United States
Environmental Protection
Agency

Office of Solid Waste
and Emergency Response
Washington, DC 20460

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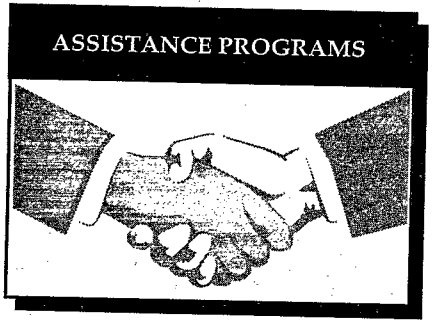
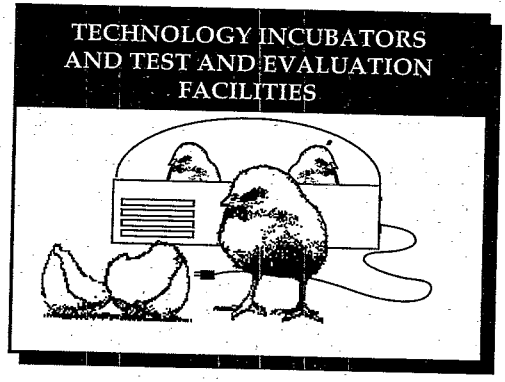
September 1994

EPA

Innovative Hazardous Waste Treatment Technologies: A Developer's Guide To Support Services *Third Edition*





INNOVATIVE TECHNOLOGY
COMMERCIALIZATION
FULL-SCALE TEST
PILOT-SCALE TEST
BENCH-SCALE TEST
PROOF OF CONCEPT
UNIVERSITY-BASED HAZARDOUS WASTE RESEARCH CENTERS
TECHNOLOGY INCUBATORS AND TEST AND EVALUATION FACILITIES
ASSISTANCE PROGRAMS

INNOVATIVE HAZARDOUS WASTE TREATMENT TECHNOLOGIES

A DEVELOPER'S GUIDE TO SUPPORT SERVICES

SEPTEMBER 1994

U.S. Environmental Protection Agency
Office of Solid Waste and
Emergency Response
Technology Innovation Office
Washington, DC 20460

NOTICE

This material has been funded wholly or in part by the United States Environmental Protection Agency (EPA) under contract number 68-W2-0004. This booklet is intended to be used as a point of departure for technology developers seeking assistance. Inclusion in this booklet or the mention of trade names, commercial firms, or ventures does not constitute an endorsement by the U.S. EPA. In addition to the resources identified in this booklet, developers of innovative hazardous waste treatment technologies are encouraged to contact local programs, facilities, and universities not listed. To obtain a copy of this report, fill out the request form on the next page.

U.S. EPA INNOVATIVE HAZARDOUS WASTE TREATMENT TECHNOLOGIES
A DEVELOPER'S GUIDE TO SUPPORT SERVICES

EPA-542-B-94-012

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Comments may address suggested programs, facilities, agencies, or universities for future inclusion; updates to current listings; and/or requests for additional documents, databases, or other resource tools.

FOREWORD

The U.S. Environmental Protection Agency (EPA) recognizes the challenges faced by hazardous waste treatment technology developers and vendors. This booklet provides information on sources of assistance and support in bringing technologies from the proof of concept stage to the commercialization stage. It includes information on sources of grant funding and technical assistance, and identifies incubators, test and evaluation facilities, and university-affiliated research centers that can provide a range of technology development and evaluation services.

It is our hope that this information will be useful to both new and established developers of treatment technologies. Your comments and suggestions for future editions are welcome. The form on page iii can be used to make such suggestions or to order additional copies of the booklet.

Walter W. Kovalick, Jr., Ph.D.
Director
Technology Innovation Office
Office of Solid Waste and Emergency Response

Section

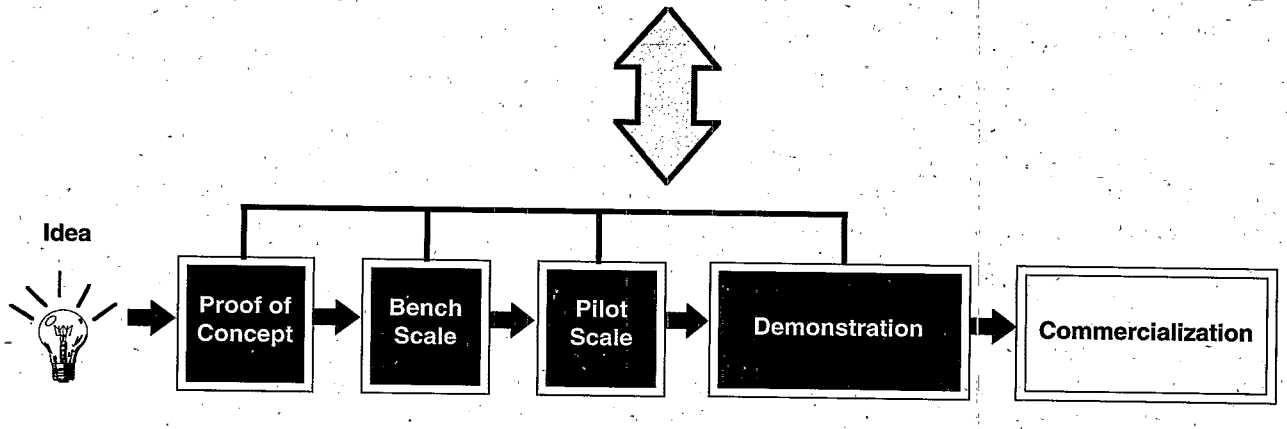


TABLE OF CONTENTS

TABLE 1 - SERVICES FOR DEVELOPERS

TYPES OF SERVICES	NATURE OF SERVICES
• ***Financial Assistance***	Identification of alternative funding sources, including venture capital, government grant programs, and joint venture opportunities for technology developers.
• ***Market Analyses***	Environmental market analyses for candidate technologies to define the size and nature of the applicable market. Analyses include recommendations on further developmental activities, as well as time and money likely to be required for commercialization. For information on the future demand for remediation services across major U.S. cleanup programs, see Cleaning Up the Nation's Waste Sites: Markets and Technology Trends, EPA 542-R-92-012, NTIS PB93-140762, available through NTIS: (703) 487-4600.
• ***Testing and Evaluation***	Demonstration and testing programs at various scales for promising technologies. Evaluation of technical feasibility or status, including projects such as prototype development and testing, and scale-up design. Facilities may provide test bays with secondary containment systems and/or analytical services.
• ***Technical Assistance***	Technical expertise in a variety of science and engineering disciplines to assist in all stages of development through basic and applied research.
• ***Permitting and Regulatory Assistance***	Assistance in addressing permitting and regulatory requirements by providing personnel with permitting expertise or, in some cases, providing permitted laboratory facilities.
• ***Administrative Support***	Office space, office equipment, secretarial support, and other administrative assistance.
• ***Training and Technology Transfer***	Assistance in working with universities and other public research institutions to strengthen technological skills and approaches.

I. INTRODUCTION

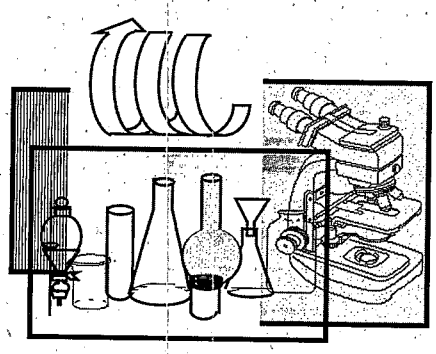
OSWER's Technology Innovation Office (TIO) has a broad mandate to increase the application of innovative technologies at Superfund sites and Resource Conservation and Recovery Act (RCRA) corrective action sites, and in the remediation of underground storage tanks. An important component of such efforts is the development of less costly and more effective innovative treatment technologies.

In investigating the needs of technology developers in the development, demonstration, and commercialization of their technologies, TIO found that there was no single, conveniently available source of information. TIO also found that there is potential demand for a variety of programs, facilities, and services. Table 1 on the previous page lists the types of services available to developers.

For the purposes of this booklet, available programs, facilities, and services have been divided into three categories:

- Assistance programs
- Technology incubators and test and evaluation (T&E) facilities
- University-affiliated hazardous waste research centers.

DEVELOPERS ARE CONFRONTED WITH AN ARRAY OF CHALLENGES

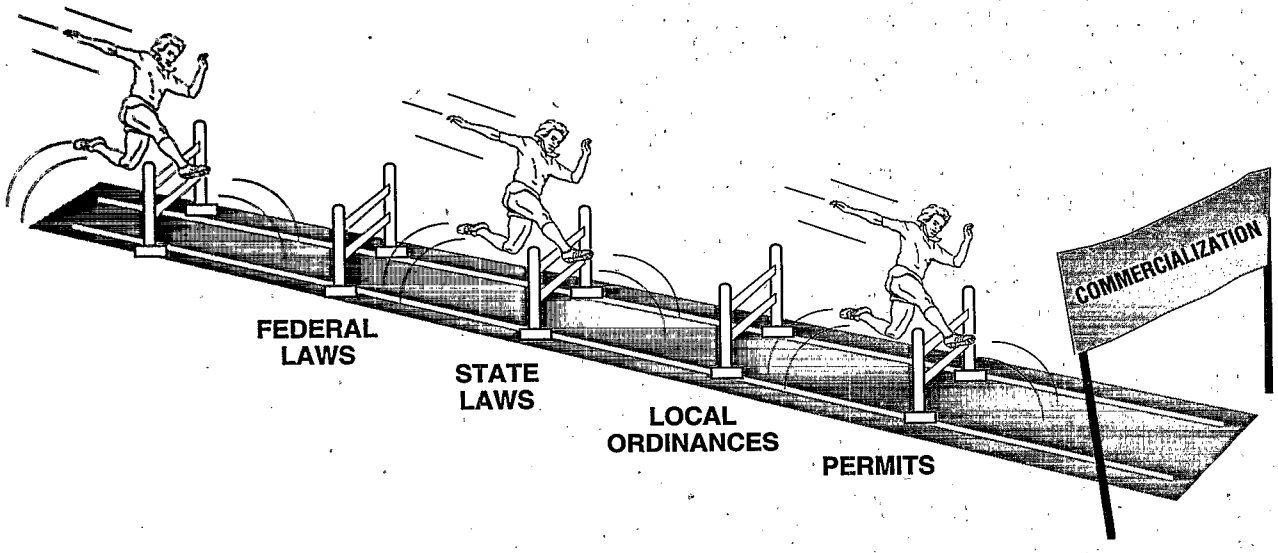


- **Research**
- **Testing**
- **Engineering Design**
- **Permits**
- **Market Acceptance**
- **Costs**

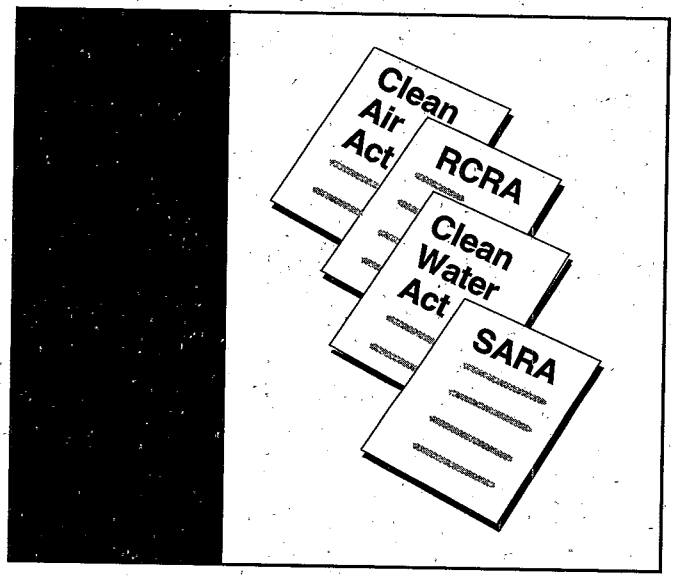
This booklet begins with a brief overview of the regulatory requirements. The remainder of the document summarizes assistance programs, facilities, and research center services available to developers of innovative hazardous waste treatment technologies.

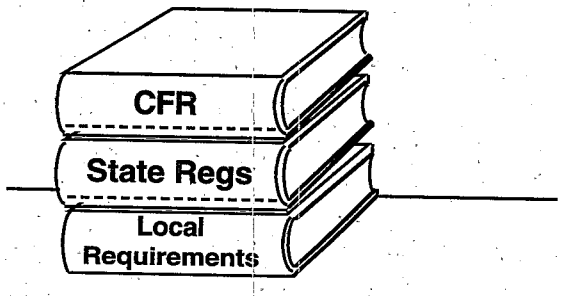
Information contained in this booklet was gathered primarily from facility personnel. The descriptions provide a snapshot of the equipment and expertise available. Included organizations/programs are meant only to be illustrative of potential sources of assistance. Developers should use this booklet as a point of departure for contacting programs, facilities, and services.

DEVELOPERS FACE REGULATORY HURDLES



II. REGULATORY REQUIREMENTS





The field of hazardous waste remediation is relatively unique in the extent to which research and development, as well as full-scale technology application, may be subject to regulation. Acquiring permits not only necessitates gathering substantial amounts of information, but also may require a significant lead time before they are actually issued. These factors must be considered in developers' planning processes.

An awareness of regulatory requirements can assist technology developers in avoiding regulatory problems, determining market "niches," and accelerating market acceptance.

Since Federal and state regulatory programs are dynamic, and because requirements differ among states, it is not possible to provide definitive guidance in this booklet. Interested parties should contact appropriate EPA Regional or state regulatory personnel for up-to-date information on regulatory requirements. The following sections on technology development and technology application provide some general regulatory information useful to developers, particularly those just entering the environmental field who may not be fully aware of regulatory requirements.

TECHNOLOGY DEVELOPMENT

Permitting

EPA has issued a number of regulatory provisions intended to provide relief in permitting and testing requirements for technology developers. Since States vary in the extent to which they have adopted these provisions, developers should contact their EPA Region or State to verify the applicability of regulatory provisions in a particular jurisdiction.

Research, Development, and Demonstration (RD&D) permits (40 CFR 264, 270) are available to technology developers who wish to conduct limited duration and limited quantity testing on actual hazardous waste. The intent of this provision is to set up a permitting process for RD&D activities that is less expensive and time-consuming than full-fledged RCRA permitting.

