Partnerships for the Remediation of Hazardous Wastes

> "Every dollar we invest in environmental technology will pay off in a healthier environment worldwide, in greater market share for U.S. companies, and in more jobs for American workers."
>
> — *President Bill Clinton*

Through a number of public statements and initiatives, President Clinton has made both economic development through public-private partnerships and environmental technology innovation priorities of his Administration.

This publication from the U.S. Environmental Protection Agency's Technology Innovation Office provides potential private sector partners interested in the development of new and innovative hazardous waste technologies with information on opportunities for entering into joint public-private development projects.

These partnerships serve to combine the talent and dollars of the private sector and the government to more quickly and efficiently provide remediation technologies to meet the needs of current and future hazardous waste cleanup requirements. Public-private partnerships provide a means of sharing risks associated with investment in new technologies. Federal agencies contribute technical expertise, while private partners are able to limit their financial risk and liability by obtaining cost and performance data through an independent analysis of technology evaluation results. These partnerships also bring in regulators early in the development process, increasing the likelihood of regulatory acceptance.

This document includes contacts and information profiles on four programs through which EPA and other federal agencies support emerging technology development through partnerships with private entities.

The Partnerships

EPA sponsors the following public-private partnership programs through which it establishes contact with private sector partners for technology development, determines joint interests and objectives, and enters into cooperative agreements and other mechanisms to accomplish those objectives.

Bioremediation Action Committee

Clean Sites Public-Private Partnerships

Consortium for Site Characterization Technology

Remediation Technologies Development Forum

Bioremediation Action Committee

The Bioremediation Action Committee (BAC) is a public-private partnership of experts from government, industry, and academia to improve the use of bioremediation in the treatment, control, and prevention of environmental contamination. From the outset, the BAC has provided a proactive forum for public and private experts to advance both the science and practical field application of bioremediation.

Structure

Representatives from EPA's Technology Innovation Office (TIO) and National Risk Management Research Laboratory serve as co-chairs of the BAC. The Committee includes more than 100 experts in the field of bioremediation. BAC members and organizations collaborate to attain objectives defined by the Committee. The BAC advances bioremediation through a variety of functions including:

- coordinating joint research and applied development activities across organizations;
- transferring information;
- identifying priorities; and
- conducting projects to accomplish committee goals.

The work of the BAC is carried out through Subcommittees overseen by the BAC Executive Committee.

Publications

Bioremediation Field Evaluation: Eielson Air Force Base. EPA 540-R-95-533
Bioremediation Field Initiative Site Profile: Eielson Air Force Base. EPA 540-F-95-506b
Bioremediation Field Initiative Site Profile: Escambia Site. EPA 540-F-95-506g
Bioremediation Field Initiative Site Profile: Hill Air Force Base. EPA 540-F-95-506c
Bioremediation Field Initiative Site Profile: Libby Ground Water Site. EPA 540-F-95-506a
Documents are available at *http://www.epa.gov/ord/webpub/biorem/*

Action Areas

Bioremediation Field Initiative

The Bioremediation Field Initiative is an EPA program that assesses and documents the performance of full-scale bioremediation field applications, in coordination with EPA's Regional offices and the states, and maintains a database on progress in applications of bioremediation techniques. The Initiative also provides technical assistance on selected full-scale field applications.

Bioremediation in the Field Search System

The Bioremediation in the Field Search System (BFSS) is a PC-based keyword-searchable database of information on waste sites in the U.S. and Canada where bioremediation is being tested or implemented, or has been completed. The current version contains information on more than 450 sites. BFSS may be downloaded from the Clean-Up Information (CLU-IN) Web site (*http://clu-in.com*) or bulletin board system (301-589-8366), or EPA's Office of Research and Development bulletin board system (513-569-7610). Diskette copies of BFSS may be obtained by calling EPA at 513-569-7562.

Current Activities

The Alternative Endpoints Subcommittee is initiating work in the field to evaluate the effectiveness of bioprocesses based on reductions in concentrations of the contaminants and reductions in toxicity. The Natural Attenuation Subcommittee is considering some field evaluations of natural attenuation. Sites under consideration include petroleum hydrocarbon and other PAH (polycyclic aromatic hydrocarbon)-contaminated sites such as town gas sites and wood preserving sites.

Developments

1990
Established Bioremediation Action Committee, bringing together more than 100 leaders in the field of bioremediation.

1990
Established Bioremediation Field Initiative to evaluate field applications of bioremediation.

1992-current
Published Bioremediation Field Initiative site profiles and field evaluations.

