Multi-State Evaluation

Elements Important to the Verification of Remediation Technologies

2nd Edition
December 1999

Prepared by
Interstate Technology and Regulatory Cooperation Work Group
Verification Work Team

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ABOUT THE ITRC

Established in 1995, the Interstate Technology and Regulatory Cooperation Work Group (ITRC) is a state-led, national coalition of personnel from the regulatory and technology programs of more than 25 states, three federal agencies and tribal, public and industry stakeholders. The goal of the ITRC is to reduce barriers and accelerate interstate deployment of superior, cost-effective, innovative environmental technologies.

Various tools have been developed and services provided by the ITRC to accomplish this goal. The ITRC develops products including **Case Studies, Technology Overviews, and Technical/Regulatory Guidance**. Case studies and technology overviews include regulatory information reports, state surveys, closure criteria documents, and formats for collection of cost and performance data. The products may also provide state input into other complementary efforts and develop approaches to enable state regulatory agencies to accept performance data gathered in another state as if the testing had been done in their own state.

ITRC technical/regulatory guidance documents, each of which deals with a specific type of technology, enable faster, more thorough reviews by state agencies of permit applications and site investigation and remediation plans allow full-scale deployment of such technologies. Use of these documents by states in their regulatory reviews also fosters greater consistency in technical requirements among states and results in reduced fragmentation of markets for technologies caused by differing state requirements.

Those who conduct and oversee demonstrations and verifications of technologies covered by ITRC technical/regulatory guidance documents will also benefit from use of the documents. By looking ahead to the typical technical requirements for permitting/approving full-scale deployment of such technologies, they can collect and evaluate information to facilitate and smooth the permitting/regulatory approval process for deployment.

DISCLAIMER

The ITRC does not endorse the use of nor does it attempt to determine the merits of any specific technology verification or certification program through the publication of this document. The ITRC does not assume any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method or process discussed in this document. Mention of trade names, commercial products, or specific technology providers does not constitute endorsement or recommendation of use. These documents are designed to help states and others develop a consistent approach to their evaluation, regulatory approval, and deployment of specific technologies at specific sites.

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FINAL

JANUARY 1999
updated December 1999

Prepared by
The Interstate Technology and Regulatory Cooperation
Work Group
Verification Work Team

Acknowledgements

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The work team also wishes to recognize the efforts of its participating members. State regulatory representatives who developed this document included, Ms. Nancy Uziemblo (WA), who co-chaired the group with Mr. Jim Harrington (NY). Other members of the group included Ms. Kira Lynch of the U.S. Army Corps of Engineers and Mr. Michael Jacobson of Pacific Rim Enterprise Center. Assistance was also provided by Mr. Jeff Heimerman, EPA/TIO, Mr. Rick Tomlinson, WGA circuit rider, and Dr. Eric Nutall, University of New Mexico. Group facilitation and technical support were provided by Mr. Steve Hill and Mr. Brent Westfall of Coleman Research, Ms. Chris Renda of the Environmental Services Network, Dr. Fred T. Price and Ms. Courtney Zamora of Booz·Allen & Hamilton, Inc.

In addition, the group would like to thank representatives of ITRC member states and federal agencies who provided the basic information for the matrix and rated the elements of the matrix that is the basis of this report. Written responses were received from California, Colorado, Florida, Illinois, Kentucky, Louisiana, Maryland, Massachusetts, Nebraska, New Jersey, New York, Ohio, Tennessee, Texas, Virginia, and Washington. The group recognizes the contribution of the eleven verification programs and four other stakeholders named in this report who provided information for the matrix. Finally, thanks to these stakeholders who participated in the verification program summit meeting on November 2, 1998.

Executive Summary

This report is the result of efforts by the Interstate Technology and Regulatory Cooperation (ITRC) Verification Work Team. The purpose of this report is to provide environmental technology verification programs with information about what states and other stakeholders expect from a technology verification effort. The ITRC Verification Work Team hopes that by reading this report, the leaders of the verification programs will be encouraged to incorporate states' needs in their programs.