In 1988, EPA promulgated the Treatability Study Sample Exclusion Rule (40 CFR 261.4(e)-(f)) which conditionally exempts small-scale treatability studies from RCRA manifest and permit requirements. The rule is intended to allow technology developers to conduct studies on actual hazardous waste rather than having to rely on surrogates. Such studies can involve up to 1000 kg of non-acute hazardous waste. A significant number of states have adopted this provision.

On February 18, 1994, EPA promulgated a revision to the Treatability Study Sample Exclusion Rule (59 FR 8362, 40 CFR Part 261). Among other things, the revision increased the quantity limit to 10,000 kg for contaminated media. The larger quantity limit is intended to benefit both technology developers and remedial action decision-makers. The revision will not generally be effective until states adopt it.

Interested parties should contact State and Regional personnel to determine the status of the rule and/or its revision in their jurisdiction. It is important to obtain a copy of the rule to ensure that compliance requirements are understood.

Table 2 contains a list of EPA Regional contacts to consult in determining the applicability of RD&D permitting and the Treatability Studies Sample Exclusion Rule. In addition to the Regional contacts, personnel at a number of the facilities described in this booklet may be able to provide assistance in understanding regulatory requirements.

TABLE 2
EPA REGIONAL CONTACTS
(See Figure 1 for map of Regional offices)

Region 1	John Podgurski, (617) 573-9680
Region 2	Andrew Bellina, (212) 264-0504
Region 3	John Humphries, (MD, VA, WV, DE), (215) 597-0320 Paul Gotthold, (PA, D.C.) (215) 597-7937
Region 4	Douglas McCurry, (404) 347-3433
Region 5	Karl Bremmer, (312) 353-0398
Region 6	David Neleigh, (214) 655-6785
Region 7	Wes Bartley, (913) 551-7632
Region 8	Larry Wapersky, (303) 293-1509
Region 9	Larry Bowerman, (415) 744-2051
Region 10	Mike Gearheard, (206) 553-2782

Performance Standards

Developers need to know the performance standards potentially applicable to the technology under development. Performance requirements for hazardous waste clean up may involve clean-up goals based on site-specific factors or the application of pre-established technology-based standards. Standards to which a technology *may* be subject can be found in EPA's Land Disposal Restrictions guidelines (40 CFR 268) for contaminated waste streams and in the Maximum Contaminant Level (MCLs) (40 CFR 141) regulations for contaminated ground water, (i.e., drinking water). Information on *actual* clean-up levels at individual hazardous waste sites may be available at EPA Headquarters and Regional libraries and from state agencies.

Developers should note that in addition to meeting specific clean-up goals for the contaminated media in question, there also may be limits on permissible air emissions and/or wastewater discharges.

TECHNOLOGY APPLICATION

By the time a developer achieves full-scale commercialization, it is likely that regulatory requirements are reasonably well understood; however, attention to this complex area can prevent unpleasant surprises.

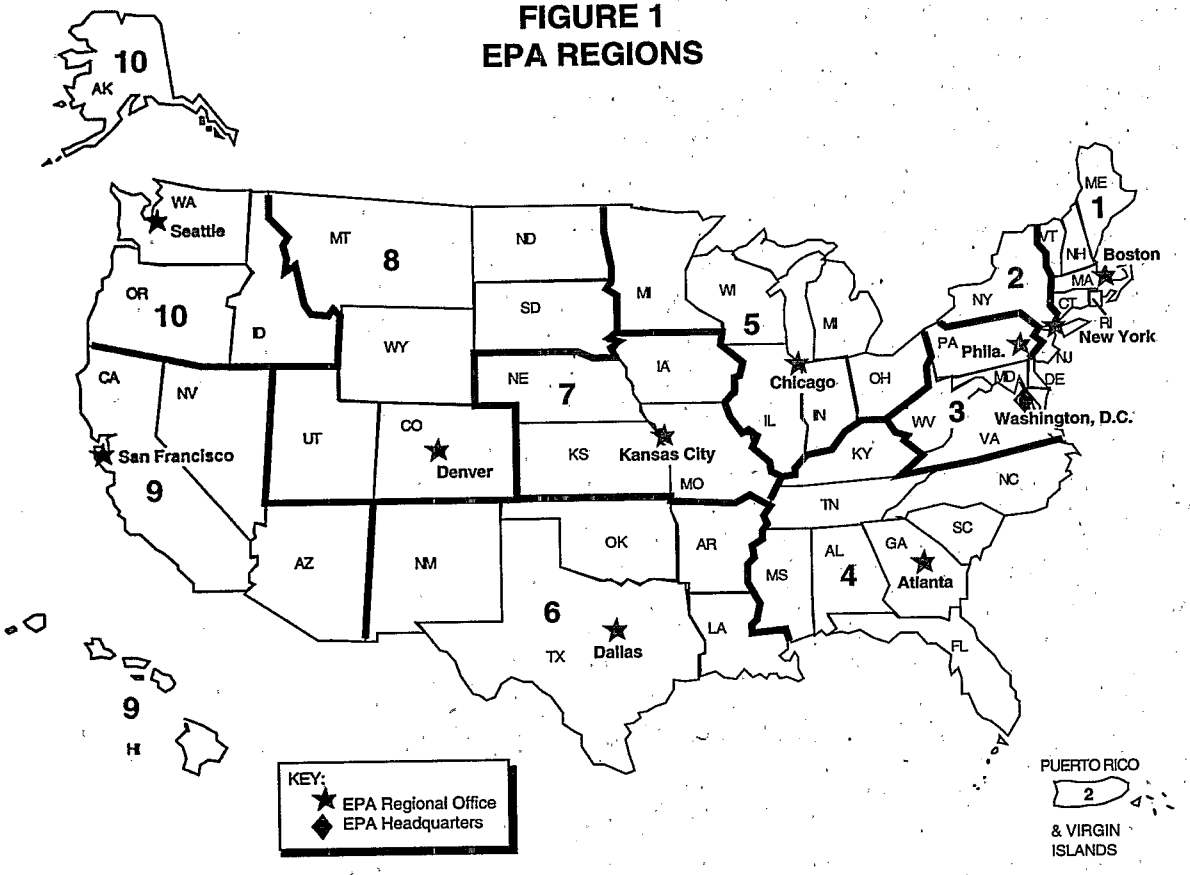
For General Regulatory Information Call the RCRA/UST, Superfund and EPCRA Industry Assistance Hotline 1-800-424-9346, (703) 412-9801

There are provisions for relief from *administrative* requirements (i.e., permits) for activities at National Priority List (NPL) sites being cleaned up under the Superfund program (CERCLA/SARA); however, *substantive* requirements (e.g., MCLs for drinking water) must still be met. Depending on the nature of the activity and its location, technology applications at other sites may be subject to permit requirements under Federal RCRA, Clean Air Act, Clean Water Act, or underground injection control provisions of the Safe Drinking Water Act. States generally have equivalent provisions that also must be satisfied.

Developers of technologies for treating polychlorinated biphenyls (PCBs) should be aware that these technologies are subject to separate regulation by EPA's Office of Toxic Substances (40 CFR 761).

Toxic Substances Control Act (TSCA) Assistance Information Service (202) 554-1404

FIGURE 1
EPA REGIONS



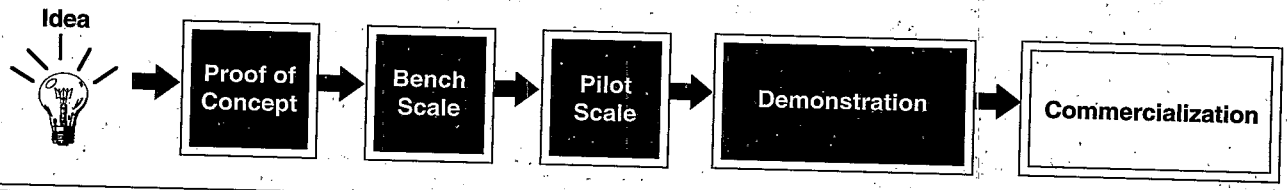
III. DOMESTIC ASSISTANCE PROGRAMS

- Federal, state, and private, domestic programs exist to assist developers of innovative hazardous waste treatment technologies.

- Programs may provide financial and/or technical assistance, particularly with the development and demonstration stages of innovative hazardous waste treatment technologies, occasionally at no cost.

- Assistance programs may provide developers with a mechanism for independently validating their results and communicating their successes.

- Conditions for assistance vary widely among programs.



A number of Federal and state programs have been established to provide financial and/or technical assistance to technology developers. This Section highlights both domestic Federal and state assistance programs as well as representative examples of international programs that may aid individuals with the development and demonstration of innovative hazardous waste treatment technologies. These programs range from those that provide grants for technology development to those that allow developers to demonstrate the performance of their technologies at actual hazardous waste sites. Also included in this Section are Federal and state technical assistance and information resources. These organizations may provide technical assistance, aid in accessing funding, links to other developers and researchers, and training. Interested developers should contact the appropriate programs for additional information.

Developers can also access information on innovative treatment technologies and make information on their technologies available to potential users of remediation technologies using the Federal databases and bulletin boards described in the following box.

INNOVATIVE TECHNOLOGY INFORMATION DATABASES/BULLETIN BOARDS

- The Alternative Treatment Technologies Information Center (ATTIC) - provides on-line access to hazardous waste abstracts, news bulletins, conference information, and a message board. Developers can access this collection of hazardous waste databases through a bulletin board. **To learn how to access ATTIC, call (703) 908-2137. To access the ATTIC Bulletin Board System, call (703) 908-2138 (Communication Parameters: 8 data bits, 1 stop bit, and no parity; accessible at 1200-14,400 baud).**

- The Cleanup Information Bulletin (CLU-IN) - provides hazardous waste developers with current information on innovative technologies via a bulletin board. CLU-IN also provides information bulletins, message and on-file exchange, and on-line databases and directories. **To learn how to access CLU-IN or to gather additional information about its contents or services, call (301) 589-8368. To access directly, call (301) 589-8366 (Communication Parameters: 8 data bits, 1 stop bit, and no parity; accessible at 1200-9600 bauds).**

- The Bioremediation in the Field Search System - provides access to information on over 160 bioremediation sites nationwide. The database spans both full-scale remediation efforts and treatability and feasibility studies under CERCLA, RCRA, Toxic Substances Control Act (TSCA), and Underground Storage Tanks (UST). **To obtain a copy, download from ATTIC or CLU-IN or order on diskette at no cost from EPA's Center for Environmental Research Information (CERI), (513) 569-7562.**

- The Vendor Information System for Innovative Treatment Technologies (VISITT) - provides potential users of remediation technologies with information about technology vendors. VISITT contains information provided by technology developers and vendors on availability, performance, and cost of innovative hazardous waste remediation. **To become a registered VISITT user, fax a request to the National Center for Environmental Publications and Information (NCEPI) at (513) 891-6685 or mail a request to P.O. Box 42419, Cinn., OH 45242-0419.**

In addition to the EPA data bases and bulletin boards discussed above, developers can obtain information on other federal systems by obtaining a copy of *Accessing Federal Data Bases for Contaminated Site Clean-up Technologies, EPA/542/B-93/008, October 1993* from TIO.

NAME: SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION PROGRAM

Address: U.S. Environmental Protection Agency
Risk Reduction Engineering
Laboratory
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Contact: John Martin
Phone: (513) 569-7696
Fax: (513) 569-7620

The Superfund Innovative Technology Evaluation Program (SITE) was established in 1986 by EPA's Offices of Research and Development (ORD) and Solid Waste and Emergency Response (OSWER). Its purpose is to promote the development and use of innovative technologies to clean up Superfund sites across the country. The SITE Program has three major components:

- The Demonstration Program - generates performance, engineering, and cost data through selected innovative technology demonstrations. EPA publishes an annual solicitation for proposals from developers to demonstrate their technologies, ideally at actual Superfund sites. Under this program, the vendor typically pays for the operation of the demonstration. EPA pays for the planning, sampling, and analysis, and generates reports to communicate the results of the demonstration.

- The Emerging Technology Program - supports bench-scale and pilot-scale development and testing of innovative treatment technologies. EPA publishes an annual solicitation for participants who may receive up to $150,000 per year for two years.

- The Monitoring and Measurement Technologies Program - supports the development and demonstration of innovative field-ready technologies that detect, monitor, or measure hazardous substances in the air, surface water, soil, wastes, and biological tissues. (For more information contact Lary Jack, (702) 798-2373).

NAME: THE FEDERAL TECHNOLOGY TRANSFER ACT PROGRAM

Address: U.S. Environmental Protection Agency
OSPRE/ORD
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Contact: Larry Fradkin
Phone: (513) 569-7960
Fax: (513) 569-7132

In the past, legal and institutional barriers have prevented government and industry from collaborating in developing and marketing effective technologies to prevent and control pollution. The Federal Technology Transfer Act of 1986 (FTTA) removes some barriers to the joint development of commercial treatment technologies. The FTTA allows flexible cooperative research and development agreements (CRADAs) among Federal laboratories, industry, and academic institutions.

Under CRADAs, companies may be given exclusive rights to market and commercialize new technologies that result from the collaboration. For industry, the key advantage of CRADAs is the speed and ease with which the agreements can be negotiated and signed. CRADAs are not subject to Federal contracting or grant requirements.

Environmental research, such as development of innovative technologies for treating hazardous wastes, requires the collaboration of experts in many different fields. EPA's 12 interdisciplinary research laboratories that employ over 850 scientists and engineers can provide the needed expertise.

NAME: ***THE U.S. DEPARTMENT OF ENERGY, OFFICE OF ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT***

Address: Environmental Restoration and Waste Management, Technology Development
U.S. Department of Energy
Washington, DC 20585
Contact: EM Central Point of Contact
Phone: 1-800-845-2096
Fax: (301) 903-7238

The U.S. Department of Energy (DOE) Office of Environmental Restoration and Waste Management (EM) is charged with overseeing a multi-billion dollar environmental clean-up effort. EM leads a national research, development, demonstration, testing, and evaluation program to provide environmental restoration and waste management technologies to DOE sites and to manage DOE generated waste.

DOE also supports the development of promising environmental clean-up business and research opportunities through a range of financial assistance vehicles and technology transfer tools.