1994
Released Version 1.0 of the Bioremediation in the Field Search System (BFSS).

Subcommittees

Alternative End Points

The Subcommittee on Alternative End Points evaluates ecological and health assays that best indicate the bioavailable fractions of specific contaminants at sites. The Subcommittee is addressing four major testing issues: treatability, ecological, human health, and surrogate chemical.

Work on the *Treatability Tests* issue involves the compilation of data on soil and contamination characteristics and ecological and human health end points from various laboratory-, pilot-, and field-scale bioprocess projects. This information answers questions on the degree of treatment required by various bioprocesses, the point at which treatment should cease, and how these processes relate to natural attenuation and risk-based closures. Work on the *Ecological Tests* issue involves evaluation of available ecological assays that will measure bioremediation efficiency, especially for polycyclic aromatic hydrocarbon (PAH) contamination.

Work in the area of *Human Health Tests* involves the compilation and evaluation of information concerning available human health tests. Additional tests that measure treatment efficiency in terms of human health end points are needed. Work on *Surrogate Chemical Tests* addresses the need to develop alternative tests to estimate exposures and effects based on a chemical, rather than a biological, approach.

Natural Attenuation

The Subcommittee on Natural Attenuation is working on a set of recommendations to identify candidate sites for remedies that include natural attenuation. Candidate site selection is based on a combination of contaminant types (chlorinated solvents versus fuels), contaminated matrix (ground water versus soil), and oxygen conditions (aerobic versus anaerobic).

The Subcommittee also works on establishing quality control standards for characterizing natural attenuation sites. Affordability and the adequacy of data are the determinative tools identified to support the selection of natural attenuation while maintaining the quality control standard.

Oil Spills

The Subcommittee on Oil Spills seeks to work with the spill response community on the usefulness and effectiveness of bioremediation. The Subcommittee seeks to promote the acceptance of bioremediation for oil spills by developing a viable, realistic method for applying bioremediation as a response tool. The Subcommittee also is considering conducting field studies to uncover potential user needs and provide credible cost and performance data.

The Subcommittee has identified other needs for promoting bioremediation for oil spills, including developing techniques for inland and marine environments and prioritizing research into the effectiveness and ecological effects of bioremediation.

Future Plans

The Alternative Endpoints Subcommittee will be evaluating various ecological and health assays to assess the risk of residual PAHs. The National Research Council will be conducting a study evaluating the assays. The Oil Spills Subcommittee is planning a workshop to develop a plan for interested participants on some field efforts. Presently, projects in both marine and inland waterways are under consideration to evaluate the effectiveness of bioremediation.

Developments

1995
Bioremediation Action Committee annual meeting in Cincinnati. Work initiated on BFSS Version 2.0.

1995
EPA published guide to bioremediation research and development initiatives.

1995
Released Version 2.0 of the Bioremediation in the Field Search System.

1996
Bioremediation Action Committee formed subcommittees for Alternatives End Points, Natural Attenuation, and Oil Spills.

Clean Sites, Inc. Public-Private Partnerships

Through the Clean Sites Public-Private Partnerships for technology acceptance, EPA and Clean Sites, Inc., a nonprofit firm, develop partnerships between federal agencies (such as the Departments of Defense and Energy) and private industry site owners for the joint evaluation of full-scale remediation technologies. The purpose of this partnership program is to create a demand among potential users of new technologies by allowing the end-users of the technologies to be involved throughout the demonstration process. Through their involvement in the design and implementation of the demonstration, the participants have the ability to influence the nature of the data that are collected through the demonstration. These data can help site owners determine the applicability of the technologies to problems at their sites. These partnerships were the first federal effort utilizing a "demand pull" approach for the demonstration and evaluation of remediation technologies.

EPA's Technology Innovation Office (TIO) works with Clean Sites through a cooperative agreement proposed to TIO and awarded in 1992. After an initial meeting between industry and the government in October 1991 to discuss the concept of such partnerships, the cooperative agreement was established and the project has since yielded ongoing public-private partnerships at six federal facilities.

