through metabolites and metabolic pathways in the body and, as a result, there is no single way to determine its cancer risk.
- Determining the TCE risk depends on a combination of factors, including not only the level of exposure to TCE itself, but also the sources of exposure to TCE metabolites (TCA and DCA) and the prior or ongoing exposure to other contaminants that produce the same metabolites.
- Determining risks to children requires understanding factors impacting differences in exposure (e.g., TCE is in human milk, making nursing an exposure pathway), differences in the rate at which children's systems clear toxic metabolites, and children's greater sensitivity to neurotoxins.

Cogliano said that, in addition to commending the Agency on many areas of the assessment, the Science Advisory Board (SAB) recommended adding a chapter to serve as a model for children's risk assessments and suggested several options for addressing cumulative risks. He said the team is working

to address the SAB comments as well as those received during the public comment period in order to finalize the assessment.

A participant commented that the misinterpretation of the term “risk-based” — *e.g.*, applying MCLs even if there are no receptors — can significantly increase the cost of cleanups with little potential for actually lowering risk. He suggested that more needs to be done to educate people about how to determine risk. Cogliano agreed and said that it is very difficult to communicate the complicated interactions involved in assessing risk.

DNAPL/FeDTIP Update

Skip Chamberlain briefed the Roundtable on technology demonstration projects under the Federal DNAPL Technology Initiative Program (FeDTIP), which focuses on design and implementation of an expedited technology development process for remediating DNAPLs in the subsurface. He indicated that several of the Initiative’s first demonstrations are in the process of concluding and that there is interest in moving into a measurement and monitoring phase. He said a nanoscale permeable reactive barrier project is underway at Cape Canaveral. Demonstrations at NAS North Island and DOE’s Pinellas sites are in the initial stages, and a source zone removal project is being considered at DOE’s Paducah site. He also reported that the Environmental Security Technology Certification Program (ESTCP) is considering funding a project to develop a mass flux measurement to determine when to turn off source zone remedial systems and how to monitor the passive remediation that follows. He indicated that the FeDTIP team has a bi-weekly conference call and suggested that it may be possible to include interested FRTR members on the call and to post summaries of future calls on the FRTR website.

Chamberlain announced that DoD’s Tri-Services meeting will be held in March and co-located with the meeting of the ITRC.

Jim Cummings (U.S. EPA/TIO) noted that EPA recently held a seminar on *in situ* treatment of NAPL-contaminated groundwater that drew about 250 participants, with hundreds more participating via the simultaneous Internet broadcast.

In updating participants on FeDTIP activities, he indicated that he hopes the EPA expert panel will achieve consensus on an approach for DNAPL remediation early in 2003. Recommendations from the National Research Council (NRC) expert panel, which was formed at the request of the Army Environmental Center (AEC) are expected in early 2004. He said that there are still scientific and data-related obstacles to overcome in addressing DNAPL remediation, and the effort to document appropriate and useful projects continues. He indicated that, to date, data has been collected on about 70 applications of thermal treatment, 200 of chemical oxidation, and more than 40 of surfactant/cosolvent flushing. He said that, to continue to move forward on technologies for DNAPL remediation:

- More work needs to be done on understanding synergies between biotic and abiotic processes. He pointed to the cosolvent flushing/enhanced bioremediation project at the former Sages Drycleaner site in Florida, and an *in situ* chemical oxidation/vegetable oil injection at the Navy’s King’s Bay site as examples of sites where synergies have been exploited successfully. He said that FRTR will continue to seek and document such projects.
- More creative approaches are needed for remediating large, complex sites.

- Approaches such as facilitating natural attenuation need to be explored to help complete work at small sites, and move forward on site closure and property transfer.