To learn about the full range of DOE/EM's assistance programs, first call the EM Central Point of Contact (CPOC) at 1-800-845-2096. The EM CPOC is a referral and monitoring service that expedites and monitors private sector interaction with EM. The CPOC can identify links between industry technologies and program needs and provides potential partners with a connection to an extensive network of Headquarters and field program contacts.

Developers can also gain information on DOE's business and research opportunities by obtaining the U.S. Department of Energy Environmental Cleanup Technology Development Program Business and Research Opportunities Guide (DOE/EM-0115P). This Guide can be purchased from the National Technical Information Service by calling (703) 487-4650.

DOE/EM's largest assistance vehicles are Research Opportunity Announcements (ROAs) and Program R&D Announcements (PRDAs). ROAs solicit industry and academic proposals throughout the year for potential contracts in applied research. ROAs support research efforts for the development of technologies with potential application in the EM program. A proposed technology should improve DOE's capabilities in areas such as in situ remediation; characterization, sensors, and monitoring; efficient separations technology for radioactive waste; and robotics. ROAs are typically published in the *Commerce Business Daily* and include a partial set-aside for small businesses. DOE administers its only currently active ROA through its Morgantown facility. The agency anticipates making 25-30 awards this year through this ROA. **For more information on Morgantown's ROA, contact Thomas Martin, (304) 291-4087.**

PRDAs solicit a broad mix of proposals where R&D and demonstration, testing, and evaluation are required within broadly defined areas of interest. DOE can issue a PRDA in response to a specific program need (e.g., the need to cleanup a mercury contaminated facility). Multiple awards for proposals, which may have varied approaches or concepts, are generally made. Numerous PRDAs may be issued each year. DOE also provides financial assistance through the Small Business Innovative Research Program (also described in this Section) and the Small Business Technology Transfer Program.

DOE provides technical assistance through Cooperative R&D Agreements (CRADAs), and the Small Business Technology Integration Program, for example.

NAME: AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE INNOVATIVE TECHNOLOGY PROGRAM

Address: Air Force Center for Environmental Excellence (AFCEE)
Technology Transfer Division (ERT)
8001 Arnold Drive
Brooks AFB, TX 78235-5357
Contact: Ross N. Miller
Phone: (210) 536-4331
Fax: (210) 536-4330

The Air Force Center for Environmental Excellence (AFCEE) Innovative Technology Program was established to identify innovative technologies in the areas of site characterization, remediation, and pollution prevention. The program is based upon an annual solicitation under a Broad Agency Announcement for Technology Demonstration. The purpose of this effort is to field test innovative remedial or pollution prevention/control technologies, techniques that save money and time, and those that facilitate compliance with air, soil, and water regulatory requirements.

Areas of interest include, but are not limited to, the following: remediation technologies for soil and water contaminated with fuels, chlorinated solvents, pesticides, PCBs, and heavy metals; vapor phase capture and treatment; cost effective site characterization techniques; parts cleaning/degreasing; stripping/removal of protective coatings; and industrial process sludge treatment.

Successful projects have historically been those that satisfied the following criteria: the technology is based upon sound scientific principles; the proposed technology has widespread applicability across the Air Force; and the proposed technology represents a cost savings when compared to other technologies currently in use.

Types of contracts available to developers include: Cost Plus Fixed Fee; Cost Sharing; Cost Reimbursement; Cost Plus Incentive Fee; and Time and Materials.

Copies of the current solicitation announcement and a copy of the "BAA Guide to Industry" may be obtained from AFCEE/ERT or the contracting office HSC/PKV (Mark Rounsavill), (210) 536-4479.

NAME: SMALL BUSINESS INNOVATIVE RESEARCH PROGRAM

	U.S. EPA	Department of Energy	Department of Defense
Address:	401 M St., SW Washington, DC 20460	19901 Germantown Road Germantown, MD 20874	Small Business Affairs Washington, DC 20301
Contact:	Donald Carey	Samuel Barish	Robert Wrenn
Phone:	(202) 260-7445	(301) 903-3054	(703) 697-1481

The Small Business Innovative Research (SBIR) Program is a multi-media assistance program, focusing primarily on U.S.-owned, high-technology companies with 500 or fewer employees. SBIR activities are overseen by the Small Business Administration. Funding is provided to companies through grants or contracts awarded individually by SBIR program offices in 11 Federal agencies. Each agency offers at least one SBIR program solicitation per year specifying the types of research to be funded.

SBIR is a three-phased contract and grant program. In Phase I, contracts and grants are awarded in average amounts of $60,000 to $100,000 each for technology feasibility studies of six months or less. In Phase II, SBIR awards contracts and grants for one to two years of principal research and/or development, with contract and grant amounts ranging from $150,000 to $750,000, depending on the awarding agency. Only Phase I recipients are eligible for Phase II awards. Phase III funding assistance is provided either through commercial application with funding or sales from the private sector, or non-SBIR funding by the agency for further R&D of interest to the agency.

NAME: ENVIRONMENTAL TECHNOLOGY INITIATIVE

Address: U.S. Environmental Protection Agency
Office of Policy, Planning and Evaluation
(#2127)
401 M Street, SW
Washington, D.C. 20460

Contact: Brendan Doyle

Phone: (202) 260-2686

The EPA Environmental Technology Initiative (ETI) promotes the development, commercialization and use of environmental technology to improve environmental quality while fostering the creation of new jobs and businesses. EPA's Innovative Technology Council (ITC) coordinates ETI activities Agency-wide. The ITC works closely with a broad network of interested parties including other federal agencies, the environmental technology industry, non-profit groups, universities, state and local governments and others.

Plans are in place to set aside approximately $5 million in FY 95 to assist in the private sector commercialization of successful technology projects which have completed Phase 1 and Phase 2 of EPA's Small Business Innovative Research (SBIR) Program. Solicitations for this component of ETI are expected to be published in the Commerce Business Daily by November 1994. Areas of particular interest for FY 95 are In-situ subsurface treatment and Biotechnology.

FEDERAL ASSISTANCE PROGRAMS (cont'd)

NAME: THE ADVANCED TECHNOLOGY PROGRAM

Address: U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology
A430 Administration Building
Gaithersburg, MD 20899
Phone: 1-800-ATP-FUND (1-800-287-3863)
Fax: (301) 926-9524

The U.S. Department of Commerce's Advanced Technology Program (ATP) provides technology development grants and technical assistance on a cost sharing basis to single businesses or joint ventures conducting research and development of technologies with a significant potential for the stimulation of U.S. economic growth and improvement to the competitiveness of U.S. industry. The program, administered by the National Institute for Standards and Technology, strives to support high risk technologies that have the potential capability of positively impacting the Nation's economy.

ATP will fund development of laboratory prototypes and proof of technical feasibility, but not commercial prototypes or proof of commercial feasibility. Grant recipients have been in the areas of environmental technology, energy conservation, biotechnology, advanced materials, and high-performance computing, for example.

ATP awards up to $2 million, which must be applied to R&D costs only, over three years to individual firms. Joint ventures are not subject to the $2 million limit, but must provide more than 50 percent matching funds and can be funded for up to five years. Any eligible U.S. business, for-profit independent research organization, or industry-led joint venture may apply. Universities, government organizations, or non-profit, independent research organizations may be funded if part of a joint venture or as subcontractors to an eligible single applicant or joint venture.

NAME: ADVANCED RESEARCH PROJECTS AGENCY -- TECHNOLOGY REINVESTMENT PROJECT (TRP)

The mission of the TRP is to stimulate the transition to a growing, integrated, national industrial capability that provides the most advanced, affordable military systems and the most competitive commercial products. The TRP mission is accomplished through Technology Development (of dual-use product and process technologies), Technology Deployment (to establish links between existing technology capabilities for small and medium-sized businesses), and Manufacturing Education and Training.

In FY 1993 competition, the TRP selected 212 proposals for award negotiations for over $600 million in federal funds. Common requirements for all TRP efforts include defense relevance, specific partnership requirements, mandated 50% cost sharing, and competitive selection.

The initial FY 94 TRP package included a solicitation for environmental sensors. An additional FY 94 solicitation is planned. Additional information may be obtained by calling 1-800-DUAL USE (1-800-382-5873).

NAME: ***FINANCE AND INVESTMENT PROGRAMS***

Address: U.S. Small Business Administration
Office of Economic Development
409 Third Street, S.W.
Suite 8200
Washington, DC 20416
Contact: Mary Jean Ryan
Phone: (202) 205-6552
Fax: (202) 205-7230

The U.S. Small Business Administration (SBA) is an independent agency dedicated to fostering the growth and prosperity of small businesses. The Agency has numerous programs which can be useful to businesses in the development and commercialization of innovative technologies.

Within the newly-constituted Office of Economic Development, SBA has three major finance and investment programs that could be of help to innovative technology firms, including: (1) the Certified Development Company Loan Program (the "504" Loan Program); (2) the General Business Loan Program (the "7(a)" Loan Program); and (3) the Small Business Investment Company (SBIC) Program.

- The Certified Development Company Program (the 504 Loan Program) - provides long-term financing to small businesses. It makes loans available for fixed asset projects, such as those involving the acquisition of land, buildings, machinery and equipment, and/or those involving the building, modernizing, renovating or restoring of existing facilities and sites. This program cannot be used to provide working capital or inventory, consolidating or repaying debt, refinancing, or financing a plant not located in the U.S. or its possessions. An eligible business must be a for-profit corporation, partnership or proprietorship; its net worth cannot exceed $6 million, and its average net profit after taxes cannot exceed $2 million for the previous two years. **(For more information, contact Allan Mandel, Director, Office of Rural Affairs and Economic Development, (202) 205-6485.)**

- The General Business Loan Program (the 7(a) Loan Program) - provides guaranteed loans that are made by private lenders, usually banks, and guaranteed up to 90 percent by SBA.

  Interest rates are negotiated between the borrower and the lender, subject to SBA maximums. **(For more information, contact Sloan Coleman, Regulatory Specialist, (202) 205-6570.)**

- The SBIC Program - was created in 1958 to fill the gap between the availability of venture capital and the needs of small businesses in start-up and growth situations. SBICs are privately-owned and managed investment firms that are licensed and regulated by the SBA. They use their own funds to make venture capital investments in small businesses.

  Virtually all SBICs are profit-motivated businesses. They provide equity capital, long-term loans, debt-equity investments and management assistance to qualifying small businesses. Many investment companies seek out small businesses with new products or services because of the strong growth potential of such firms.

  SBA publishes a regularly updated directory listing all current SBIC licensees, which is available at the local SBA offices. **(For more information, contact Robert Stillman, Associate Administrator for Investment, (202) 205-6510.)**

Though the Washington, DC-based "contacts" are listed for each of these, both the 504 and the 7(a) loan programs are available at any of the SBA's more than 100 field offices.

NAME: THE SMALL BUSINESS DEVELOPMENT CENTER PROGRAM

Address: U.S. Small Business Administration
Office of Small Business Development Centers
409 Third Street, S.W.
Washington, DC 20416
Contact: Judith B. Dunn
Phone: (202) 205-7301
Fax: (202) 205-7727

The Small Business Development Center Program, administered through the U.S. Small Business Administration (SBA), is a cooperative effort of the private sector, the educational community, and Federal, state, and local governments.

The 57 Small Business Development Centers (SBDCs) provide management and technical assistance counseling services and training opportunities for present and prospective small business owners. SBDCs sponsor national innovation workshops designed to help innovators and developers of new technologies, entrepreneurs, and inventors bring their ideas to the marketplace. Several SBDCs have established separate Technology Assistance Programs to assist inventors, manufacturers, and other small businesses in the development and commercialization of environmental technologies.

SBDCs work with paid, private sector consultants, engineers, and testing laboratories to provide clients with specialized expertise. SBDC one-on-one counseling services are provided free of charge. However, clients may be charged a nominal fee for training workshops and conferences, and/or assistance in developing financial packages.

Small businesses seeking assistance should refer to Appendix I for a nationwide listing of SBDCs.

NAME: MINE WASTE TECHNOLOGY PILOT PROGRAM

Address: P.O. Box 3767
Butte, MT 59702
Contact: Creighton Barry
Phone: (406) 494-7268
Fax: (406) 494-7230

The mission of the Mine Waste Technology Pilot Program (MWTPP) is to advance the understanding, development, and application of engineering solutions to national environmental issues resulting from the past practices of mining and treating metallic ores. In accomplishing this mission, the MWTPP is developing and conducting a program that emphasizes technical management practices and treatment technology development, testing and evaluation at the bench and pilot-scale level, and an educational program that emphasizes training and technology transfer.

The MWTPP, funded by the U.S. EPA, is in its third year of operation and is continuing to test and evaluate technologies that will provide low-cost, permanent solutions to mineral waste problems. MSE, Inc., the DOE contractor in Butte, Montana, and the Montana College of Mineral Science and Technology are the performing organizations for the MWTPP.

NAME: THE SUPERFUND TECHNICAL LIAISON PROGRAM

Address: U.S. Environmental Protection Agency
Office of Science, Planning and
Regulatory Evaluation (H-8105)
Office of Research and Development
401 M Street, SW
Washington, DC 20460
Contact: Amy Mills
Phone: (202) 260-7667
Fax: (202) 260-0507

The Superfund Technical Liaison Program was created in 1990 jointly by the U.S. EPA's ORD and OSWER to expand the technical support available to Regional staff. It is managed within the Regional Operations Staff of ORD's Office of Science, Planning and Regulatory Evaluation (OSPRE) in EPA Headquarters.

Technical Liaisons are ORD senior scientists and engineers located in the EPA Regional hazardous waste offices. They interact on a daily basis with remedial project managers, on-scene coordinators, Regional management, and other hazardous waste personnel. The liaisons foster communications—especially the transfer of scientific and engineering products—between ORD laboratories and the Regions. They can provide developers with technical information on sites and technologies in the EPA Regions.