This report contains input from states regarding information they felt should be included in an environmental technology verification report. One hundred and thirteen discreet categories of information (termed "data elements" in the report) were identified and labeled essential, nice-to-have, or unnecessary. A total of 16 states, 11 verification programs, and four stakeholder organizations participated. The list of data elements and their ranking is presented in a matrix format. Three states (Louisiana, Illinois and Tennessee) indicated by signing an agreement letter that the matrix represented the minimum information needed from a verification program.

This report also includes other information gathered as part of the ITRC verification team's efforts. For example, an ITRC Verification Summit meeting was held for states and verification programs to discuss the data elements and other issues. Highlights of this meeting were used in preparing this report. Verification program summaries describing the programs are also included in this report.

This edition of the report includes the following new information:

- On April 14, 1999, Kentucky signed the agreement letter. This signature acknowledges Kentucky's formal agreement that their responses to the matrix elements represent their minimum information needs from verification programs (see Appendix C for a copy of the letter).
- Appendix E reflects more detailed responses to the matrix elements from Mass STEP.

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Section 1 - Introduction and Background

The cleanup of hazardous waste sites often involves the use of environmental remediation technologies. Existing technologies are frequently being improved while new technologies are being developed. Before states agree to allow a technology to be used at a hazardous waste site, they must be assured that the technology will perform effectively and safely. This assurance can be provided by a verification program.

Verification is defined in this report as the act of establishing the accuracy or truth of a claim about the performance of an environmental technology. The verification process, in turn, increases the understanding of the technology and may lead to the development and subsequent use of improved cleanup technologies. With increasing numbers of new and innovative environmental remediation technologies, states can benefit from more information provided by verification programs. This information will help states identify useful technologies for their sites.

As states try to incorporate the use of new technologies at sites, they are in need of (1) more information including technology performance and cost data and (2) data presented in a consistent, standard format. Although vendors and verification programs are often willing to supply information needed by the states, as technologies evolve and uses change, it is increasingly difficult to meet the needs of all parties.

In response to these challenges, the Interstate Technology and Regulatory Cooperation (ITRC) Work Group's Verification Team (VT) was formed. The mission of the VT is to assist states in making informed decisions regarding innovative remediation technologies. The VT believes that a need exists for helping states find requested information on specific technologies, often available through verification programs. Additionally, a dialogue should be established to work with the verification programs in their efforts, and to enhance states' confidence in the verification results.

This report is intended to provide verification-related information useful to states, verification programs, and other stakeholders. Furthermore, this report will help verification programs understand state information needs enabling the programs to incorporate those needs into their reporting.

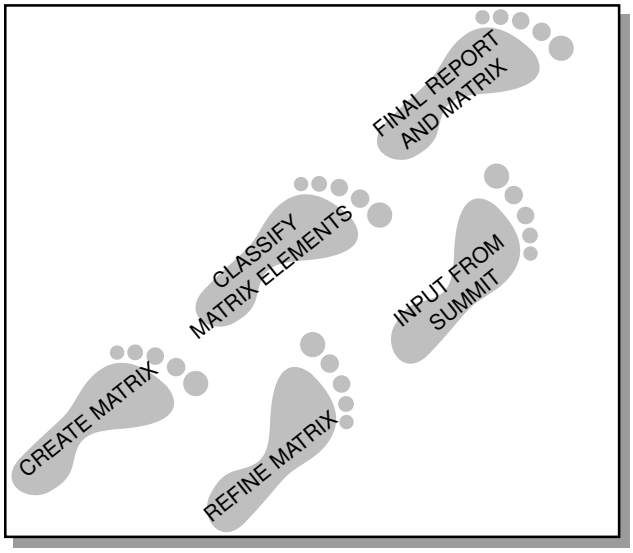


Figure 1.1 Steps in the Development of the ITRC VT Matrix Report

In creating the report, the VT followed a series of steps (Figure 1.1). The VT reviewed the type of information provided by various verification programs, developed a list of information

collected by those programs (data elements), and summarized this information to create the matrix. The team then refined the list of data elements with input from state points of contact (POCs) and other interested stakeholders. The final matrix is shown in Appendix A. The state POCs, state staff, verification programs, and other stakeholders then classified the elements of the matrix as essential (ES), nice to have (NH), or unnecessary (UN). In November 1998, ITRC sponsored a one-day summit meeting for verification programs, states, and other stakeholders. The summit resulted in an open dialogue between verification programs and states about the responses to the matrix. Combined, these efforts form the basis for this report. Other components of this report include: (1) information about verification programs in the form of program summaries and (2) information about related efforts such as the six state memorandum of understanding (MOU) and the Catalog of Environmental Technology Verification Programs in North America.