Publications

Fact Sheet: Public-Private Partnership Program. EPA 542-F-96-029
Lasagna™ Soil Remediation. DOE/EM-0308 (available from NTIS)
Additional information available at *http://clu-in.com*

Pending Publications:
SITE Program Innovative Technology Evaluation Report on the Use of Two-Phase Extraction™ at McClellan Air Force Base
DOE Reports on the Pilot Testing of Rotary Steam Drilling and Anaerobic Biodegradation at the Pinellas Plant

Structure

Clean Sites works with TIO and other federal agencies to identify candidate facilities for the joint evaluation of projects. Once identified, Clean Sites develops the site information necessary to match problems of common concern to the private sector, solicits industry participation, and establishes the partnerships between the facilities and private companies. Clean Sites then provides the infrastructure necessary to implement the project. Based on the common problems identified by the partnership group, the host organization arranges for the procurement of the technologies for demonstration. Clean Sites

Current Activities

Clean Sites, Inc., is actively engaged in the following development projects:
Application of steam drilling and anaerobic bioremediation at DOE/Pinellas Innovative Treatment Remediation Demonstration (ITRD) Project
Application of Two-Phase Extraction™ and air sparging at DOE/Mound ITRD Project
Continued progress on the development of the Lasagna™ technology (see RTDF description on pages 8 and 9 for more information)

Developments

CLEAN SITES

1991 U.S. Air Force worked with Clean Sites to establish McClellan Air Force Base as the initial partnership site.

CLEAN SITES

1991 Clean Sites convened a meeting of Fortune 100 technology-user firms to gauge their interest in participating in development partnerships.

CLEAN SITES

1992 EPA approved cooperative agreement with Clean Sites to facilitate public-private partnerships at federal facilities.

CLEAN SITES

1992 EPA/Clean Sites worked with DOE Sandia National Laboratory to develop partnership program for DOE facilities.

and TIO also facilitate interactions with federal and state regulators. Public involvement is handled through the host facility's public affairs program.

Technology Evaluation Partnership Projects

Currently, there are six technology evaluation partnership projects under the Clean Sites Public-Private Partnership Program.

McClellan Air Force Base, Sacramento, California

This project includes a demonstration of Two-Phase Extraction™ of chlorinated volatile organic compounds (VOCs) in ground water in unconsolidated soils; and Photolytic Destruction of chlorinated VOCs in off-gas from Two-Phase Extraction.

Pinellas DOE Plant, Largo, Florida

Working with DOE's Innovative Treatment Remediation Demonstration (ITRD) program, Clean Sites is facilitating a partnership looking at Permeable Membrane Pervaporation for chlorinated VOCs in groundwater recovery well effluent; Rotary Steam Drilling for chlorinated VOCs in soil and ground water; and *In Situ* Anaerobic Bioremediation for chlorinated and other VOC contamination in soil and ground water.

Mound DOE Facility, Miamisburg, Ohio, OU-1

Again working with the DOE/ITRD program, Clean Sites is facilitating a partnership looking at Two-Phase Extraction™ for soil and ground water contaminated with chlorinated VOCs in lower permeability soil; and Air Sparging/Soil Vapor Extraction (possibly with *in situ* oxidation) for chlorinated VOCs in deep ground water in more permeable soils.

Massachusetts Military Reservation/ Otis Air National Guard Base, Falmouth, Massachusetts

A demonstration is being conducted on an *In Situ* Passive Treatment Wall using abiotic iron/nickel-enhanced reductive dechlorination of chlorinated VOCs in deep ground water in unconsolidated soils; and on the Vertical Hydrofracturing used to install the iron/nickel treatment wall.

Lasagna™ Project (DOE)

The Lasagna™ Process project was jointly developed with the RTDF program's Lasagna™ Public-Private Partnership (see page 9) as a partnership to research a process that applies electroosmosis to induce flow of contaminated ground water in very low permeability subsurface formations.

Naval Air Station, North Island, California

A demonstration of the NoVOCs System™ for *in situ* treatment of chlorinated VOCs in ground water in unconsolidated soils is being conducted.

Future Plans

- Application of photolytic destruction of soil vapor extraction off-gas at McClellan Air Force Base
- Application of reactive wall technology at Massachusetts Military Reservation
- Application of NoVOCs technology at Naval Air Station North Island
- Clean Sites will issue reports on the performance of these technologies upon completion of the demonstrations
- Clean Sites will issue a report on overall experiences of the partnership program to be released upon completion of the program in 1997

Developments

1992
Meeting held between U.S. Air Force and eight Fortune 500 companies to plan partnership demonstrations at McClellan Air Force Base.

1993
Clean Sites and consortium of government and private entities established partnership to research and develop Lasagna™ process.

1993
EPA/Clean Sites and DOE established partnership under Innovative Treatment Remediation Demonstration program at the Pinellas facility.