SUPERFUND TECHNICAL LIAISONS

Ruth Bleyler, Region 1
Waste Management Division
U.S. EPA (HSS-CAN7)
JFK Federal Building
Boston, Massachusetts 02203
(617) 573-5792

Jon Josephs, Region 2
ERRD, U.S. EPA
Room 13-100, 26 Federal Plaza
New York, NY 10278
(212) 264-8098

Norm Kulujian, Region 3
Hazardous Waste Management Division,
U.S. EPA
Office of Technology and Program Support
841 Chestnut Building (3HW01)
Philadelphia, PA 19107
(215) 597-1113

Stephen Mangion, Region 5
Office of Superfund, U.S. EPA
77 West Jackson (HSRLT-5J)
Chicago, IL 60604
(312) 353-7499

Robert Mournighan, Region 7
WSTM/SPFD, U.S. EPA
726 Minnesota Avenue
Kansas City, KS 66101
(913) 551-7913

Robert Stone, Region 8
Hazardous Waste Management Division,
U.S. EPA
Superfund Management Branch
999 18th Street, Suite 500
Denver, CO 80202-2466
(303) 294-7597

John Barich, Region 10
Technical Support Branch
Environmental Science Division, U.S. EPA
1200 Sixth Avenue
Seattle, WA 98101

NAME: THE NATIONAL TECHNOLOGY TRANSFER CENTER

Address: 316 Washington Avenue
Wheeling, WV 26003
Contact: Marketing Department
Phone: (304) 243-2456
Fax: (304) 243-2539

The National Technology Transfer Center (NTTC), housed at Wheeling Jesuit College, was established by Congress to strengthen the competitiveness of American industry by assuring that business has rapid access to marketable Federal technologies and by promoting collaboration between U.S. companies and Federal laboratories in the development and commercialization of technological products, processes, and services. NTTC addresses these goals by providing the following services:

- Gateway (1-800-678-6882) - Developers can call Gateway to locate laboratory contacts who can answer technical questions. Technology agents on Gateway will also provide callers with information on current and completed research and can help developers explore licensing opportunities and pursue CRADAs. Information Specialists will draw on the *Federal R&D Resource Information System* to address callers' questions. This system includes information on Federal R&D technologies, resources, facilities, and expertise available. It includes government databases describing research in progress, technical reports, and new technologies available for commercialization. NTTC's system also includes an updated electronic directory of Federal laboratories and technology resources.

- Business Gold - Provides users with information on Federal technologies and business opportunities at no cost. The database includes announcements of new Federal technologies available for licensing and development and solicitations and other technology transfer opportunities.

Developers can access Business Gold using a modem or through Internet Access directions are as follows:

- Dial-Up Bulletin Board
  - Set data bits to 7, stop bits to 1, parity to Even and emulation to vt100
  - 300-2400 baud modems dial (304) 243-2561
  - 9600 modems and higher dial (304) 243-2560
  - For help or more information, call: (304) 243-2570
  - First time sign-ons login as guest - no password required, or

- Internet Connection
  - Telnet to iron.nttc.edu (192.188.119.50)
  - Login as visitor, use your e-mail address for a password
  - For more information, refer to info@nttc.edu
  - All files are located in a public directory (/pub). Use anonymous ftp to transfer files or e-mail files to your own mailbox.

NTTC also implements an R&D Program and Technology Assessment program, through which a panel of industry representatives conduct technical evaluations of major Federal R&D activities. In addition, NTTC develops a range of training programs focused on technology transfer and enhancing local, state, and regional economic development.

STATE-DIRECTED ASSISTANCE RESOURCES

NAME: NEW JERSEY COMMISSION ON SCIENCE AND TECHNOLOGY

Address: 28 West State Street, CN832
Trenton, NJ 08625
Contact: David Hochman
Phone: (609) 984-1671
Fax: (609) 292-5920

The New Jersey Commission on Science and Technology is the State of New Jersey's agency for technology-based economic development. It funds grants for a series of Advanced Technology Centers, including the Hazardous Substance Management Research Center (Discussed in Section V, University-Affiliated Hazardous Waste Research Centers, of this guide) and its affiliated centers and technical assistance programs, based at the New Jersey Institute of Technology.

The Commission provides New Jersey small businesses participating in the Federal Small Business Innovative Research Program with technical and financial assistance to supplement funding between phases, and funds a small business assistance voucher program to enable small and medium-sized companies to procure R&D services on a small scale from the commission's programs.

The commission can assist larger or out-of-State companies/organizations by referring these organizations to technical contacts within the New Jersey university system and coordinating their interaction with these sources of technical assistance.

NAME: VIRGINIA's CENTER FOR INNOVATIVE TECHNOLOGY

Address: 2214 Rock Hill Road
Suite 600
Herndon, VA 22070
Contact: Jack Heinemann
Phone: (703) 689-3006
Fax: (703) 689-3041

Virginia's Center for Innovative Technology (CIT) is a non-profit corporation created by the Virginia General Assembly to foster the State's technological growth and competitiveness. CIT matches a company's needs with the R&D capabilities of Virginia university faculty researchers and laboratories. CIT provides immediate technology transfer and assistance to Virginia companies at no cost. The center strives to help developers initiate research within six weeks of contact with CIT.

CIT will match Virginia companies in need of technical assistance with university experts. CIT also responds to proposals for funding from these company and University pairs. CIT helps to pull technologies out of Federal laboratories so that they can be set up at private companies. CIT also works with universities to develop protocols, which can be sold at a low cost to Virginia small businesses.

CIT funds and conducts industry-driven research at the University of Virginia, Virginia Tech, Old Dominion University, Virginia Commonwealth University, George Mason University, and the College of William and Mary, and funds and operates technology development centers and institutes.

STATE-DIRECTED TECHNICAL ASSISTANCE/INFORMATION RESOURCES

NAME: ILLINOIS POLLUTION PREVENTION AND TECHNICAL ASSISTANCE PROGRAM

Address: Illinois Hazardous Waste Research and Information Center
1 East Hazelwood Drive
Champaign, IL 61820
Contact: Daniel Kraybill
Phone: (217) 333-8947
Fax: (217) 333-8944

The Illinois Pollution Prevention and Technical Assistance (PPTA) Program is administered through the Illinois Hazardous Waste Research and Information Center (HWRIC). HWRIC operates a T&E facility discussed in Section IV of this booklet. The ITA program acts as an intermediary among local Illinois businesses, technology developers, and regulatory agencies to reduce waste generation. The ITA program offers advice to technology developers and access to networks within the State's business community. Information is offered on the availability of innovative hazardous waste treatment technologies. Participation in this program may offer developers of innovative hazardous waste technologies the opportunity to apply their technology to actual hazardous waste sites in the State of Illinois.

NAME: CALIFORNIA REMEDIAL TECHNOLOGY ASSESSMENT PROGRAM

Address: Department of Toxic Substances Control
Site Mitigation Program
P.O. Box 806, HQ-12
Sacramento, CA 95812-0806
Contact: Mark Berscheid
Phone: (916) 322-3294
Fax: (916) 324-3107

The Remedial Technology Assessment Program (RTAP) was established to identify innovative treatment technologies and to match these technologies with appropriate sites in California for the purpose of performing site-specific demonstrations of these technologies.

RTAP will assist in locating sources of funding or incentives to participate in site-specific demonstration projects at California sites. The program may also issue variances instead of permits to developers as a means of expediting the application of their technology to specific sites.

NAME: ***CALIFORNIA CERTIFICATION PROGRAM (AB 2060) FOR HAZARDOUS WASTE ENVIRONMENTAL TECHNOLOGIES***

Address: Department of Toxic Substances Control
P.O. Box 806
Sacramento, CA 95812-0806
Contacts: Tony Luan, John Wesnousky
Phone: (916) 322-5244, (916) 322-2543
Fax: (916) 327-4494

A new law enacted by California Legislature, effective January 1, 1994, authorizes the California Department of Toxic Substances Control to certify the performance of hazardous waste environmental technologies. The certification program provides an in-depth, independent review of technologies at the manufacturers' level to facilitate regulatory and end-user acceptance and to promote growth of California's environmental technology industry.

The Program's regulatory certification process can streamline the California regulatory requirements associated with use of the technology as well as provide information on the technology's performance. Through the program's performance certification, the State will provide a high-quality evaluation of the efficacy and efficiency of a technology's performance. This certification can be used by the applicant to support marketing of their hazardous waste environmental technology. The results of a performance certification may also be used to provide information to regulatory agencies in support of a permit or other activity.

The Program only certifies technologies that do not pose a significant potential hazard to the public health and safety or to the environment when used under specified operating conditions and that can be operated with minimal maintenance and without specialized training. Incineration technologies are explicitly excluded from the certification program. Hazardous waste environmental technologies that may be certified include, but are not limited to, hazardous waste management technologies, site mitigation technologies, and waste minimization and pollution prevention technologies.

NAME: ***CALIFORNIA ENVIRONMENTAL TECHNOLOGY CENTER***

Address: 9500 Gilman Drive, 0241
La Jolla, CA 92093-0241
Contact: Ed Furtek
Phone: (619) 534-8400
Fax: (619) 534-8270

The California Environmental Technology Center (CETC) will accelerate the development and commercialization of innovative environmental technologies through cooperative efforts with industry, national laboratories, Federal and state government agencies, universities, private research institutions, and the environmental community. CETC was formed by the California Environmental Protection Agency and the University of California San Diego Scripps Institution of Oceanography (UCSD/SIO) and is funded by a $1.5 million grant from the California Environmental Protection Agency.

CETC is currently in the planning and implementation phase, with the objectives of this phase being to: assess the State's environmental research priorities, needs, and capabilities; design a State-wide organization with the ability to select and support appropriate environmental research, development, demonstration, and commercialization projects; develop basic and applied research programs in support of environmental technology for sustainable development; develop and implement technology transfer and commercialization services for the environmental technology industry; and identify potential sources of State, Federal, and private sector support for environmental technology initiatives. **CETC is also accessible via Internet cetc@ucsd.edu.**

NAME: ***MERRA***

Address: 2901 Hubbard Road
Suite B-106
Ann Arbor, MI 48105
Contact: Thomas Borton
Phone: (313) 930-0033
Fax: (313) 930-0145

MERRA is a non-profit, public/private venture of government, industry, research institutions, and academia. Waste treatment technology developers can benefit from MERRA's Specialty Business Development Center (SBDC), an industry-sponsored effort to provide business development assistance to Michigan proprietary technology-based small firms. MERRA-SBDC provides a variety of services to technology developers, including: Federal procurement assistance (e.g., providing information on R&D funding or grant applications); commercialization assistance (e.g., developing business plans or raising investment capital); and technology transfer (through collaborations with Michigan universities and Federal laboratories).

NAME: TECHCONN, TECHNOLOGY FOR CONNECTICUT, INC.

Address: University of Connecticut
Thames River Campus
401 West Thames Street (Route 32)
Stone House, Unit 1103
Norwich, CT 06360-7159
Contact: Cliff Neal
Phone: (203) 887-5225
Fax: (203) 889-7112

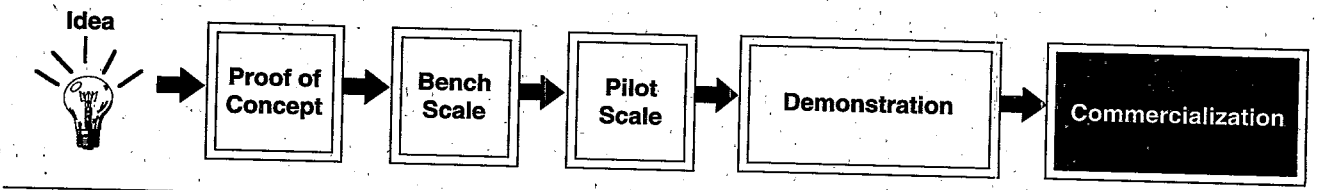
TECHCONN, Technology for Connecticut, Inc. is a grassroots private non-profit (501(c)(3)) corporation formed by volunteers from business, universities, government, service organizations, consulting firms, etc., in response to an anticipated downturn in the regional economy due to decreased defense income.

TECHCONN forms partnerships between Connecticut government, industry, labor, and education to develop new businesses and products through the demonstration and commercialization of new technologies. TECHCONN's projects advance technology, create jobs, improve Connecticut's economic competitiveness and environment, and provide social benefits.

TECHCONN's primary focus to date is on new clean power generation technologies to replace nuclear and fossil fuels, like hydrogen fuel cells and aero-derived gas turbines, in which Connecticut is an international leader. TECHCONN is also involved in clean vehicles, recycling, smart highways, and technology development and transfer. As one example, TECHCONN has developed a $30 million project to power clean hybrid electric vehicles with composite bodies and advanced batteries charged by a fuel cell fed by waste bio gas from the anaerobic digestion of municipal sewage sludge.

IV. INTERNATIONAL ASSISTANCE PROGRAMS

- International programs exist to assist developers of innovative hazardous waste treatment technologies.
- Programs focus on assisting developers at the commercialization stage and include assistance in understanding and accessing overseas markets.
- Programs exist to provide export financing support, loan guarantees, and insurance against a range of risks which may be encountered in foreign business endeavors.
- Conditions for assistance vary among programs.



NAME: OFFICE OF ENVIRONMENTAL TECHNOLOGIES EXPORTS (ETE)

Address: International Trade Administration
U.S. Department of Commerce
Room 4322
14th and Constitution Ave., NW
Washington, DC 20230
Contact: Catherine Vail
Phone: (202) 482-5225
Fax: (202) 482-5665

The Office of Environmental Technologies Exports (ETE) introduces export-oriented U.S. environmental technology companies to U.S. government trade development programs. These trade development programs provide developers access to information on high potential export markets and U.S. government activities related to emerging markets.

ETE can also direct developers to government export financing support programs and projects, such as the Export Import Bank, the Overseas Private Investment Corporation, the Trade and Development Agency, and multilateral development banks. In addition, ETE identifies sub-sector opportunities and requirements developers must address in order to compete for major procurement opportunities.

NAME: THE TRADE INFORMATION CENTER

Address: U.S. Department of Commerce
Room 7424
14th Street and Constitution Ave., NW
Washington, DC 20230
Contact: John Montgomery
Phone: 1-800-872-8723, 1-800-833-8723 TDD
Fax: (202) 482-4473

The Trade Information Center is a central access point for information on Federal export assistance programs that provide export counseling, international market research and trade leads, overseas and domestic trade events and activities, export financing, and advice on documentation and licensing requirements. The center is operated by the Trade Promotion Committee, which includes 19 Federal agencies responsible for international trade and export promotion.

The center provides callers with reports and statistics from the National Trade Data Bank that includes more than 10,000 government documents related to export production and international markets. In addition, the center advises businesses on upcoming conferences, trade missions and fairs offered in the U.S. and overseas by Federal, state, and local organizations.