As listed in Table 1.1, 16 states, 11 verification programs, and 4 interested stakeholders completed and returned the verification matrix. See Appendix B for a list of acronyms used in Table 1.1.

In some cases, there were multiple reviewers from a state. If multiple reviews were provided, the state was asked to consolidate the responses and provide one combined response to each data element. States were asked to sign an agreement letter indicating that they acknowledge that the elements identified in the matrix represent the state's minimum needs in the area of environmental technology verification and agree with the information in this report (Appendix C). If a signature representing a formal state agreement was not provided, the responses to the matrix in this report are viewed as individual reviewers' responses, not as a state's response.

Since verification programs can vary widely in their mission, client base, and sponsors, a brief description of each verification program was prepared for this report. The verification programs provided information

Table 1.1 States and Verification Programs Who Responded to the Matrix

No.	State	Contact	Number of Reviewers
1	California	Paul Hadley	Eight
2	Colorado	Jeff Deckler/Walter Avramenko	Two
3	Florida	Tom Douglas	One
4	Illinois	Edwin C. Bakowski	Multiple
5	Kentucky	Alauddin A. Alauddin	Three
6	Louisiana	Narendra M. Dave	One
7	Maryland	Stanley Tsai	One
8	Massachusetts	Sandra Hurlbut/David LaPusata	Seven
9	Nebraska	Jeff Kelley	One
10	New Jersey	Mike Winka	One
11	New York	James Harrington	Eight
12	Ohio	Tom Velalis	Three
13	Tennessee	David Randolph	One
14	Texas	Geof Meyer	Seven
15	Virginia	Erica Dameron	One
16	Washington	Max Power	Three
No.	**Verification Programs**	**Contact**	**Number of Reviewers**
1	CAL-EPA	Terry Escarda	Eight
2	EPA SITE	Annette Gatchett	One
3	ESTCP	Jeffrey Marqusee	One
4	ETV-Canada	Allan Ding	Three
5	EvTEC	William Kirksey	One
6	FIU/HCET	Joseph Boudreaux/ Cindy Zhang	Two
7	ITRD	Mike Hightower	One
8	Mass-STEP	Linda Benevides	One
9	NJCAT	Rhea Brekke	One
10	RCI	Stanley Chanesman	One
11	SCMTP	Eric Koglin	One
No.	**Other Stakeholders**	**Contact**	**Number of Reviewers**
1	FES & FICE	Tim Larson	One
2	DOE-EML	Catherine Klusek	Three
3	DOE-OST	Jaffer Mohiuddin	Multiple
4	DuPont	Nancy Grosso	Two

about their program in response to a request from the ITRC VT. Verification program summaries (Appendix D) were developed using this information and, in some cases, information on the worldwide web. The summaries were reviewed and revised by the verification programs prior to being included in this report. These summaries are meant to give the reader a general understanding of each program.

There are at least two additional efforts underway which are related to the VT effort. These are the ITRC six state MOUs and the Catalog of Environmental Technology Verification Programs in North America. These efforts complement the results of this report by providing an example of a reciprocal state approval effort and providing additional information about verification technology programs.

Six states (California, Illinois, Massachusetts, New Jersey, New York, and Pennsylvania) signed a MOU on June 4, 1996. A goal of the MOU was to define a process for the reciprocal evaluation, acceptance, and approval of environmental technologies. To implement the MOU, the six states selected eleven sample technologies for pilot projects. The sample technologies included a full range of environmental technologies for pollution prevention, measurement and monitoring, treatment and control, and remediation. The six states identified three tiers of data requirements (protocols) for specific technologies. A Tier I protocol offers vendor guidance for the development of credible data. A Tier II protocol provides vendor guidance for comprehensive performance testing. A Tier III protocol provides vendors and state permit writers with guidance for permitting or approving the use of specific technology types.