1996
Phase I vertical field experiment of Lasagna™ process successfully completed at Paducah Gaseous Diffusion Plant.

The ETV Consortium for Site Characterization Technology

As one of the ten pilot programs under the Environmental Technology Verification (ETV) Programs, the goal of the Consortium for Site Characterization Technology (the Consortium) is to increase the use of innovative characterization technologies at contaminated sites. The Consortium brings together the interests of federal and state regulators and end users of these technologies to facilitate independent verification of technology performance. The Consortium focuses on two activities to reach this goal:

1) Identification, demonstration, evaluation, and verification of innovative monitoring, measurement, and site characterization technologies with information transfer to developers, users, and regulators.

2) Implementation of a process for verifying performance of innovative site characterization technologies through independent testing to generate data needed to evaluate and verify technology performance.

The Consortium fills the need for independent evaluation of technology performance, allowing technology customers, investors, and regulators to make decisions backed by quality data from a scientifically credible body.

Structure

The Consortium is a partnership between the EPA and the Department of Energy. Under the framework of this ETV pilot, a DOE lab serves as the third party verification organization. The Consortium has assembled a Board of Technology Users to provide guidance on technology needs and to serve as a vehicle for transferring information to their respective organizations. The Board is comprised of representatives from DoD, EPA, DOE, and DOC, small business concerns, instrument and professional societies, state organizations, and private-sector companies that use site characterization and monitoring technologies.

Process

The Consortium chooses technologies for the verification program based on an assessment of the user

Publications

Consortium for Site Characterization Technology. Fact sheet. EPA 542-F-96-012
Field Portable X-Ray Fluorescence (FPXRF). Fact sheet. EPA 542-F-96-009a
Cone Penetrometer/Laser Induced Fluorescence. Fact sheet. EPA 542-F-96-009b
Portable Gas Chromatograph/Mass Spectrometer. Fact sheet. EPA 542-F-96-009c

Pending Publications:
Eleven final technology evaluation reports

Current Activities

FY 96-97 Consortium Verification Projects: The Consortium is identifying candidates in response to the solicitation for *in situ* monitoring and sample collection technologies
Development of the Consortium Network of EPA Regional Advocates
Finalizing the *Guidance Manual for the Preparation of Site Characterization Technology Development Plans*
Electronic dissemination of evaluations on the World Wide Web (*http://clu-in.com*)
Evaluating Consortium Technology User Needs

Developments

1991
Consortium concept for evaluation and verification of innovative site characterization technologies presented to Federal Remediation Technologies Roundtable.

1993
Initial funding obtained to create a CSCT testing entity for innovative site characterization and monitoring technologies.

1994
Funding obtained from the Environmental Technologies Initiative (ETI) to support verification of innovative site characterization technologies.

1995
CSCT named one of the initial four pilot programs in the ETV Program, with ETI support.

community. To determine technologies available to meet these needs, it solicits vendor participation through *Commerce Business Daily* announcements.

From the proposals submitted in response and a meeting with the vendors, the Consortium selects full-scale, commercially-ready technologies that meet program needs. The Consortium then collaborates with the developer to plan and conduct the test. Based on the evaluation of performance from the test, the Consortium verifies performance by issuing an evaluation report accompanied by a statement of verification.

The Consortium does not provide funding to the developer to participate in the program. The developer is expected to contribute time and money to the test. A minimum of one field test is required; in most cases two field tests at different sites are completed. The evaluation plans, implementation of tests, and reports are all developed by the third party verification organization.

The developer is expected to conduct demonstrations at suitable sites. The Consortium supports the developer in selecting the site, approving the demonstration plan, and auditing the demonstration. The Consortium is responsible for preparing the Innovative Technology Verification Report. It takes about one year from the first meeting with a selected developer to the end of the process, signalled by the issuance of a verification report.

Participation

While the Consortium would like to include all developers in the process, limits on resources require some prioritization and selection. Each year, working with the Board, the Consortium identifies needs and solicits developers with corresponding technologies. For example, the needs for 1996 were:

1) *In situ*, real-time monitoring devices for measuring metals, radionuclides, VOCs, polychlorinated biphenyls, semi-volatiles, pesticides, and dense non-aqueous phase liquids in soil, soil gas, and water.

2) Innovative technologies for sampling soil, soil gas, and ground water.

The Consortium has defined three levels of technology maturity, ranging from prototype-level applications to commercial production units with documented field experience that may be subjected to performance verification for acceptance by regulators. The demonstration/verification process applies only to the latter type of technology. However, the Consortium is interested in establishing early contact with technology developers who have technologies that will eventually qualify for participation in the verification process.