NAME: OFFICE OF INTERNATIONAL TRADE

Address: U.S. Small Business Administration
409 3rd Street SW, 6th Floor
Washington, DC 20416
Contact: Irene L. Fisher
Phone: (202) 205-6720
Fax: (202) 205-7272

The Office of International Trade (OIT) provides export financing and business development assistance to established and prospective small business exporters. The Export Working Capital Program (EWCP) encourages lenders to "bank" small-business-exporter deals by significantly reducing the risk associated with the deals. The EWCP can support single transactions or multiple export sales. Under the program, the U.S. SBA can guarantee up to 85 percent of a private sector loan up to $750,000. Loan maturities are generally for 12 months, with two options to renew, for a total of 36 months. Guarantees can be extended for pre-shipment working capital, post shipment exposure coverage, or a combination of pre- and post-shipment financing.

OIT also works in cooperation with other Federal agencies and public and private-sector groups to encourage small business exports and to assist small businesses seeking to export. OIT's outreach efforts include sponsoring or supporting export training conferences and developing "how-to" and market-specific publications for exporters. OIT directs and coordinates SBA's ongoing export initiatives, such as the Export Legal Assistance Network and SBA's Automated Trade Locator Assistance System.

NAME: ENVIRONMENTAL TECHNOLOGY NETWORK FOR ASIA

Address: U.S. Agency for International Development (U.S. AID)
Center for Trade and Investment Services
Room 100, SA-2
Washington, DC 20523-0229
Contacts: Maria Chen, Brenda Walsh
Phone: (202) 663-2674, (202) 663-2759
Fax: (202) 663-2760

The Environmental Technology Network for Asia (ETNA), an initiative of the United States-Asia Environmental Partnership (US-AEP) and the Center for Trade and Investment Services of the U.S. AID, provides developers of energy and environmental technologies with trade leads from nine Asian countries. Once registered with ETNA's environmental trade opportunity database, environmental technology companies are electronically matched by ETNA engineers with needs for environmental services in Asia and notified of the opportunity via fax within 48 hours.

ETNA's environmental technology representatives provide information on specific products or services, payment and shipping terms, company contact person, and nature of environmental problem, as well as country-specific environmental trade and investment laws and polices. These technology representatives are located in the following nine locations:

- Bangkok, Thailand
- Hong Kong
- Kuala Lumpur, Malaysia
- Seoul, Korea
- Taipei, Taiwan
- Bombay, India
- Jakarta, Indonesia
- Manila, Philippines
- Singapore

NAME: THE OVERSEAS PRIVATE INVESTMENT CORPORATION

Address: 1100 New York Avenue, NW
Washington, DC 20527
Phone: (202) 336-8799 (OPIC InfoLine)
Fax: (202) 408-9859

The Overseas Private Investment Corporation (OPIC) assists American investors by financing businesses through loans and loan guarantees, insuring investments against a range of risks, and providing other investor services in 140 countries and areas worldwide.

OPIC supports, finances, and insures projects that have a positive effect on U.S. employment, are financially sound, and promise significant benefits to the social and economic development of the host country. Their assistance is available for new investments, privatizations, and for the expansion and modernization of existing plants sponsored by U.S. investors. Investments may take the form of conventional equity investments and loans, construction and service contracts, production sharing agreements, and leases, for example.

Callers can receive facsimiles of various OPIC documents by mailing requests to the above address or calling **OPIC FactsLine at (202) 336-8700**. Available documents include the Preliminary Application for Financing (OPIC Form 115, FactsLine request number 6902) and a Request for Registration for Political Risk Investment Insurance (OPIC Form 50, FactsLine request number 7902).

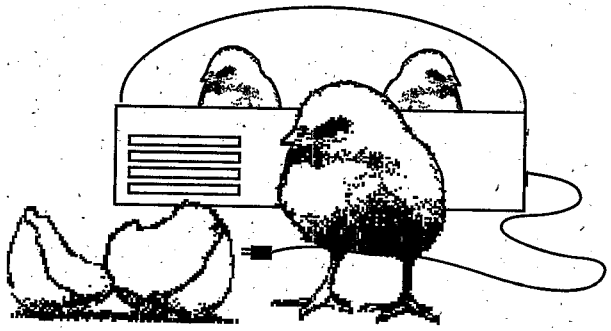
NAME: CALIFORNIA ENVIRONMENTAL TECHNOLOGY EXPORT PROGRAM

Address: Office of Pollution Prevention and
Technology Development
P.O. Box 806
Sacramento, CA 95812-0806
Contact: Tim Ogburn
Phone: (916) 445-2966
Fax: (916) 327-4494

The California Environmental Technology Export Program promotes the export of California environmental technologies internationally. The Export Program is a component of the California Environmental Partnership, which, under the leadership of California's Environmental Protection Agency and the Trade and Commerce Agency, promotes and assists in the development, manufacture, use, and export of environmental technologies, products, and services. The Partnership links the public and private sectors to enhance environmental and economic progress.

The Export Program supports the export of environmental technologies by acting as a clearinghouse of environmental trade information for domestic sellers and foreign buyers, performing market studies and soliciting technical advice to identify international opportunities, participating in technical exchange programs to enhance foreign buyer awareness, coordinating activities and foreign governments to maximize trade promotion and financial assistance opportunities, and leading or partnering with other agencies on trade missions.

V. TECHNOLOGY INCUBATORS AND TEST AND EVALUATION FACILITIES

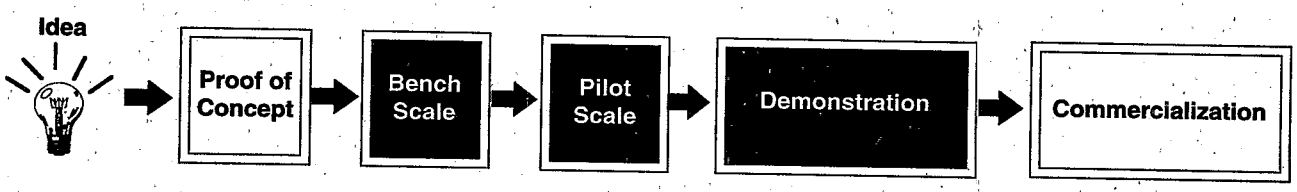


INCUBATORS

- **Business incubators provide:**
  - **Office space and equipment**
  - **Market services**
  - **Secretarial support**
  - **Business planning.**
- **Technology incubators may also provide:**
  - **Lab space and equipment**
  - **Analytical services**
  - **Permitting and regulatory assistance.**

TEST & EVALUATION (T&E) FACILITIES

- **T&E facilities provide permitted facilities and equipment for conducting technology tests or demonstrations at the lab, bench, or pilot scales.**
- **These facilities may also share personnel for independent technology testing and evaluation.**



Business Incubators

Business incubators play a significant role in helping infant businesses survive and grow. Business incubators are facilities that specialize in providing small businesses with office space and shared administrative support services, identifying sources of capital, performing market analyses, and assisting in business development. The National Business Incubation Association estimates that there are over 530 incubators in North America. For more information on business incubators, contact:

Dinah Adkins
National Business Incubation Association (NBIA)
20 East Circle Drive
Athens, OH 45701
(614) 593-4331

Technology Incubators

Some business incubators specialize in encouraging the development and commercialization of innovative technologies. These technology incubators provide a wide variety of services to developers of innovative hazardous waste treatment technologies at all stages of development. Some of these facilities, such as the National Environmental Technology Applications Corporation, also serve as test and evaluation facilities. In addition to general business support services offered by most incubators, technology incubators may offer:

- Permitting and regulatory assistance
- Laboratory space
- Analytical services
- Testing and evaluation facilities and expertise
- Technical expertise in many disciplines and experience in the hazardous waste industry, especially when affiliated with university research centers.

Test and Evaluation Facilities

T&E facilities offer services to technology vendors at the developmental and equipment demonstration stages. Federal, state, and private facilities generally have the necessary permits to allow testing on actual hazardous wastes at lab, bench, or pilot scales. T&E facilities may have "secondary containment" controls on emissions and effluents independent of those associated with the technology being evaluated, that offer a safe environment to test the limits of the technology. In addition, facilities may have the personnel and expertise to ensure that tests are conducted in accordance with appropriate analytical protocols. The opportunity to perform tests at one of these facilities can offer a developer independent validation of the technical performance of an innovative technology. This can facilitate marketability and commercial acceptance. The profiles of the test and evaluation facilities developed for this booklet were prepared from information provided by the facilities.

Technology Evaluation Programs

In addition to facilities and services, developers would benefit from information on testing procedures applicable to their technologies. EPA's ORD has developed generic treatability study guidance and is in the process of developing treatability study protocols for individual technologies. (For information on the availability of these protocols, contact Edward Bates ORD/RREL at (513) 569-7774.)

In addition, test and evaluation facilities may provide treatability study support to developers. Examples of such facilities and brief descriptions of the type of treatability study services they provide are included at the close of this Section.

Federal Test and Evaluation Facilities

NAME: ***U.S. EPA INCINERATION RESEARCH FACILITY***

Address: U.S. Environmental Protection Agency
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Contact: Robert Thurnau
Phone: (513) 569-7692
Fax: (513) 569-7549

The EPA Incineration Research Facility (IRF) is located on the grounds of the National Center for Toxicological Research (NCTR) in Jefferson, Arkansas. The IRF consists of 12,000 square feet of RCRA storage/treatment area, a Rotary Kiln pilot-scale incineration system, along with adjacent labs, offices, trailers, and outdoor support equipment. The IRF has a full RCRA Part B permit and a TSCA R&D permit for incineration research and is authorized by the State of Arkansas to perform research with alternate thermal and air pollution control technologies.

The consortium for Site Characterization Technology is a public-private venture led by EPA with other federal agencies to evaluate and demonstrate (in accordance with consensus-based protocols), and transfer information about innovative and alternative monitoring, measurement and site characterization technologies.

FEDERAL TEST AND EVALUATION FACILITIES (cont'd)

NAME: U.S. EPA SOLID AND HAZARDOUS WASTE RESEARCH FACILITY

Address: U.S. Environmental Protection Agency
5995 Center Hill Road
Cincinnati, OH 45224
Contact: Robert Landreth
Phone: (513) 569-7871
Fax: (513) 569-7879

The U.S. EPA Solid and Hazardous Waste Research Facility is designed to evaluate solid waste management technologies and hazardous waste remediation technologies at the bench and pilot-scales. The facility is operated by University of Cincinnati staff and is equipped to perform geo-technical, geo-chemical, biological, and geo-hydrological tests. The facility can accommodate technologies including but not limited to: delivery and recovery systems for in-situ site remediation, chemical stabilization and solidification, and computer-aided site characterization modeling. Hazardous waste treatment technology developers can obtain services from the facility including: testing and evaluation for validation of developer claims; short-term and long-term leach analyses; field evaluation; and program design and implementation for field testing. The facility currently operates under a 1,000 kg treatability exclusion from the State of Ohio.

NAME: U.S. EPA TEST AND EVALUATION FACILITY

Address: U.S. Environmental Protection Agency
T & E Facility
Cincinnati, OH 45268
Contacts: EPA - Francis L. Evans, III
ITEP - Radha Krishnan
Phone: (513) 569-7050
Fax: (513) 569-7052

The U.S. EPA T&E Facility was constructed in 1979 to accommodate a broad spectrum of approaches for treating wastewater. However, the RCRA-permitted facility can perform research and testing for hazardous waste treatment. The facility is managed under contract by the operational support contractor IT Environmental Programs, Inc. The facility contains a 24,000 square foot high-bay experimental area, on-site analytical chemistry laboratories, chemical storage areas, hazardous waste storage facilities, liquid pumping systems, and two 5-ton bridge cranes. The facility's research capabilities are accessible to other government agencies, as well as to private industry and developers.

NAME: DEPARTMENT OF DEFENSE/NATIONAL ENVIRONMENTAL TECHNOLOGY DEMONSTRATION PROGRAM

The DOD/National Environmental Technology Demonstration Program is an Air Force, Army, Navy, and EPA effort to establish a coordinated environmental technology testing and evaluation program. Areas of responsibility are divided among the services and EPA.

The Air Force is developing the Experimental Controlled Release Site, where research can be conducted on the transport of dense nonaqueous phase liquid (DNAPL) contamination in ground water and where remediation technologies for DNAPLs in soil and ground water can be demonstrated.

The Army Environmental Technology Evaluation Center will provide characterized locations for test and evaluation of physical, chemical, and biological remedial technologies for soils, sediment, ground water, and surface water contaminated with energetics and heavy metals.

The Navy's Environmental Technology Demonstration Site for Advanced Fuel Hydrocarbon Remediation Technologies will provide locations to demonstrate remediation technologies for the treatment of Navy-specific fuels contamination.

EPA, through the University of Michigan, is developing the National Center for Bioremediation Research and Development at Wurtsmith Air Force Base in Oscoda, MI, which will provide a controlled field test-bed facility for conducting the investigations required to develop, evaluate, and establish a general basis for the design and engineering of integrated bioremediation systems. The project focuses principally on in-situ remediation of surface soils, subsoils, surface waters, and ground water contaminated by organic materials.

EPA's Consortium for Site Characterization Technology will identify, evaluate, demonstrate, and transfer information about innovative and alternative monitoring, measurement, and site characterization technologies.

DOD/National Environmental Technology Demonstration Program Contacts

Air Force Experimental Controlled Release Site
Mark H. Smith, Ph.D.
AL/EQW
139 Barnes Drive, Suite 2
Tyndall AFB, FL 32403-5323
(904) 283-6290

Army Environmental Technology Evaluation Center
Theodore Ruff
USAEC, SFIM-AEC-TSD
APG, MD 21010-5401
(410) 671-1560

Consortium for Site Characterization Technology
Eric Koglin
U.S. EPA EMSL-LV
P.O. Box 93478
Las Vegas, NV 89193-2478
(702) 798-2432

Navy Environmental Technology Demonstration Site for Advanced Fuel Hydrocarbon Remediation Technologies
Ernest Lory
NFESC, ESC-411
560 Center Drive
Port Hueneme, CA 93034-4328
(805) 982-1299

National Center for Bioremediation Research and Development
Walter J. Weber, Jr., Ph.D.
181 EWRE Building
The University of Michigan
Ann Arbor, MI 48109-2125
(313) 763-2274

NAME: THE CENTER FOR ENVIRONMENTAL TECHNOLOGY IN OAK RIDGE, TENNESSEE

Address: 900 Tricounty Blvd.
Oliver Springs, TN 37841
Contact: S.A. Meacham
Phone: (615) 435-3179
Fax: (615) 435-3738

The Center for Environmental Technology (CET) in Oak Ridge, Tennessee provides a fully integrated system for accelerated evaluation, development, commercialization, and public acceptance of creative environmental solutions. In an effort to accomplish this goal, CET links private sector technology users and suppliers with the U.S. DOE and other government agencies in order to produce, deploy, and apply environmental clean-up solutions that are cost effective, innovative, safe, and environmentally viable.