A Catalog of Environmental Technology Verification Programs in North America is being developed by Pacific Rim Enterprise Center and the Colorado Center for Environmental Management, with the support of the U.S. Department of Energy. The catalog is intended to increase the awareness about environmental technology verification as a tool, highlight some of the issues affecting verification efforts, and present the diversity of existing programs. Twenty-three programs covering remediation, pollution prevention, water, and air technologies are profiled in the catalog. The catalog also contains a matrix which highlights key aspects and differences of each program.

Section 2 - Objectives

The intent of this report is to encourage verification programs to incorporate state needs so that the output from these programs can be utilized by the states to make better and faster remediation technology decisions. The objectives of this report are to:

- ✓ **Identify data elements, which if included in the verification process, would enhance states' confidence in verification results.**
- ✓ **Encourage verification programs to incorporate states' needs into their programs.**
- ✓ **Encourage states to consider reciprocal state acceptance of environmental technology verifications.**
- ✓ **Provide readers with highlights of the verification programs, as well as relationships among programs and their customers.**
- ✓ **Identify efforts by other groups to enhance communication between states, verification programs, and other stakeholders.**
- ✓ **Foster cooperation and dialogue among the verification programs and states.**

End of Section 2

Section 3 - State Needs for Environmental Technology Verification

The following general observations are based on state and verification program responses to the 113 matrix elements (Appendix E). Reviewers were asked to rate the elements as essential (ES), nice to have (NH), or unnecessary (UN) and to add new elements they thought were missing from the matrix. Since some states had multiple reviewers, the VT requested that the state reviewers provide one combined response to each element of the matrix - ensuring that the results from each state would have the same weight. The state determined the method for obtaining a single combined response.

Based on the overall responses to the matrix, states rated more elements ES than did verification programs (Figures 3.1 and 3.2). However, states and verification programs both felt that approximately 74% or more of the elements were essential. Only 18 to 23 % of the elements were rated as NH, with only 2 to 3% rated as UN.

These findings indicate that the matrix elements are generally a good representation of the information needed by states to evaluate a remediation technology. This was expected since the matrix elements were developed with significant input from the states and verification programs and include the elements normally considered essential by states. However, each state may have additional data elements that it considers essential or nice to have under special circumstances.

The matrix can be used by vendors and other stakeholders as a starting point for discussions about providing or collecting data for verification of a remediation technology, and as a basis for determining the type of information states need.

Some states have formally agreed that the elements identified in the matrix represent their

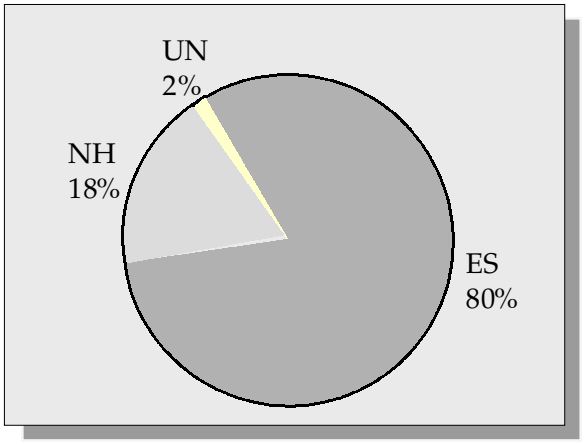


Figure 3.1 States' Response to Verification Matrix Elements

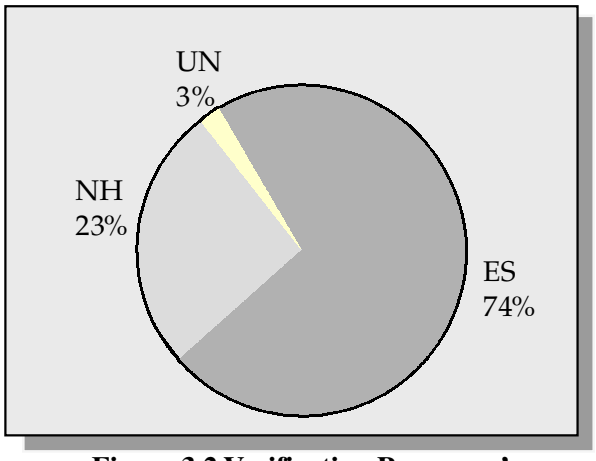


Figure 3.2 Verification Programs' Response to Verification Matrix Elements

state's minimum needs in the area of environmental technology verification (Appendix C). For states participating in this project, vendors, technology verification programs, and other stakeholders will have a clearer understanding of the state's data needs. States that have not participated are encouraged to sign the agreement form in Appendix C and send the signed form to the ITRC Verification Team.