A participant from the Navy said that they are developing a decision-making process for use in analyzing source zone removal at sites that would be beneficial to all agencies. A survey has been prepared to elicit case study information via the Internet. The project will be subject of an ESTCP proposal,

Preview: 2003/2004 Optimization Conference

Kathy Yager (U.S. EPA/TIO) and Mario Ierardi presented a proposal for a 2003/2004 Optimization Conference, asking for the support of FRTR member agencies. The conference, "Improving Cleanup Performance: Measuring & Optimizing Cleanup Performance," would be the second of its kind; the first was held in 1999. They explained that the decision to hold another conference was prompted by the increase in insight and knowledge about optimization gained since 1999, DoD's formal identification in 2001 of optimization as a requirement, and the increasing transition of remedial responsibilities to states and their resulting interest in optimization. They proposed that the conference be held under FRTR auspices and indicated that DOE, Navy, the Air Force Real Property Agency (AFRPA), and EPA have already expressed interest in sponsorship. Yager said that one additional agency is needed to share the funding for the meeting. She also said that funding will be needed to support the travel of state personnel to the meeting; the Navy provided this support for the 1999 meeting. Making the meeting more broadly accessible via webcast is being considered. Conference proceedings will be prepared and made available on CD-ROM.

Preliminary plans call for a 2- or 3-day conference with evening poster sessions and workshops. Several topics have been suggested as potential conference themes, including:

- Case studies of cost-effective long-term monitoring tools and strategies;
- Case studies of subsurface system performance assessment tools;
- Lessons learned from DOD and EPA nationwide optimization projects;
- Updates on current optimization tools and guidance documents; and
- Improved data management and data visualization tools.

Ierardi and Yager said that next steps include finalizing funding commitments from FRTR agencies over the next month, establishing an FRTR advisory group to guide development of the agenda, and identifying an organization to manage logistics for the conference. They asked that agencies wishing to sign on as co-sponsors for the 2003/2004 Optimization Conference, or to assist in identifying a contractor or university to manage conference logistics, contact either of them.

DECISION SUPPORT TOOLS FOR REMEDIATION

Part I: Determining the Nature and Extent of Contamination

Carlos Pachon (U.S. EPA/TIO) introduced the focus topic and reviewed the agenda for this portion of the meeting. He said that decision support tools (DSTs) provide a way to package all the pieces of information that program managers need in order to examine alternatives and make sound remedial decisions. In addition, using DSTs to visually depict the nature of the problem and the results to be expected from a proposed solution can be powerful tools in communicating with stakeholders. Pachon said that choosing appropriate DSTs involves considering several factors, including the amount of training needed for effective use, the flexibility offered, and the data collection and management requirements.

(FIELDS) Environmental Decision Support

Brian Cooper (U.S. EPA Region 5) described the Field Environmental Decision Support (FIELDS) system. This is a free set of tools, developed by Region 5 with input from field personnel, that provides data analysis and interpretation for environmental decision-making. It integrates geographic information systems (GIS), imaging software, global positioning systems (GPS), and in-field sampling and analysis technology. FIELDS tools run on ArcView desktop mapping and GIS software. He showed participants examples of several FIELDS software functions (see Attachment B), including:

- The Sample Design module to help users determine the number and location of samples that should be taken at a given site;
- The Database Query module, which can accept data from STORET and other database formats and extract data by intervals for quick maps of hot spots or by a variety of factors and display them visually;
- The 2-D Modeling Module, which includes quality assurance checks and cross-validation routines to help determine if and in what areas more data may be needed;
- The 3-D Modeling Module, a stand-alone application incorporating various GIS capabilities; and
- The Analysis Tools for use in developing estimates of the mass of contaminants in soil and sediments and the volume of contaminated soil or sediment at a given site; estimates of the areas requiring remediation to meet specified goals; and, with integration of Spatial Analysis Decision Assistance (SADA) software, estimates of exposures to pollutants.

He said the FIELDS software has been used at a Region 5 site and results are currently being peer-reviewed. In addition, a FIELDS conference is scheduled for March 5-7, 2003.

Environmental Visualization System (EVS)

Reed Copsey (C Tech Development Corp.) described and demonstrated C Tech's Environmental Visualization System (EVS) as an example of the ways in which visualization software can help characterization, remediation, and monitoring of sites (see Attachment C). He said the software contains an integrated set of modules that work together to build a 3-D picture of the site and make it possible to "see" the impact of various options at critical decision points. For example, environmental visualization tools can be used to analyze site-specific tabular, GIS, and other data to determine:

- Subsurface lithology;

- Borings needed and optimal sampling locations for effective assessment and characterization;
- Source(s) of subsurface contamination and variations in plume volume and contaminant mass;
- Groundwater modeling results;
- Plume migration; and
- Efficiency of monitoring well systems.