CET provides technical services, facilities, and demonstration sites to expedite and make more cost-effective regulatory, contracting, and related operations. To this end, CET provides access to the Oak Ridge Complex, which makes the following resources available to developers:

- A variety of environmental challenges for demonstration opportunities
- More than 3,000 environmental scientists, engineers, technicians, and regulatory experts
- The Oak Ridge National Laboratory resources
- Venue control and security in laboratories.

NAME: WES HAZARDOUS WASTE RESEARCH CENTER

Address: U.S. Army Engineer Waterways
Experiment Station
3909 Hall Ferry Road
Vicksburg, MS 39180
Contact: Norman Francingues
Phone: (601) 634-3703
Fax: (601) 634-3833

The Hazardous Waste Research Center (HWRC) is part of the larger U.S. Army Engineer Waterways Experiment Station (WES). WES offers a full service testing and evaluation facility with safety equipment, a high-bay testing area, and a fully equipped analytical lab including state-of-the-art instrumentation for ultra low-level chemical analysis. In addition to extensive analytical equipment and facilities, the HWRC has technical personnel with research experience in a variety of hazardous waste treatment technology types. WES has been involved in best demonstrated available technology (BDAT) development work for EPA and has conducted treatability testing at Federal facility sites. In addition, WES is capable of conducting/assisting in treatability testing for other Federal agencies on a cost reimbursement basis and is currently working with several private companies under CRADAs to expedite transfer of remediation technologies to the commercial/private sector. WES is currently permitted by U.S. EPA and the State of Mississippi under RCRA to perform storage and treatment of most listed and characteristic hazardous wastes in conjunction with research and development studies conducted on-site.

Other Technology Incubator and Test and Evaluation Facilities

NAME: THE SAVANNAH RIVER RESEARCH CAMPUS

Address: 2120 Williston Road
Aiken County, SC 29802
Contact: Lynn Phillips
Phone: (803) 642-2012
Fax: (803) 642-2124

The Savannah River Research Campus is a 422-acre technology park under development in Aiken County, South Carolina, adjacent to the Savannah River Superfund Site. The research center will provide office space, research laboratories, and incubator space in support of research and incubator activities and will span 47,000-square feet. The research center will be occupied by the Department of Energy, Westinghouse, and the South Carolina Research Authority, with the Advanced Analytical Center for Environmental Services locating on the campus in the near future. The Savannah River Site is already the location of environmental developments ranging from hydrogen to robotics to advanced environmental technology and is assisting companies in their efforts to solve manufacturing and maintenance problems and to form partnerships in developing and demonstrating technologies.

NAME: THE ILLINOIS INSTITUTE OF TECHNOLOGY RESEARCH INSTITUTE

Address: IIT Research Institute
Energy and Environmental Sciences
Chicago, IL 60616-3799
Contact: Gug Sresty
Phone: (312) 567-4232
Fax: (312) 567-4286

The Illinois Institute of Technology Research Institute (IITRI), Energy and Environmental Services is designed to encourage cooperation among its 300 member research scientists at the main campus of the Illinois Institute of Technology and the 400 additional scientists at satellite campuses. Specific IITRI services available to developers of hazardous waste treatment technology include professional testing and evaluation, technology development planning assistance, and services for matching innovative technologies with actual site needs. IITRI evaluates innovative technology independently under confidential conditions, and conducts professional testing to verify developer claims.

OTHER TECHNOLOGY INCUBATOR AND TEST AND EVALUATION FACILITIES (cont'd)

NAME: ILLINOIS HAZARDOUS WASTE RESEARCH AND INFORMATION CENTER

Address: Illinois Department of Energy and Natural Resources
1 East Hazelwood Drive
Champaign, IL 61820
Contact: David Thomas
Phone: (217) 333-8940
Fax: (217) 333-8944

The Hazardous Waste and Research Information Center (HWRIC) located on the University of Illinois, Urbana-Champaign campus, was created by Illinois State legislation to support research and development on hazardous waste prevention, treatment, and remediation technologies. The facility accommodates researcher and vendor work at the large bench and small pilot-scales.

Research - The center awards approximately $1 million annually to sponsor five categories of research. These categories include waste characterization and assessment, waste reduction and pollution prevention, waste treatment, disposal, and remediation, environmental processes and effects, and risk assessment and policy analysis. Proposals are solicited on an annual cycle during late fall and winter. Funding for research projects that are selected averages approximately $75,000 per year.

Industry and Technical Assistance Program - (Discussed in Section III, Assistance Programs, of this guide.)

Lab Services Program - The 22,000 square foot Hazardous Materials Laboratory houses a pilot scale, high-hazard and two treatability laboratories for working with industry and technology developers on waste reduction and treatment projects. The lab also has a full range of analytical support capabilities. It can accommodate technologies up to approximately tractor trailer size. Developers are currently authorized to conduct up to 1,000 kg treatability studies. The program uses $100,000 of the center's research funds to provide testing assistance on pollution prevention technologies and techniques.

NAME: NATIONAL ENVIRONMENTAL TECHNOLOGY APPLICATIONS CENTER

Address: University of Pittsburgh Applied Research Center
615 William Pitt Way
Pittsburgh, PA 15238
Contact: Robb Lenhart
Phone: (412) 826-5511
Fax: (412) 826-5552

The National Environmental Technology Applications Center (NETAC) was created in 1988 through a Cooperative Agreement with U.S. EPA as a subsidiary of the University of Pittsburgh Trust. It utilizes the resources and experience of industry, government, and academia to assist clients in the development and commercialization of innovative technologies. NETAC staff are engineers, scientists, and businessmen trained to assist in the development of more affordable and effective environmental technologies. NETAC services include: financial assessments; technology assessments; market analyses; testing and evaluation; permitting, regulatory, and legal assistance; and commercialization assistance.

NAME: NATIONAL DEFENSE CENTER FOR ENVIRONMENTAL EXCELLENCE

Address: National Defense Center for Environmental Excellence
11450 Scalp Avenue
Johnstown, PA 15904
Contact: Dale Denny
Phone: (814) 269-2432
Fax: (814) 269-2798

In 1990, the Department of Defense (DOD) established the National Defense Center for Environmental Excellence (NDCEE) in Johnstown, PA, to lead and support DOD facilities and the associated industrial base in adopting a comprehensive approach to pollution prevention, and to address other high priority environmental issues. The NDCEE is operated by Concurrent Technologies Corporation (CTC), a non-profit institution. DOD encourages CTC to offer its pollution prevention services to the U.S. private industry to improve its competitiveness in the global economy.

The NDCEE, through CTC, identifies, evaluates, demonstrates, and transitions environmentally-acceptable manufacturing processes to its client base, and provides related information services. NDCEE's other focus areas include: environmental restoration; waste minimization; waste management; materials recycling; risk assessment; and medial waste management. A key resource is a 185,000 square foot Demonstration Factory, which incorporates production-scale, state-of-the-art equipment that enables the NDCEE to perform process demonstrations, validations, education, and training activities.

Other Technology Incubator and Test and Evaluation Facilities (cont'd)

NAME: WESTERN NEW YORK TECHNOLOGY DEVELOPMENT CENTER

Address: University of Buffalo Incubator
Baird Research Park
1576 Sweet Home Road
Amherst, NY 14228
Contact: Robert Martin
Phone: (716) 636-3626
Fax: (716) 636-3630

The mission of the Western New York Technology Development Center (TDC) is to promote technical business creation and expansion, primarily for the five western counties of New York. The TDC, located adjacent to the State University of New York at Buffalo, has established a working relationship, especially for technical assistance, with the New York Center for Hazardous Waste Management. The TDC-managed University of Buffalo Incubator provides both physical space and essential start-up services for new technical business ventures. The center is a 40,000 square foot facility, which accommodates activities requiring up to 2,500 square feet of space. The facility is outfitted with wet laboratories and central services including compressed air, vacuum natural gas, and distilled water. In addition, the center provides a full range of services, including capital resources. Environmental health and safety services are provided through the University at Buffalo. Prospective developers are required to submit a business plan or a research plan.

NAME: THE UNIVERSITY OF WYOMING - CENTER FOR ENVIRONMENTAL SIMULATION STUDIES

Address: P.O. Box 3354
Room 6012, Ag. "C"
Laramie, WY 82071
Contact: Lee A. Bulla, Jr.
Phone: (307) 766-2170
Fax: (307) 766-3875

The University of Wyoming (UW) - Center for Environmental Simulation Studies (CESS) offers developers a five-story environmental simulation laboratory (ESC) consisting of 24 feet long, 20 feet wide, and 10 feet deep concrete lysimeter where large soil embankments can be built and has also developed detailed plans to construct four additional ESL laboratories. Rainfall, stream flow, ground water, sunlight, plant life cycles, and climate can be simulated in the existing ESL, which is covered by an environmental chamber.

The existing and planned ESLs allow for the systematic testing of technologies without the initial cost and monitoring difficulties often encountered with large-scale field trials. Using the ESL, developers can acquire high quality results through a range of operating conditions and conducted at a scale between bench, laboratory, and field studies. Contained testing, such as that at CESS, is often cost effective, timely, and offers a lower risk than field testing. The UW also provides developers access to other support facilities and technical expertise.

NAME: NATIONAL ENVIRONMENTAL WASTE TECHNOLOGY TESTING AND EVALUATION CENTER

Address: P.O. Box 3767
Butte, MT 59702
Contact: Creighton Barry
Phone: (406) 494-7268
Fax: (406) 494-7230

The National Environmental Waste Technology Testing and Evaluation Center uses the facilities and capabilities of the U.S. DOE Component Development and Integration Facility, Montana College of Mineral Science and Technology, and Montana Technology Companies. Full testing and evaluation services are available in laboratory-, bench-, pilot-, and demonstration-size facilities, including a fully equipped analytical laboratory and environmental monitoring and support facilities. In addition to analytical equipment and facilities, access is available to more than 300 personnel with research, development, testing, operating and evaluating experience in mining and hazardous waste treatment technology.

The center also has access to the largest Superfund site in the country, and to the Berkeley Pit that contains approximately 22 billion gallons of ground water contaminated with metallic and inorganic acid mine drainage.

NAME: THE TENNESSEE INNOVATION CENTER

Address: 1055 Commerce Park Drive
Oak Ridge, TN 37830
Contacts: Tom Valunas, Mel Koons
Phone: (615) 482-2440
Fax: (615) 483-0941

The Tennessee Innovation Center (TIC) is a wholly-owned subsidiary of Martin Marietta Corporation. It was established to encourage industrial development in the Oak Ridge, Tennessee area through equity investment in start-up companies. In addition to providing equity capital, TIC maintains a staff of professionals who are available to assist their client companies' management.

OTHER TECHNOLOGY INCUBATOR AND TEST AND EVALUATION FACILITIES (cont'd)

NAME: HAZEN RESEARCH, INC.

Address: 4601 Indiana Street
Golden, CO 80403
Contacts: Barry Hansen, Rod Hodgson
Phone: (303) 279-4501
Fax: (303) 278-1528

Hazen Research, Inc. has over 75,000 square feet of offices, laboratories, pilot plants and demonstration plants for the custom development and design of separation processes. Hazen has expertise with the following technologies: thermal processing, soil washing, materials handling, water treatment, leaching, and recovery from solution, particularly for metals. In addition, Hazen provides waste characterization, commercial analytical services, process engineering and feasibility studies to its clients.

Hazen has capabilities to investigate and develop process technology for a wide range of wastes. Hazen undertakes treatability testing on RCRA regulated waste under the treatability exemption and is also licensed to conduct treatability testing on TSCA regulated waste. In addition, Hazen has a Radioactive Materials License.

NAME: KIBER ENVIRONMENTAL SERVICES, INC.

Address: 3786 Dekalb Technology Parkway
Atlanta, GA 30340
Contacts: Neville Kingham, Tom Harper
Phone: (404) 455-3944
Fax: (404) 451-0155

Kiber Environmental Services, Inc. provides bench scale treatability testing for a wide variety of treatment technologies. These include, but are not limited to: solidification, stabilization, fixation; soil washing/flushing; biological treatment (anaerobic and aerobic); vapor extraction; sludge dewatering; water/wastewater treatment; and thermal treatment (low and high).

Kiber has also designed and operated numerous pilot and full scale treatment systems and remains abreast of innovative treatment technologies and demonstration projects through their support of the U.S. EPA's SITE program and the Superfund Technical Assistance Participant Response Team program.

Kiber complies with RCRA requirements for treatability studies, has a variance from the State of Georgia that permits the company to perform bench-scale treatability studies within the State, and holds a TSCA permit to perform treatability studies on wastes contaminated with PCBs.

NAME: INTERNATIONAL TECHNOLOGY CORPORATION

Address: Technology Development
312 Directors Drive
Knoxville, TN 37923
Contacts: Ed Alperin, Joe McLaughlin
Phone: (615) 690-3211
Fax: (615) 694-9573

International Technology (IT) Corporation offers services to treatment technology developers to assist them in promoting the development and commercialization of their products.

IT's facilities include two 16,000-square foot laboratories, one in Knoxville, TN and a second in Oak Ridge, TN. These facilities are licensed and permitted for conducting treatability testing at bench- and pilot-scale for hazardous, radioactive, and mixed wastes. In addition to these facilities, IT has a 5,000-square foot facility dedicated to biological treatability studies.