In addition to responses received from 16 states and 11 verification programs, 4 other stakeholder groups, including federal agencies, private industry, and citizens responded to the matrix (Appendix E). Responses from federal agencies and private industry were consistent with those of the states and verification programs. Citizen stakeholders also commented on the matrix during ITRC meetings adding health and safety elements to the matrix and clarified other data elements.

Table 3.1 State and VP Predominate Rating

Category	Data Element (Is it essential to have…)		States	Verification Programs	Others
			Predominate Rating		
2.0 GENERAL TECHNOLOGY OVERVIEW	2.3 Potential Markets		NH	NH	NH
3.0 TECHNOLOGY STATUS		3.2.2 A list of commercial applications (include references and list of sites where there has been acceptance of technology by other public or government agencies)	ES	NH	ES
	3.3 Public Involvement / Acceptance of Technology	3.3.1 A list of community outreach efforts and list of stakeholder involvement with contacts	NH	NH	ES/NH
		3.3.2 Contact List	ES	ES	NH
4.0 TREATMENT OR MEASUREMENT PROCESS	4.5 Process Flow Diagram	4.5.2 An energy balance	ES	NH	ES
6.0 OUTPUT (Measurement Technologies Only)	6.4 Regulatory	Decision error determination established in consideration of the regulatory standards under which the technology is intended to operate or which it is intended to meet	ES	NH	ES
7.0 OPERATIONAL PARAMETERS	7.4 Equipment Specifications	7.4.2 Summary including reliability	ES	ES/NH	ES
		7.4.3 Summary including portability/ and ruggedness	ES/NH	NH	ES/NH
		7.4.4 Summary including protectiveness, public health, and environment (flora and fauna)	ES	NH	ES
		7.4.6 Summary including weight and size of technology	ES	NH	ES
	7.7 Infrastructure	Infrastructure needed to support the technology (e.g., transportation, store waste handling, staffing or shift needs, continuous operations, single shift or batch operations)	ES	ES/NH	ES
8.0 VERIFICATION PLAN	8.1 Scope of Plan	8.1.3 Vendor claims	ES/NH	ES	NH

Table 3.1 (Continued) State and VP Predominate Rating

Category	Data Element (Is it essential to have…)		States	Verification Programs	Others
			Predominate Rating		
9.0 QUALITY ASSURANCE REQUIRED FOR ACCEPTABLE VERIFICATION	9.2 Samples	9.2.2 Independent labs should utilize sample(s) acquired from a self/personally provided source	ES/NH	ES	ES/NH
		9.2.3 Samples from company source	ES	ES	NH
	9.3 Analytical Methods	9.3.3 Referred publications in professional journals	NH	ES	NH
10.0 EMERGENCY PLANNING & WORKER HEALTH AND SAFETY		10.1.1 A description of the minimal credible accident scenario	ES	NH	ES
		10.1.2 Emergency Plan – outlined course of action to be executed in case of an emergency	ES	ES/NH	ES
12.0 LICENSING PARAMETERS	12.1 License		ES	ES	ES/NH
	12.2 Operation Qualifications		ES	ES	ES/NH
13.0 EXECUTIVE SUMMARY	13.1 Executive Summary	13.1.1 "Whom"	ES	ES	NH
		13.1.5 Stakeholder Involvement	ES	ES	ES/NH
	13.3 Report Accessibility	13.3.1 Internet access	NH	ES/NH	NH
		13.3.3 Video documentation of demonstration	NH	NH	NH

In addition to the general observations about the overall responses to the matrix, some observations can be made regarding responses to individual matrix elements. Table 3.1, a subset of Appendix A, shows the predominate rating given by states, verification programs, and other stakeholders to individual data elements. For example, if 7 states rated an element ES, 5 rated it NH, and 3 rated it UN, the predominate rating is ES.

In another example, if 7 states rated an element ES and 7 rated it NH, it would appear in the table as ES/NH. The table includes only those elements where the predominate rating was not ES for all three categories of reviewers.