The Consortium evaluates each submittal to determine the maturity level. The Consortium then selects from candidate technologies based on characteristics including innovation, analytical attributes, and physical attributes.

Future Plans

Convene two to three Regional Network meetings and two Board of Technology Users meetings per year.
Address regulatory impediments to the use of innovative technologies.
Conduct evaluations of *in situ* monitoring and sampling technologies.
Work with the Oak Ridge National Laboratory as the new third-party verification organization for the Consortium.

Developments

1995
Initial Board of Technology Users meeting convened to assess needs of users of innovative site characterization and monitoring technologies.

1995
Initial meeting of the CSCT Regional Network convened.

1995
The first set of CSCT technology verification field tests completed.

1996
The first set of CSCT Technology Verification Reports released.

Remediation Technologies Development Forum

The Remediation Technologies Development Forum (RTDF) was established in 1992 by EPA after industry representatives met with EPA's Administrator to identify ways of working together to solve complex hazardous waste remediation problems. The RTDF is a consortium of partners from industry (47%), government agencies (32%), and academia (21%) who share the common goal of developing more effective, less costly hazardous waste characterization and treatment technologies. RTDF achieves this goal by identifying high priority remediation technology development needs and implementing collaborative research to address these needs. RTDF also addresses scientific, institutional, and regulatory barriers to innovative technologies.

RTDF information and publications may be obtained via the World Wide Web on the RTDF homepage (*http://www.rtdf.org*).

Structure

RTDF forms self-managed Action Teams to bring members together to work on priority needs. Action Teams focus on the development, testing, and evaluation of *in situ* remediation technologies. EPA's Office of Research and Development (ORD) and TIO facilitate the operation of the Action Teams and chair the RTDF Steering Committee. ORD also contributes research to these jointly-led projects. The U.S. Departments of Defense and Energy provide in-kind services and funding for Action Team activities.

RTDF Action Teams

There are five Action Teams currently. Each Team is co-chaired by EPA and industry representatives.

Bioremediation Consortium

The mission of the Bioremediation Consortium is to accelerate the development of cost-effective bioremediation processes for degrading chlorinated solvents. To accomplish this mission, the members jointly participate in the research, development, demonstration, and evaluation efforts necessary to achieve public and regulatory acceptance of these biological processes.

Publications

Remediation Technologies Development Forum. Fact Sheet. EPA 542-F-96-010
Lasagna™ Public-Private Partnership. Fact Sheet. EPA 542-F-96-010a
Bioremediation of Chlorinated Solvents Consortium. Fact Sheet. EPA 542-F-96-010b
Permeable Barriers Action Team. Fact Sheet. EPA 542-F-96-010c
IINERT Soil-Metals Action Team. Fact Sheet. EPA 542-F-96-010d
Guidance Handbook on Intrinsic Remediation of Chlorinated Solvents (see WWW)

Current Activities

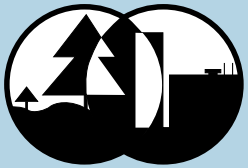
The Phase II field test of the Lasagna™ technology is underway at the Paducah Gaseous Diffusion Plant. Upon successful completion of the test, the technology will be used to remediate the entire Solid Waste Management Unit site.

The Phase I field tests of intrinsic bioremediation, accelerated anaerobic bioremediation, and cometabolic bioventing are underway at Dover Air Force Base. Phase II studies are planned at Strother Field Industrial Park for intrinsic bioremediation and accelerated anaerobic bioremediation and at Hill Air Force Base for cometabolic bioventing.

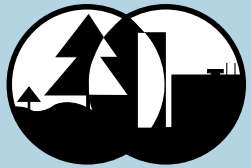
Developments

1992
RTDF established after a meeting between EPA Administrator and industry representatives.

1993
RTDF Bioremediation Consortium established by private industry, universities, and federal agencies.



1994
Research agreement signed by the industrial partners of the RTDF Bioremediation Consortium.



1994
EPA and a private research consortium entered a partnership to develop the Lasagna™ process.

The Consortium developed a comprehensive research plan to test and evaluate the effectiveness of three *in situ* bioremediation processes for degrading chlorinated solvents (cometabolic bioventing, natural attenuation, and accelerated anaerobic degradation). Field studies under this plan have been initiated at Dover Air Force Base.