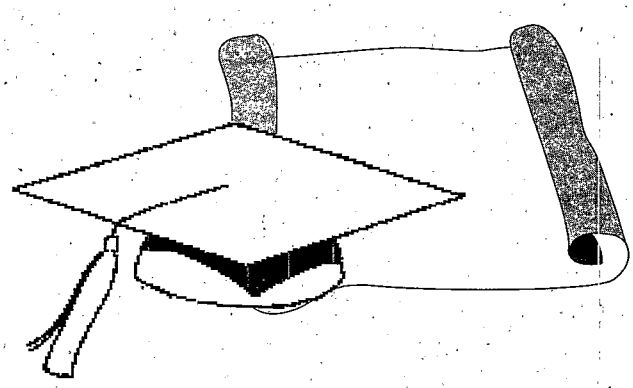
IT's experience in treatability testing includes the preparation of treatability study work plans (TSWP), preparation and performance of treatability studies, and preparation of treatability study reports (TSR), all in compliance with U.S. EPA guidance. These tasks are completed in accordance with established QA/QC, health and safety, and radiation protection programs that meet appropriate U.S. EPA, Occupational Safety and Health Administration (OSHA), and state radiation protection requirements. Regulatory-approved treatability study programs have included technologies such as stabilization, vitrification, thermal desorption, incineration, soil washing, soil flushing, chemical extraction, air stripping, biotechnologies, waste water treatment, ion exchange, and carbon adsorption. After evaluations are performed, IT has the technical and professional capabilities to improve technology processes based on analytical findings. Both facilities have licenses to perform treatability studies on RCRA, TSCA, and radioactive or mixed wastes.

NAME: OHM REMEDIATION SERVICES CORPORATION

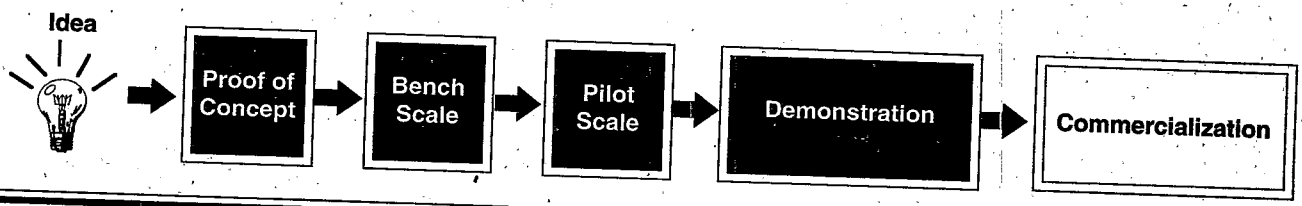
Address: 1990 N. California Boulevard
Suite 400
Walnut Creek, CA 94596
Contact: Dwight Gemar
Phone: (510) 256-6100
Fax: (510) 256-6111

OHM Remediation Services Corporation offers testing and evaluation and research services to developers of innovative treatment technology. Possible arrangements with OHM include professional tests and evaluations, collaborative research efforts by OHM and developers, and joint agreements whereby OHM and developers can team to license a technology and promote its commercialization. OHM emphasizes biological and thermal treatment processes. In addition, OHM is currently experimenting with soil washing and other treatment technologies. OHM also performs treatability studies and analytical research at its laboratory facilities in Findley, Ohio where it has a full RCRA Part B permit as well as a TSCA permit. OHM is staffed with technology research experts and performs on-site remediation testing.

VI. UNIVERSITY-AFFILIATED HAZARDOUS WASTE RESEARCH CENTERS



- **Centers enable developers to obtain multi-disciplinary technical expertise on an as-needed basis through:**
  - **Consulting support**
  - **Basic and applied research.**
- **The university-affiliated research centers are frequently less expensive than maintaining in-house expertise or procuring commercial services.**
- **These and other university research centers have been a source of many innovative technologies.**



University-affiliated research centers are an important source of both basic and applied research. The multi-disciplinary faculty and graduate students accessible through these research centers can provide scientific and engineering assistance to developers. These centers can also provide support for addressing associated technology requirements such as materials handling and emission controls.

EPA established the Hazardous Substance Research Centers (HSRCs), mandated by the 1988 amendments to Superfund, which include five competitively-awarded grants to consortia of universities including 23 member schools. These 9-year grants support diverse research and technology transfer and training activities addressing the priority problems of hazardous substance management in their geologic areas of concern. The centers are distributed across the country, based on pairs of EPA Federal Regions. Each of the HSRCs is discussed in this Section. Additional informational on the HSRCs is available from EPA's Office of Exploratory Research, (202) 260-7454.

In addition to EPA-funded research centers, many universities across the country have hazardous waste treatment expertise. This Section provides a partial list of universities that have identified themselves as having expertise in this area.

Hazardous waste treatment is a rapidly growing and evolving field. There are many universities that may be able to provide assistance in hazardous waste treatment research. Developers are encouraged to contact other universities, in addition to those listed in this booklet.

EPA-Funded Hazardous Waste Research Centers

NAME: NORTHEAST HAZARDOUS SUBSTANCE RESEARCH CENTER

Address: Northeast Hazardous Substance
Research Center
New Jersey Institute of Technology
Newark, NJ 07103
Contact: Richard Magee
Phone: (201) 596-3006
Fax: (201) 802-1946

The Northeast Hazardous Substance Research Center (NHSRC) supports EPA Regions 1 and 2. The center's programs focus on the development and demonstration of remediation and treatment technologies. In particular, the center concentrates on in-situ remediation techniques and incineration.

Participating institutions: the New Jersey Institute of Technology (NJIT), Massachusetts Institute of Technology, Princeton University, Rutgers University, Stevens Institute of Technology, Tufts University, and the University of Medicine and Dentistry of New Jersey.

NJIT also serves as the lead institution for the Hazardous Substance Management Research Center (HSMRC), funded by the National Science Foundation and composed of many of the same institutions. The HSMRC performs research in hazardous waste treatment and administers New Jersey's Innovation Partnership (IP) Grant Program. IP provides funding to private developers for research at the HSMRC. Developers must match the funds provided through IP.

NAME: GREAT LAKES AND MID-ATLANTIC HAZARDOUS SUBSTANCES RESEARCH CENTER

Address: The University of Michigan
Suite 181
Environmental and Water Resources
Engineering Building
Ann Arbor, MI 48109-2125
Contact: Walter Weber, Jr.
Phone: (313) 763-1464
Fax: (313) 763-2275

The Great Lakes and Mid-Atlantic Hazardous Substance Research Center serves EPA Regions 3 and5. The center's research program focuses on remediation technologies for sites contaminated with organic pollutants by integrating bioremediation with complementary chemical and physiochemical technologies. The center focuses on four general areas of research: biodegradation and bioventing; remediation of NAPLs in the saturated zone; remediation of soluble/sorbed contaminants in the saturated zone; and field research studies. This basic research agenda will move into field studies with the establishment of the National Center for Integrated Bioremediation Research and Development at Wurtsmith Air Force Base, Oscoda, Michigan. A second field study site is located in St. Joseph, Michigan analyzing the lake-aquifer interface and the intrinsic bioremediation of chlorinated solvents.

The center can offer technical assistance to developers interested in in-situ bioremediation technology, as well as a field study site for collaborative work at Oscoda, Michigan. Other technology transfer activities include the publishing of research, production of a scientific journal entitled *Synergos*, and information outreach and exchange among other centers, state agencies, consultants, and the interested public.

Participating Institutions: the University of Michigan, Michigan State University, and Howard University.

EPA-Funded Hazardous Waste Research Centers (cont'd)

NAME: SOUTH AND SOUTHWEST HAZARDOUS SUBSTANCE RESEARCH CENTER

Address: 3418 CEBA Building
Louisiana State University
Baton Rouge, LA 70803-6421
Contact: Louis J. Thibodeaux
Phone: (504) 388-6770
Fax: (504) 388-5043

The South and Southwest Hazardous Substance Research Center conducts research on hazardous substance problems unique to Regions 4 and 6, (e.g., wood treating wastes) and is focused on contaminated sediment (CS) and dredged material (DM) research with project themes. Themes within these focus areas include contaminant transport and transformation processes, management and control of remediation technology, ecological effects and exposure levels of sensitive receptors, and human exposure to chemicals in CS and DM. In addition to research, the center conducts training and technology transfer activities (e.g., regulatory conferences, newsletters, and technology briefs).

Participating Institutions: Louisiana State University, Georgia Institute of Technology, and Rice University.

NAME: NATIONAL CENTER FOR GROUND WATER RESEARCH

Address: Energy and Environmental
Systems Institute
Rice University
P.O. Box 1892
Houston, TX 77251-1892
Contact: C.H. Ward
Phone: (713) 527-4086
Fax: (713) 285-5948

The focus of NCGWR is to conduct interdisciplinary, exploratory research to elucidate the behavior of synthetic organic chemicals in the subsurface. The center, a university consortium, conducts research, training, and technology transfer needed for ground water quality protection and restoration. The goal of the consortium is to conduct an interactive and focused multi-disciplinary research program that contributes to the basic science and methodologies needed to achieve risk reduction through protection and restoration of ground water resources. The center's investigators have contributed to the development of models for chemical transport analysis, contamination potential of chemicals, and decision-support systems for the application of chemical transport models.

Participating Institutions: Rice University, the University of Oklahoma, Oklahoma State University, and the University of Texas at Austin.

NAME: ***GREAT PLAINS — ROCKY MOUNTAIN HAZARDOUS SUBSTANCE RESEARCH CENTER***

Address: 101 Ward Hall
Kansas State University
Manhattan, KS 66506-2502
Contacts: Larry Erickson, Stanley Grant
Phone: (913) 532-6519, (913) 532-7495
Fax: (913) 532-5985

The Great Plains-Rocky Mountain Hazardous Substance Research Center was established to conduct research on environmental concerns in EPA Regions 7 and 8. The center focuses on identification, treatment, and remediation of hazardous substances in agriculture, forestry, mining, mineral processing, and other industries as well as waste minimization related to these industries. The center also provides technology transfer assistance and training. Training initiated this year is being completed in conjunction with Native American colleges and other minority institutions. **Developers can reach the Center's Technical Assistance Hotline by calling 1-800-798-7796.**

Kansas State University, which serves as the lead institution for the center, also houses the Kansas State University Center for Hazardous Substance Research. Kansas' center focuses its research on environmental contamination in ground water and soils resulting from spills, leaking tanks, agricultural residue, solid waste disposal, and surface water pollutants. In addition, Kansas' center conducts training related to the manufacture, disposal, and transport of hazardous substances.

Participating Institutions: Kansas State University, Montana State University, South Dakota State University, the University of Iowa, the University of Missouri System, the University of Montana System, the University of Nebraska System, the University of Utah, and Utah State University.

EPA-Funded Hazardous Waste Research Centers (cont'd)

NAME: WESTERN REGION HAZARDOUS SUBSTANCE RESEARCH CENTER

Address: Department of Civil Engineering
Stanford University
Stanford, CA 94305-4020
Contact: Perry McCarty
Phone: (415) 723-4131
Fax: (415) 725-8662

The Western Region Hazardous Substance Research Center services EPA Regions 9 and 10. The primary research focus for the center is to support the development of alternative and advanced physical, chemical, and biological processes for treating hazardous substances in the surface and subsurface environments. A major focus of the center's research program is in ground water treatment and remediation of subsurface contamination.

Participating Institutions: Stanford University, and Oregon State University.

NAME: GULF COAST HAZARDOUS SUBSTANCE RESEARCH CENTER

Address: Lamar University
P.O. Box 10613
Beaumont, TX 77710
Contact: Tom Pinson
Phone: (409) 880-8768
Fax: (409) 880-2397

The Gulf Coast Hazardous Substance Research Center (GCHSRC) was established under the Superfund Amendments and Reauthorization Act of 1986. It is funded by the U.S. EPA, the State of Texas, and Industrial Associates. The purpose of the center is to conduct research to aid in more effective hazardous substance response and waste management throughout the Gulf Coast through waste minimization and alternative technology development. In its support of 50 to 70 research projects annually, 80 percent of the center's program is concentrated on waste minimization and innovative waste treatment technology development and 20 percent of the effort is directed toward technology supporting activities. The center also supports an Information and Technology Transfer Program and the Gulf Coast Environmental Library.

GCHSRC's Information and Technology Transfer Program (I&TT) is responsible for improving the dissemination of the information and technologies resulting from the center's research. The Gulf Coast Environmental Library was established in 1991. It exists to serve business and industrial clients in their environmental information needs, including text of new Federal and state regulations, samples of industrial waste minimization efforts, and copies of EPA test methods. The library is also available for use by researchers, faculty, students, and the public.

Participating Institutions: Lamar University - Beaumont, Louisiana State University, Mississippi State University, Texas Engineering Experiment Station/Texas A&M University, the University of Alabama, the University of Central Florida, and the University of Houston.

University-Affiliated Hazardous Waste Research Centers

NAME: UNIVERSITY OF CALIFORNIA, LOS ANGELES

Address: Center for Clean Technology
7440 Boelter Hall
405 Hilgard Avenue
Los Angeles, CA 90024-1600
Contacts: Dan Wahlam, William Kastenberg
Phone: (310) 206-3071
Fax: (310) 206-3906

The Center for Clean Technology, founded in 1990, employs a focused, multi-disciplinary approach to meeting pressing environmental challenges. The goal of the center is to create a science, engineering, and human resource base for the design of clean, economically competitive technologies.

The center brings together engineering and applied science research programs in six areas: pollution prevention; thermal treatment; wastewater treatment; multimedia transport and transformation; remediation and restoration; and risk and systems analysis for the control of toxics. Over 30 investigators are involved in more than 50 research projects.

In addition to collaborative projects, the center's technology transfer and outreach efforts include an Industrial Affiliates Program and workshops, newsletters, and technical advisory committee meetings. **More information is available via e-mail to "cc@seas.ucla.edu".**

NAME: CARNEGIE MELLON UNIVERSITY

Address: Carnegie Mellon Research Institute
4400 5th Avenue
Pittsburgh, PA 15213
Contact: Edwin Minkley
Phone: (412) 268-3188
Fax: (412) 268-3101

Carnegie Mellon Research Institute is an applied research organization that develops practical applications of technologies for industry and government. The center's staff specializes in conducting research on biodegradation of solid waste and hazardous waste materials. It also conducts research in the areas of gas sensors and artificial intelligence concepts to be used as a tool in evaluating permit requests. The center is primarily funded (85 percent) through industry sponsorships. The remaining funding is through government grants. In addition to providing research for a diverse group of sponsors, the center also provides specialized capabilities to smaller companies that do not have access to such capabilities in-house.