Copsey added that animation can be incorporated to show changes over time.

Discussion of Part I Presentations

Points made during this question and answer period were:

- C Tech's EVS has been evaluated in EPA's SITE Program. It has been used on a number of private sites, but much of the data is restricted.
- EVS uses kriging algorithms that have been peer-reviewed by EPA and DOE to accomplish uncertainty analysis.
- C Tech has not addressed frequency optimization in its Well Decommission module.
- The Well Decommission module in the EVS also can be used to determine where to add monitoring wells to make the array more effective and efficient.
- The FIELDS system has been deployed by Region 10 at two sites and generally would be used for large, complex sites. FIELDS also was helpful, however, in determining how to make remediation more effective at a small brownfields site in Pennsylvania.
- Help and support in using decision support tools is available from DOE's Argonne National Laboratory (www.anl.gov).

Part II: Optimizing Existing Systems

Optimizing Groundwater Monitoring: MAROS2

Julia Aziz (Groundwater Services, Inc.) described the Monitoring and Remediation Optimization System (MAROS), Version 2 software. MAROS2 is free-ware programmed for Microsoft Access. It was developed with support from the Air Force Center for Environmental Excellence (AFCEE) and in accordance with the *AFCEE Long-term Monitoring Optimization Guide*. The software helps site managers formulate appropriate long-term groundwater monitoring programs that can be implemented at lower costs. Aziz said that MAROS2 can be very useful in answering questions that arise when site owners and regulators negotiate long-term monitoring plans and in providing periodic updates on the results of these plans.

MAROS2 contains a Database Input module, an Automated Data Consolidation module, and four optimization tools — Plume Stability and Individual Well Trend Analysis, Sampling Frequency Analysis, Sampling Location Analysis, and Sampling Sufficiency Analysis. These modules and tools can be used to:

- Store and create presentations on historical site data;
- Develop statistical information on trends;
- Identify wells that may no longer be necessary; and
- Optimize the number of monitoring wells and the sampling frequency.

Aziz illustrated how MAROS2 is used with information from an application at the Fort Lewis Logistic Center to optimize the Upper Aquifer groundwater long-term monitoring plan (see Attachment D). She said that an EPA geostatistical study to compare MAROS 2.0 with other optimization methods is ongoing.

Optimizing Pump and Treat Systems: Data Assimilation

Dave Wilson (U.S. EPA Region 5) said that the Superfund Program overall is moving beyond the investigation and remedy selection stage into a data-intensive post-construction and long-term monitoring phase. But Remedial Project Managers (RPMs) already are overwhelmed with the volume of information coming across their desks. Region 5 uses three tools to address this problem:

- Collection of data in a standardized electronic format using the Region 5 Superfund Electronic Data Deliverable (EDD) and the Multimedia EDD;
- Assembly of all relevant site cleanup information in a *Remedy Performance and Compliance (RPC) Report*; and
- Standardized and normalized analyses of data to help evaluate remedy progress and cleanup effectiveness.

Wilson said that one of the issues in evaluating the performance of groundwater pump-and-treat systems is developing an accurate picture of the “capture zone,” the area in which releases are stabilized and under control, and monitoring changes in the zone overtime. OPDATE is a data assimilation tool Region 5 uses to determine the “capture zone” at such sites. OPDATE can be used with on an off-the-shelf or a specifically designed groundwater flow model. Wilson demonstrated that the OPDATE tool assimilates actual monitoring head data, current extraction rates, and current contaminant concentrations, and populates Technical Plotting and Data Processing (Techplot) visualization software to show the “capture zone” and any areas of uncertainty (see Attachment E).