IINERT Soil-Metals Action Team

IINERT stands for In-Place Inactivation and Natural Ecological Restoration Technologies. These techniques alter the molecular species of metals/metalloids in soil, reducing and essentially eliminating their solubility and bioavailability, thereby reducing the risk they pose to human health and the environment. The mission of the IINERT Soils-Metals Action Team is to develop, demonstrate, and achieve regulatory and public acceptance of these technologies.

Lasagna™ Public-Private Partnership

Lasagna™ refers in an integrated, *in situ* remedial technology developed by EPA and a private research consortium. The process, named for its treatment layers, combines electroosmosis with treatment zones installed directly in contaminated soil. Conceptually, the process treats organic and inorganic contaminants and mixed wastes without the use of injection or extraction wells. A field experiment to test the process was initiated in 1995 at the DOE Paducah Gaseous Diffusion Plant in Kentucky. The mission of the Lasagna™ Partnership is to pool expertise and resources to advance the development of the Lasagna™ technology. This partnership has operated in conjunction with the Clean Sites Lasagna™ partnership.

Permeable Barriers Action Team

The mission of the Permeable Barriers Action Team is to accelerate development, including public and regulatory acceptance, of permeable barrier technologies to treat chlorinated solvents, metals, radionuclides, and other pollutants in ground water. The efforts focus on defining hydraulics and geochemical reactions, conducting demonstrations that validate effectiveness, developing design and implementation protocols, developing emplacement techniques, and conducting economic analysis of treatment costs.

The Action Team's Organics Work Group is participating in a study of *in situ* treatment of chlorinated solvents at Dover AFB. Field work for the project began in June 1996. The Inorganics Work Group is in the process of assessing potential sites for evaluating the effectiveness of permeable barrier technology in treating mixed contaminants.

Sediments Remediation Action Team

The mission of the Sediments Remediation Action Team is to develop and evaluate passive, *in situ* techniques to remediate sediment contamination, investigate mechanisms and rates of natural biological degradation, and develop related assessment procedures.

Future Plans

- The Organics Work Group of the Permeable Barriers Action Team will initiate a field study at Dover Air Force Base in 1997. The Inorganics Work Group is assessing sites to test the effectiveness of permeable barriers in treating mixed waste.
- The IINERT Soil-Metals Action Team will initiate a field study in cooperation with the USDA, Missouri Department of Natural Resources, and EPA Region 7 at a site in Joplin, Missouri.
- The Sediments Remediation Action Team is forming work groups and assessing potential field study test sites.

Developments

1995 RTDF Bioremediation Consortium initiated Phase I field tests for three biological processes at Dover Air Force Base.

1995 RTDF Permeable Barriers Action Team established, led by U.S. EPA NERL-Athens and DuPont.

1995 Field experiment to test the Lasagna™ process initiated at the DOE Paducah Gaseous Diffusion Plant.

1996 RTDF Sediments Remediation Action Team established.

People You Will Definitely Want To Be In Touch With

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Superfund Innovative Technology Evaluation (SITE) Program

Since 1987, the SITE program has served as EPA's verification program for remediation technologies. EPA teams with technology vendors to demonstrate and evaluate field-ready clean-up technologies at compatible waste sites. EPA has completed evaluation of 86 technologies.