University-Affiliated Hazardous Waste Research Centers (cont'd)

NAME: ADVANCED APPLIED TECHNOLOGY DEMONSTRATION FACILITY

Address: Energy and Environmental Systems Institute
Rice University
P.O. Box 1892
Houston, TX 77251-1892
Contact: C.H. Ward
Phone: (713) 527-4086
Fax: (713) 285-5948

The Advanced Applied Technology Demonstration Facility (AATDF) for environmental technology is a university consortium of environmental research centers funded by the U.S. DOD. AATDF focuses on assessing and selecting the most promising emerging clean-up technologies proposed by the research and engineering field and designing, operating, and managing a wide variety of field demonstrations of technologies at the Experimental Controlled Release Sites (ECRS) and DOD Technology Development and Demonstration Sites (D_4T). ECRS are existing sites on DOD bases that require remediation. The D_4T site(s) is one or two test release site(s), the location of which is still being determined.

The consortium includes experts in environmental science and engineering, with particular emphasis on the conceptual and process design of remedial technologies and the implementation of controlled field demonstrations for proof-of-concept. The AATDF emphasizes development of technology break-throughs in terms of performance, cost, and efficiency.

Participating Institutions: Rice University, the University of Waterloo, Lamar University, the University of Texas at Austin, Louisiana State University, and Stanford University.

NAME: UNIVERSITY OF CINCINNATI

Address: Center for Hazardous Waste Research, Education, and Management Institute
Department of Civil and Environmental Engineering
Cincinnati, OH 45221
Contact: John Reed
Phone: (513) 558-1723
Fax: (513) 558-5062

In addition to the services provided through the U.S. EPA's Solid and Hazardous Waste Research Facility in Center Hill, Ohio (see Section IV), the University of Cincinnati conducts research on hazardous waste treatment technologies. Specific research projects have included: biological treatment using thin film bioreactors, solidification and stabilization of soils, reverse osmosis, hazardous waste composting, and wastewater treatment. The university is testing aerobic and anaerobic treatment methods in fluidized bed reactors using activated carbons as a support medium.

NAME: UNIVERSITY OF FLORIDA

Address: The Florida Center for Solid and Hazardous Waste Management
2207-D NW 13th Street
Gainesville, FL 32609
Contacts: John Schert, Paul Still
Phone: (904) 392-6264
Fax: (904) 846-0183

The University of Florida is the host institution for the Florida Center for Solid and Hazardous Waste Management. Established by the Florida Legislature in 1988, the center conducts research and provides education on hazardous waste management. Specific areas include methods and processes for recycling, treating, and disposing of solid and hazardous waste. The center annually issues requests for pre-proposals from which it selects new research projects and appropriates funding. The center staff provide technical information by phone or fax, as well as access to the center's library. The center also operates the Florida Recycling Marketing System (FRMS), an electronic bulletin board with information about waste reduction, waste exchange, recycling, and composting. **The modem access number for FRMS is (800) 348-1239.**

Participating Institutions: Florida State University, the University of South Florida, the University of Central Florida, Florida A&M University, Florida Atlantic University, Florida Institute of Technology, and the University of Miami.

NAME: UNIVERSITY OF TENNESSEE

Address: Center for Environmental Biotechnology
University of Tennessee
10515 Research Drive
Knoxville, TN 37932-2567
Contact: Gary Sayler
Phone: (615) 675-9450
Fax: (615) 974-8080

The Center for Environmental Biotechnology (CEB) focuses on training and research leading to the development and effective use of microorganisms for environmental remediation. CEB is located near over 70 environmental services companies, employs 70 professionals in the field, and has 30,000 square feet of fully equipped research space, with 15,000 square feet as a single laboratory facility exclusively for environmental research and biotechnology. CEB receives Federal, industrial, and university support to conduct research activities. Ongoing investigations include: molecular probe development for monitoring and optimizing TCE degradation; molecular methods for quantifying microbial PAH degradation in manufactured gas plant soil; and bioluminescent sensor technology for on line in-situ measurement of biodegradation.

University-Affiliated Hazardous Waste Research Centers (cont'd)

NAME: LOUISIANA STATE UNIVERSITY

Address: Hazardous Waste Research Center
3418 CEBA Building
Louisiana State University
Baton Rouge, LA 70803
Contact: David Constant
Phone: (504) 388-6770
Fax: (504) 388-5043

The Louisiana State University's Hazardous Waste Research Center (HWRC) conducts research on hazardous waste treatment and disposal. Research priorities include incineration, alternative methods of treatment, and interaction between waste constituents and natural media. In addition to fundamental research, the center conducts applied research and technology transfer. The applied research program fosters university-industry research and has included studies of nitric oxide, single cell cascade cross-flow air stripping of volatile organics from ground water, dry sorbent injection to remove hydrogen chloride from air emissions, and in-situ waste remediation technologies including soil washing and bioremediation.

NAME: NEW MEXICO STATE UNIVERSITY

Address: Waste Management Education and
Research Consortium
Chemical Engineering Department
New Mexico State University
P.O. Box 30001, Dept. WERC
Las Cruces, NM 88003-8001
Contact: Ron Bhada
Phone: (505) 646-1510
Fax: (505) 646-4149

New Mexico State University is the lead organization of the Waste Management Education and Research Consortium. The consortium conducts research in all areas of hazardous waste management. Currently, there are 32 projects in process including research on in-situ remediation and bioremediation of toxic wastes. Eight of these projects are in the demonstration stage and approaching commercial realization. The consortium is examining different technologies involving sensor instrumentation and robotics as well as physical, chemical, and biological methods, for cleaning up soil and water. University faculty and staff collaborate with industry and third parties in developing new technology. Requests for proposals are sent out by the university that specify the research topic areas.

Participating Institutions: the University of New Mexico, New Mexico Institute of Mining and Technology, Navajo Community College, and Los Alamos and Sandia National Laboratories.

NAME: STATE UNIVERSITY OF NEW YORK AT BUFFALO

Address: New York State Center for Hazardous Waste Management
207 Jarvis Hall
Buffalo, NY 14260
Contact: Ralph Rumer
Phone: (716) 636-3446
Fax: (716) 645-3446

The New York State Center for Hazardous Waste Management administers research and pilot-scale demonstration projects directed at the development of technologies applicable to the remediation of contaminated environmental media, waste reduction, waste treatment, and productive reuse of hazardous waste. The center reviews competitive proposals from university and private industry researchers within New York State and awards contracts on an annual basis. The center is currently involved in a multi-vendor demonstration of bioremediation technologies at a state Superfund site. The center draws on R&D talent State-wide in carrying out its research programs.

NAME: UNIVERSITY OF PITTSBURGH

Address: Center for Hazardous Materials Research
University of Pittsburgh Applied Research Center
320 William Pitt Way
Pittsburgh, PA 15238
Contact: Edgar Berkey
Phone: (412) 826-5320
Fax: (412) 826-5552

The Center for Hazardous Materials Research (CHMR) conducts a wide range of environmental research, including the development and implementation of new technologies for hazardous waste management and remediation. CHMR's facility includes offices, laboratories, and pilot plants. CHMR's multi-disciplinary staff have industrial experience with large and small companies, as well as regulatory experience at both the Federal and state level. CHMR can also provide independent testing and evaluation of innovative remedial technologies, equipment, and procedures.

NAME: ***NEW JERSEY INSTITUTE OF TECHNOLOGY - OTTO H. YORK CENTER FOR ENVIRONMENTAL ENGINEERING AND SCIENCE***

Address: 138 Warren Street
Newark, NJ 07102
Contact: Richard S. Magee
Phone: (201) 596-3233
Fax: (201) 802-1946

The Otto H. York Center for Environmental Engineering and Science (CEES) houses multiple New Jersey Institute of Technology environmental centers, programs and initiatives including the Hazardous Substance Management Research Center (HSMRC) and the Northeast Hazardous Substance Research Center (NHSRC) (Discussed in Section V, EPA-Funded Hazardous Waste Research Centers, of this guide).

HSMRC aids in the development of new products, processes, and technologies to minimize, treat, and manage hazardous waste, furnishes the public and private sectors with technologies necessary to identify and remediate hazardous spills and burial sites, and facilitates the exchange of ideas and knowledge among industry, government, academia, and the public. HSMRC's focus areas include: incineration; biological and chemical treatment; physical treatment; site assessment; and remedial action.

CEES also houses the Emission Reduction Research Center, the Center for Airborne Organics, the Integrated Pollution Prevention Initiative, and the New Jersey Technical Assistance Program for Industrial Pollution Prevention, and is affiliated with the Institute for Hazardous and Toxic Waste Management.

Participating Institutions: Princeton University, Rutgers University, Stevens Institute of Technology, and the University of Medicine and Dentistry of New Jersey.

NAME: ***UNIVERSITY OF WATERLOO***

Address: Waterloo Centre for Groundwater Research
Waterloo, ONT Canada N2L3G1
Contact: Dennis Gregor
Phone: (519) 885-1211, ext. 2892
Fax: (519) 725-8720

The Waterloo Centre is the largest ground water research center in Canada. The centre is also affiliated with other university and non-university research groups in Canada. The centre performs field research, laboratory testing, and computer modeling research in organic and inorganic contaminant hydrogeology. Areas of research and testing expertise at the centre include processes of contaminant movement through subsurfaces, fate of contaminants, and remediation technology. Centre facilities include experimental laboratories and analytical capabilities. Of particular interest to developers is the availability of field sites at which testing is conducted on the behavior, fate, and remediation of contaminants in the subsurface.

APPENDIX I

SMALL BUSINESS DEVELOPMENT CENTERS (SBDCs)
Lead Organizations

Alabama
University of Alabama, Birmingham
(205) 934-7260

Alaska
University of Alaska/Anchorage
(907) 274-7232

Arizona
Maricopa County Community College
(602) 392-5224

Arkansas
University of Arkansas
(501) 324-9043

California
California Trade and Commerce Agency
(916) 322-2252

Colorado
Colorado Office of Business Development
(303) 892-3809

Connecticut
University of Connecticut
(203) 486-4135

Delaware
University of Delaware
(302) 831-2747

Washington, DC
Howard University
(202) 806-1550

Florida
University of West Florida
(904) 444-2060

Georgia
University of Georgia
(404) 542-5760

Hawaii
University of Hawaii at Hilo
(808) 933-3459

Idaho
Boise State University
(208) 385-1640

Illinois
Department of Commerce and Community Affairs
(217) 524-5856

Indiana
Economic Development Council
(317) 264-6871

Iowa
Iowa State University
(515) 292-6351

Kansas
Wichita State University
(316) 689-3193

Kentucky
University of Kentucky
(606) 257-7668

Louisiana
Northeast Louisiana University
(318) 342-5506

Maine
University of Southern Maine
(207) 780-4420

Maryland
Office of Economic and Employment Development
(410) 333-6995

Massachusetts
University of Massachusetts
(413) 545-6301

Michigan
Wayne State University
(313) 577-4848

Minnesota
Department of Trade and Economic Development
(612) 297-5773

Mississippi
University of Mississippi
(601) 232-5001

Missouri
University of Missouri
(314) 882-0344

Montana
Montana Department of Commerce
(406) 444-4780

APPENDIX I (cont'd)

SMALL BUSINESS DEVELOPMENT CENTERS (SBDCs)
Lead Organizations

Nebraska
University of Nebraska at Omaha
(402) 554-2521

Nevada
University of Nevada at Reno
(702) 784-1717

New Hampshire
University of New Hampshire
(603) 862-2200

New Jersey
Rutgers University
(201) 648-5950

New Mexico
Santa Fe Community College
(505) 438-1362

New York
State University of New York
(518) 443-5398

North Carolina
University of North Carolina
(919) 571-4154

North Dakota
University of North Dakota
(701) 777-3700

Ohio
Ohio Department of Development
(614) 466-2711

Oklahoma
SE Oklahoma State University
(405) 924-0277

Oregon
Lane Community College
(503) 726-2250

Pennsylvania
University of Pennsylvania
(215) 898-1219

Puerto Rico
University of Puerto Rico
(809) 834-3590

Rhode Island
Bryant College
(401) 232-6111

South Carolina
University of South Carolina
(803) 777-4907

South Dakota
University of South Dakota
(605) 677-5272

Tennessee
Memphis State University
(901) 678-2500

Texas
University of Houston
(713) 752-8444

University of Texas at San Antonio
(210) 558-2450

Texas Tech University
(806) 745-3973

Dallas Community College
(214) 565-5833

Utah
University of Utah
(801) 581-7905

Vermont
Vermont State Colleges
(802) 728-9101

U.S. Virgin Islands
University of the Virgin Islands
(809) 776-3206

Virginia
Virginia Department of Economic Development
(804) 371-8258

Washington
Washington State University
(509) 335-1576

West Virginia
Governor's Office of Community and Industrial Development
(304) 558-2960

Wisconsin
University of Wisconsin
(608) 263-7794

NOTES

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ABOUT TIO ...

The Technology Innovation Office in the Office of Solid Waste and Emergency Response was established to advance the development of improved technologies for the remediation of hazardous waste sites. An important component of TIO's mission is to improve access to timely, useful information. In addition to data bases and bulletin boards such as VISITT and CLU-IN discussed elsewhere in this guide, TIO has been involved in the production of a number of products of possible interest.

Cleaning Up the Nation's Waste Sites: Markets and Technology Trends, *EPA/542/R-92/012, April 1993*

This report captures information on the future demand for remediation services for all major cleanup programs in the U.S. including Superfund, Resource Conservation and Recovery Act (RCRA) corrective action, underground storage tanks (UST), state programs, and federal agencies such as the Departments of Defense and Energy.

Copies of this document can be obtained from:

National Technical Information Service (NTIS)
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4600

When ordering refer to document number: PB93-140762

Bioremediation in the Field, *EPA/540/N-94/500*
Bioremediation in the Field Search System (BFSS), *EPA/540/R-94/11a and b.*

This publication and associated data base product summarize federal and state CERCLA, RCRA and UST cleanup efforts involving bioremediation. Copies of the publication can be obtained by contacting TIO at:

5102W
401 M St., SW
Washington, D.C. 20460
(703) 308-8800

BFSS can be accessed through the ATTIC and CLU-IN systems discussed on page 8 of this guide or through the ORD electronic bulletin board system at (513) 569-7610. User Documentation and diskettes may be obtained by calling ORD at (513) 569-7562.

Profile of Innovative Technologies and Vendors for Waste Site Remediation, *EPA/540-R-94-002, December 1993*

This monograph documents the findings of a review of the characteristics of companies who supply innovative hazardous waste remediation technologies.

United States
Environmental Protection Agency
(5102W)
Washington, DC 20460

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