The following paragraphs summarize comments provided by various stakeholder groups on specific matrix elements. In each paragraph, the number in parentheses indicates the matrix element number.

Potential markets (2.3) was predominantly rated as NH by all three groups indicating that it is not an essential element in the verification process. However, most of the reviewers felt that public involvement and acceptance of a technology (3.3) was NH rather than an essential part of the verification process. This rating is due to the fact that several states believe that public outreach is the state's, and not the verification program's responsibility. States and verification programs commented that it is beneficial to inform the community about technology demonstrations and keep the community informed of progress. One verification program suggested that programs should be sensitive to potential community issues (such as noise control or odors) arising from

use of a technology during a demonstration. One state pointed out that dynamics may be different in each community and that the state is in a better position than the verification program to address these differences.

States and other stakeholders predominately rated operational parameters (7.0) as ES, while verification programs tended to rate them as NH.

Several verification programs commented on analytical methods (9.3). Verification programs acknowledged that they are expected to use existing regulatory standards depending on the type of technology and application. Vendors are expected to document the test and cite appropriate analytical methods.

Most parties indicated that emergency planning and worker health should be considered (Emergency planning 10.0), but not in a detailed manner because these elements are usually site specific. One verification program remarked that any demonstration is expected to include health and safety information. However, a state added that any health and safety requirements beyond the norm should be provided by the verification program. One state suggested using this element to document only what was done at the demonstration site and what will be done at the site in question.

Both state and verification programs responses indicated that licensing parameters (12.0) are a legal question to be addressed only by the parties involved in the verification program.

Most states and verification programs did not think that Internet access or video documentation of demonstration (13.3.1) were essential. However, ITRC is able to provide links to the verification programs' report sites.

Reviewers also commented on several elements not listed in Table 3.1. Notable comments are summarized in the following paragraphs.

In response to treatment efficiency (5.1.1), comments were submitted regarding the proper method of quantifying efficiency. Several parties stated that the percent of contaminant removed and concentrations (e.g., parts per million) are useful measures that should be provided in the verification process.

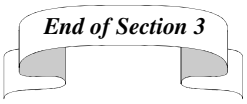
Several states and verification programs provided comments on by-products and end products (5.2) related to performing fate and transport modeling. It was noted that fate and transport modeling should be handled on a site-specific basis and is not usually the responsibility of the verification program.

Regulatory requirements (7.6) were discussed at length. Concern was expressed regarding the rapid evolution of regulatory requirements and the differences in regulatory requirements across the states. To address this concern, verification programs and states should work together to review state information requests, and then determine if that information can be reasonably provided within the realm of the verification program's work.

Some states suggested that verification programs document failures of a technology (8.3.2) during a demonstration. Valuable information can be gathered from failed verification attempts and therefore should not be overlooked.

In conclusion, the differences indicated by the findings on Table 3.1 illustrate the need for continued discussion among states, verification programs, and stakeholders on the verification process. The development of the matrix in collaboration with states, verification programs, and stakeholders has proven to be a beneficial endeavor. The November 1998 summit meeting provided a forum for the states and verification programs to better understand each other's role in the verification process. This is a step forward in developing a technology verification process to help states increase knowledge of

and confidence in a technology, resulting in improved remediation activities. However, this exercise is only the first step. Further discussions on data elements in the matrix, verification program developments, understanding states' needs from verification programs, and program costs need to continue. The verification programs have indicated their willingness to accommodate state needs. Continued discussions are expected in April 1999 to extend the efforts initiated by the ITRC Verification Team.



Section 4 - Verification Programs

Eleven verification programs agreed to participate in the ITRC verification team's efforts (Table 1.1). These programs represent a cross section of the approximately 23 verification programs in North America. The verification programs are primarily sponsored by either the federal government (U.S. or Canada) or states, and thus have some common funding resources or other support (Figure 4.1). Verification program sponsors frequently seek to develop partnerships with other stakeholders, including those in the private sector. Despite any similarities in funding, they do differ in their specific missions, technologies addressed, selection and review criteria, cost allocation structure, and other aspects, as highlighted in Appendix D.