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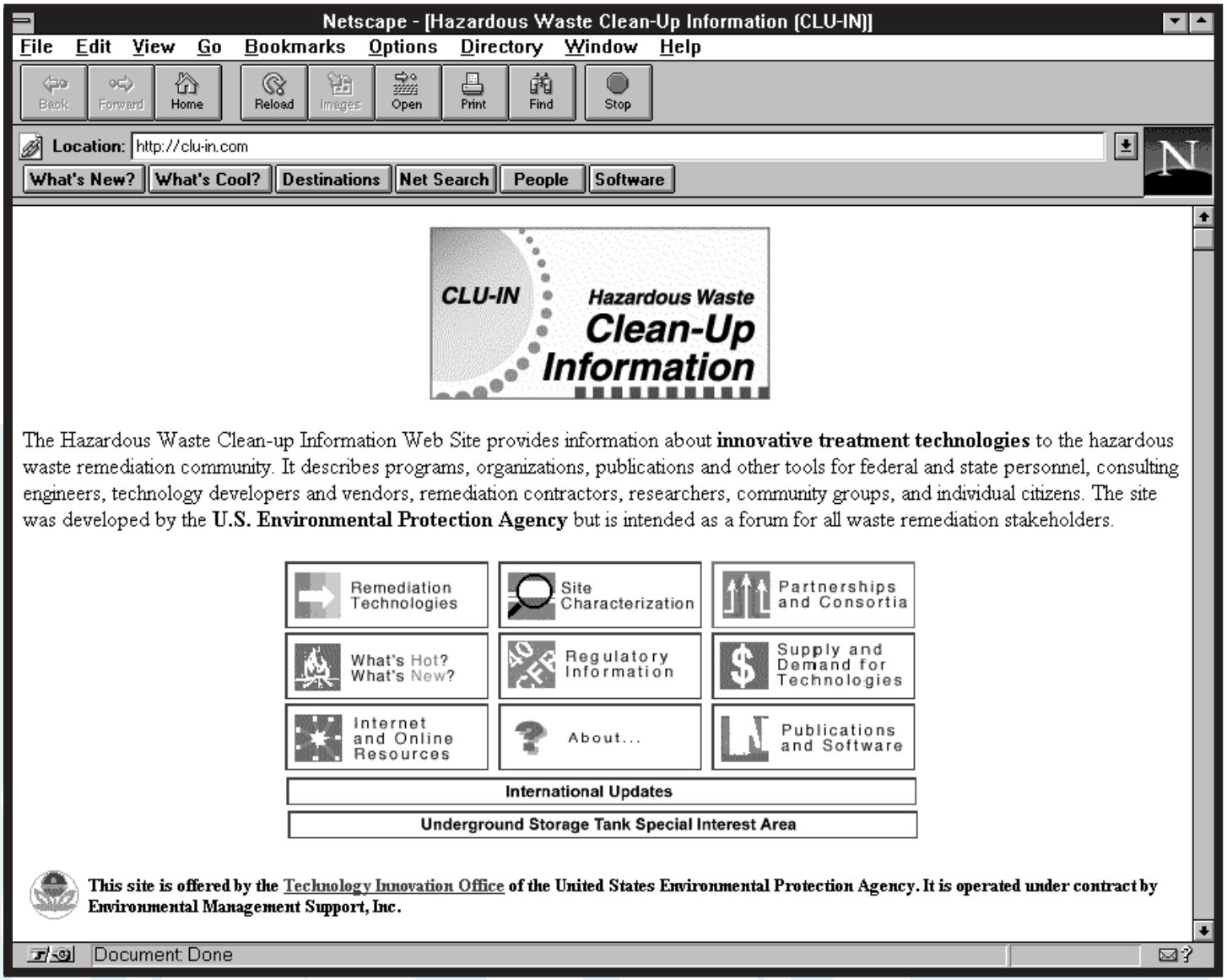
Public-Private Partnership Information and Publications Available On-Line

EPA's Technology Innovation Office operates the **CLU-IN World Wide Web Site and Bulletin Board System** (see right), an on-line service that provides up-to-date information about innovative treatment technologies to the hazardous waste remediation community. The CLU-IN web site address is *http://clu-in.com*. The CLU-IN bulletin board dial-in number is 301-589-8366. Access to the system is free.

Remediation Technologies Development Forum information and publications may be obtained on the World Wide Web on CLU-IN (described above) and on the RTDF homepage at *http://www.rtdf.org*.

Bioremediation Action Committee documents are available on the World Wide Web at *http://www.epa.gov/ord/webpub/biorem*.

Superfund Innovative Technology Evaluation (SITE) Program information and reports are available on the World Wide Web at *http://www.epa.gov/ORD/SITE*.



Recent Publications on Innovative Technologies Available Through CLU-IN

EPA Directive: Initiatives to Promote Innovative Technologies in Waste Management Programs. EPA 540-F-96-012
Surfactant Injection for Ground-Water Remediation: State Regulators' Perspectives and Experiences. EPA 542-R-95-011
State Policies Concerning the Use of Injectants for In Situ Ground-Water Remediation. EPA 542-R-96-001
Site Characterization and Monitoring: Bibliography of EPA Information Resources. EPA 542-B-96-001
Guide to Documenting Cost and Performance for Remediation Projects. EPA 542-B-95-002
Abstracts of Remediation Case Studies. EPA 542-R-95-001
Bioremediation of Hazardous Wastes: Research, Development, and Field Evaluations. EPA 540-R-95-532
Innovative Treatment Technologies: Annual Status Report Database. EPA 542-C-95-002

For Further Information

Please tell me how we can participate in:

____ Bioremediation Action Committee

____ Clean Sites Public-Private Partnerships

____ Consortium for Site Characterization Technology

____ Remediation Technologies Development Forum

Name and Title: _____

Organization: _____

Address: _____

_____

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E-mail address: _____

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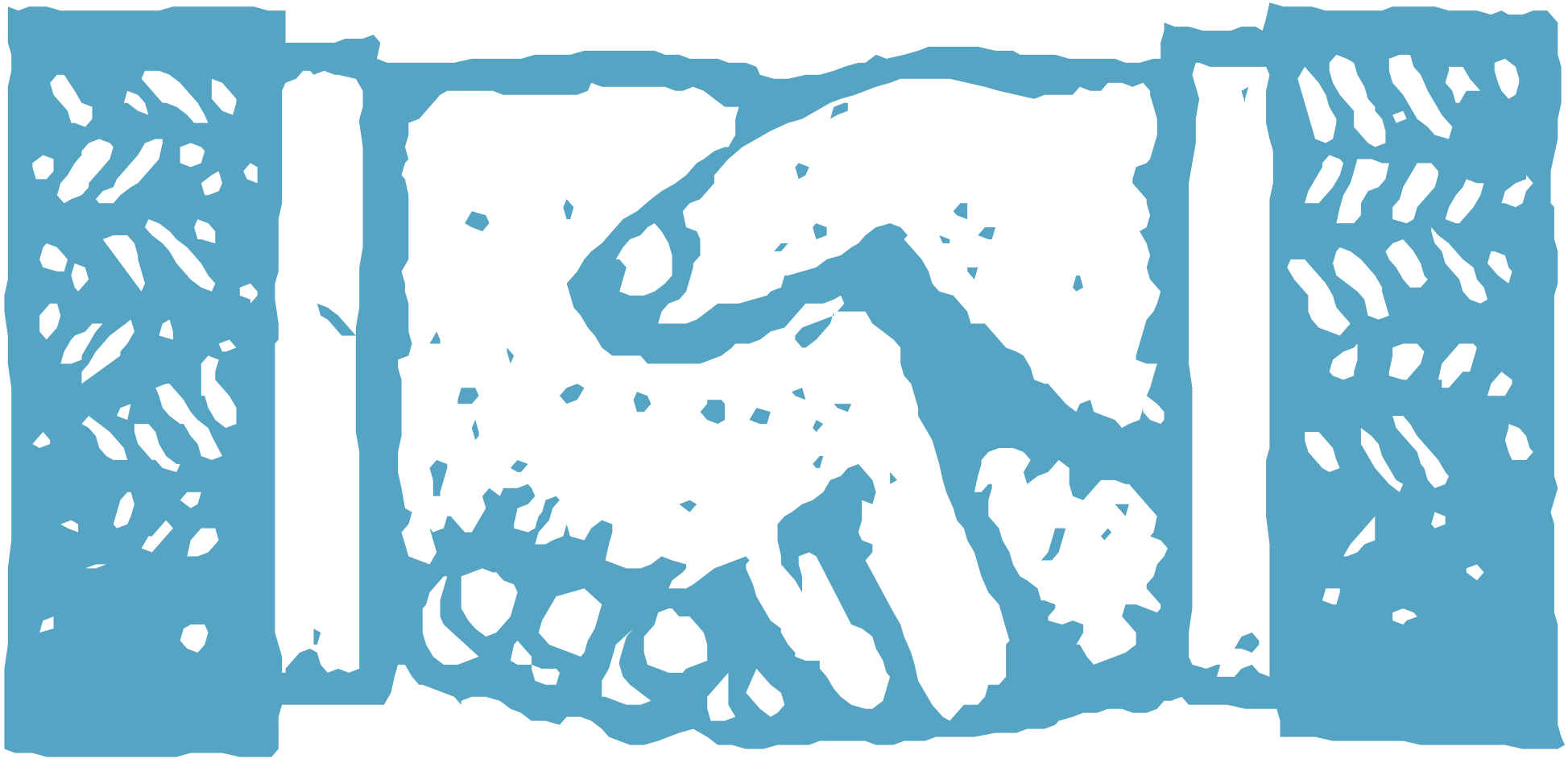
Or fax it to: 703-603-9135

United States
Environmental Protection
Agency

Solid Waste and
Emergency Response
(5102G)

EPA 542-R-96-006
February 1997

Partnerships for the Remediation of Hazardous Wastes



“Innovations in environmental technology can be the bridge that carries us from the threat of greater health crises and ecological destruction toward the promise of greater economic prosperity and social well-being. Innovation by innovation, we can build a world transformed by human ingenuity and creativity—a world in which economic activity and the natural environment support and sustain one another.”

— President Bill Clinton
Address to Congress, April 6, 1995