Results of 6 ITRC/AFRPA Optimization Visits

Mario Ierardi described lessons learned from conducting remediation process optimization (RPO) evaluations at six California Air Force Bases with NPL sites. The bases were: Castle, George, March, Mather, McClellan, and Norton. He said the Air Force is focusing on optimization to ensure that

cleanup objectives are being met effectively and efficiently. He said an internal DoD analysis of RODs found that, in 75 percent of the cases, there were no clear objectives or confirmations of results in achieving the objectives stated. A recent Resources for the Future (RFF) analysis of 5-year reviews found similar results.

Ierardi said the evaluations were conducted in partnership with the ITRC, the State of California, the Corps of Engineers, EPA, and DOE. Site visits included review of cleanup and monitoring system performance, and exit, ramp down, and cleanup completion confirmation strategies. In addition, the evaluation team assessed efforts to improve access and usability of critical information over the life of the cleanup.

He said that one of the positive results of the evaluation partnership is that ITRC has formed an RPO Team to assist in the evaluations. AFRPA supports the new ITRC RPO Team with direct funding and technical contactor support. Ierardi said the involvement of ITRC is integral to state regulators' acceptance and endorsement of RPO.

Ierardi said that the recommendations made as a result of the RPO evaluation are common to most bases. They include:

- Optimize Extraction Strategies — This involves such activities as using a simulation/optimization model to compute optimal pump-and-treat strategy/design, as has been done at McClellan AFB.
- Develop Exit Strategies and Performance Models — This involves determining the information needed to decide when/if a pump-and-treat system should be shut down.
- Develop Operating Properly and Successfully (OPS) Criteria/Strategy — This involves determining how to demonstrate that a remedial action is operating as designed and achieving the cleanup levels or performance goals delineated in the decision document, including being protective of human health and the environment, such as identification of specific criteria for OPS preparation as was done at March AFB. OPS demonstration is required under CERCLA § 120(h)(3), as amended, and an integral step for federal facilities prior to transferring property.
- Modify Groundwater Treatment Systems — This involves continually evaluating system performance to determine what changes can be made — *e.g.*, McClellan AFB replaced an air stripper with carbon and Castle AFB relocated an existing air stripper — and when to make them to reduce cost without reducing effectiveness.
- Modify Vapor Treatment Systems — This involves evaluating system performance to determine whether changes can be made and when.
- Revisit Monitoring Objectives — This involves developing a logic or process for re-examining objectives as conditions change and determining whether optimization strategies can be used and how.

Ierardi said that implementation of the recommendations from these evaluations will result in \$16.5 million in cost savings over 5 years, the ability to prepare and submit OPS earlier, improved Finding of Suitability to Transfer (FAST) strategies, the termination of 6-10 treatment systems, and renewed confidence in “Doing the Right Thing,” an Air Force principle. He said that the evaluation team also

recommended that the Air Force take steps to broaden the acceptance of RPO, including conducting communication and outreach about the benefits of optimization, and integrating the RPO framework into the site closure/long-term monitoring process; developing a system for tracking implementation of evaluation recommendations; providing ongoing support; expanding RPO assessments in FY03; and institutionalizing Air Force RPO requirements. He said that RPO guidance for the Air Force is in process and is expected to be completed in 2003.

Discussion of Part II Presentations

Points made during the question and answer period include:

- In addition to AFRPA, EPA has an active optimization program.
- The Navy is involved in tri-service and multi-agency working groups and expects this work to ultimately yield RPO guidance for the Navy.
- The AEC has a team that goes out and works on optimizing pump-and-treat systems.
- DOE usually gets involved in optimization when a site moves into the stewardship stage.

DISCUSSION: NEXT MEETING AND WRAP-UP

Suggestions of focus topics for future meetings included:

- EPA's Triad Approach, using systematic project planning, dynamic work plans, and real-time measurement technologies to speed cost-effective investigations and cleanups while maintaining or improving the defensibility of site decision-making;
- Information and Data Management; and
- Decision Support Tools for Ecological and Human Health Risk Assessment — Walt Kovalick asked participants to provide examples of the types of presentations that might be included.

Richard Mach (NFESC) indicated that the Navy would be interested in signing on as a co-sponsor for the proposed optimization conference, and that he would contact Kathy Yager to make arrangements.

The meeting adjourned.