Representatives from eight verification programs participated in an ITRC Verification Team Summit Meeting in November 1998, to discuss the results of the matrix survey, and share information with other verification programs. See Appendix F for the meeting agenda. State representatives and stakeholders also attended this meeting to provide input regarding their information needs (discussed in Section 3).

The following highlights are based on the verification program summaries (Appendix D) and information gathered at the Summit.

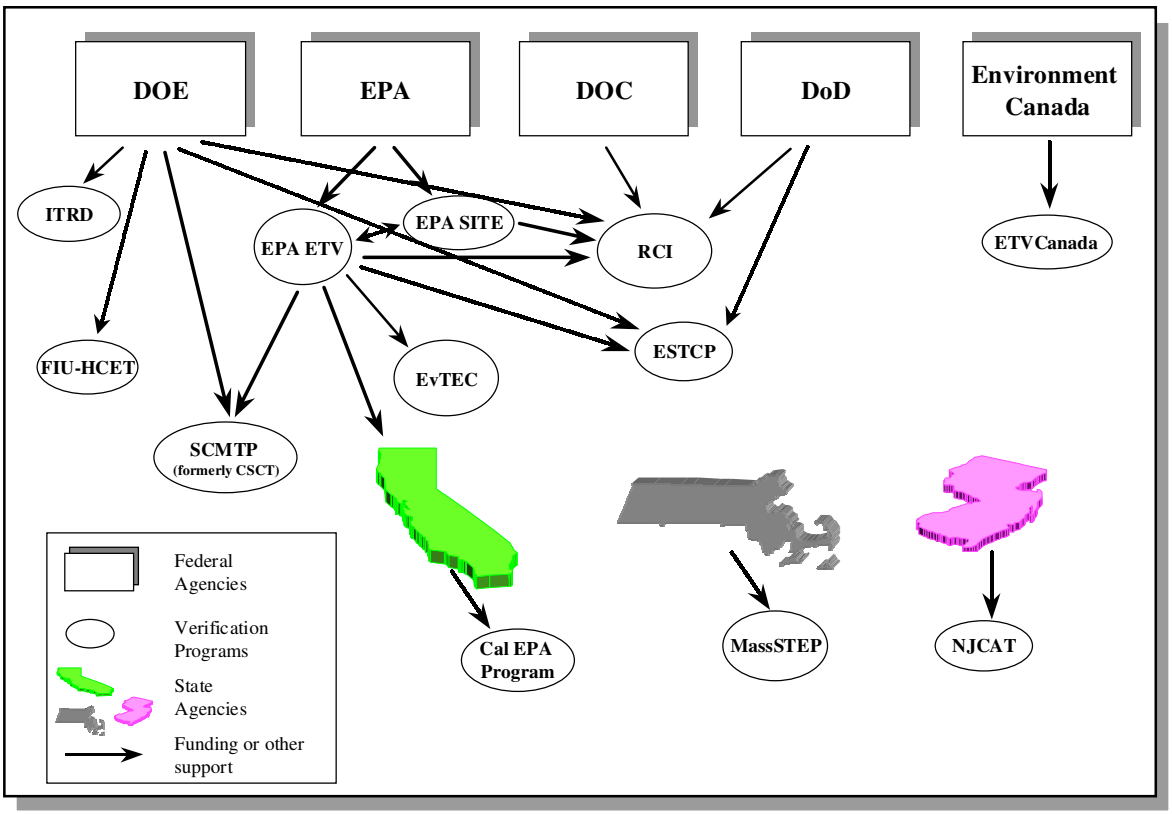


Figure 4.1 Verification Program Relational Diagram

HIGHLIGHTS OF THE VERIFICATION PROGRAMS

This section contains highlights of each of the 11 participating verification programs in no specific order. More complete program summaries can be found in Appendix D.

California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control Hazardous Waste Environmental Technology Certification Program

- The program is state run and was established in 1995.
- There are two parts to the Cal/EPA effort: 1) a state program that deals with certification and 2) a U.S. EPA pilot project that deals with verification of pollution prevention and waste treatment technologies.
- The program and the pilot project have access to the Hazardous Materials Laboratory and University of California test facilities, but will consider using data that has been previously collected.
- The program has MOUs with Canada, Bavaria, and five states that are members of the ITRC.
- The program is required, by statute, to fully recover all costs of the program and all costs not covered by the U.S. EPA pilot project.

U.S. Environmental Protection Agency's Superfund Innovative Technology Evaluation (SITE) Program

- SITE is a mature program that has been functioning for the past 11 years.
- The program is a pioneer in testing and evaluation of technologies with a focus on hazardous waste remediation monitoring and measurement.
- SITE determines the credibility of cost and performance data using internal audits during the verification process.
- SITE uses a market-driven approach, can work with all 50 states, leverages resources and provides in-kind services.
- SITE forms an evaluation team with federal and state members to develop test objectives for cost and performance of a technology.

Environmental Security Technology Certification Program (ESTCP)

- ESTCP was founded in 1995 with a focus on DoD needs. Because DoD operates throughout the United States, ESTCP is associated with all 50 states.
- The program focuses on pollution prevention, compliance, and cleanup.
- ESTCP deals with mature technologies.
- ESTCP annually solicits for verification projects involving multiple approaches and partners.
- The program uses third-party independent testing and evaluation. The program produces quarterly progress reports.

Canada's Environmental Technology Verification (ETV) Program

- ETV program is delivered and administered by a private sector partner, ETV Canada Inc, under a license.

- Environment Canada has MOUs with California EPA and New Jersey DEP to exchange information and seek reciprocity.
- This program provides a protocol for the verification entity to evaluate data supplied by the applicant.
- Environment Canada is establishing formal recognition of the ETV program with Provincial Governments, acknowledging that an ETV certificate may expedite the regulatory approvals process.

Civil Engineering Research Foundation's (CERF) Environmental Technology Evaluation (EvTEC) Program

- EvTEC is an EPA-ETV private sector pilot program, focused on becoming self-supporting and market-based.
- EvTEC is a "virtual center" using the CERF network of technical experts, testing facilities, and stakeholders.
- Only commercially ready products are accepted for verification.
- EvTEC provides verification for technologies whose performance cannot easily or directly be evaluated using existing standards or specifications.

Florida International University and the Hemispheric Center for Environmental Technology (FIU/HCET) Program

- DoE/OST, in partnership with FIU, established FIU/HCET in 1995.
- Currently, R&D activities focus on D&D of nuclear facilities for DoE. Activities include characterization, management, and reduction of radioactive and hazardous waste.
- FIU/HCET facilities include an analytical laboratory, technology assessment site, an experimental laboratory for R&D, a fabrication shop, and a licensed radiological laboratory.
- Other areas of interest include tanks, robotics, characterization, monitoring and sensor technology and international technology integration.

Innovative Treatment Remediation Demonstration (ITRD) Program

- DoE, in cooperation with U.S. EPA/TIO and Clean Sites, Inc., initiated ITRD in 1993.
- ITRD identifies new technologies that can be used to remediate sites and facilities in a cost-effective and responsible manner.
- ITRD deals with mature technologies that have been through R&D and pilot studies.
- ITRD is designed to accelerate the acceptance and use of new remediation technologies.

Massachusetts Strategic Envirotechnology Partnership (Mass-STEP) Program

- Mass-STEP, established in 1994, is a state run program.
- All technologies that are Massachusetts-based or important to Massachusetts businesses are eligible for services.
- Mass-STEP facilities include each of the four University of Massachusetts campuses and demonstration centers.
- Mass-STEP is a flexible program, offering vendors the services they need.
- Mass-STEP assists vendors at all stages of technology development.

New Jersey Corporation for Advanced Technology (NJCAT) Program

- The NJCAT verification program is a state-affiliated program established in 1997.
- The NJCAT Board of Directors includes a number of public and private members.
- NJCAT has signed a MOU with California and the Province of Ontario, Canada.
- NJCAT does not have testing facilities, but relies on its members' facilities.

Rapid Commercialization Initiative (RCI) Program

- RCI was founded in 1995 to build cooperative interactions between state, federal, and private agencies.
- RCI is not a funded partnership but intended to leverage other environmental programs (e.g., EPA-SITE, SERDP).
- RCI is a collaborative effort and uses facilities throughout the Departments of Commerce, Defense, Energy and the U.S. EPA.

Site Characterization and Monitoring Technology Pilot (SCMTP) Program

- SCMTP began as part of the EPA SITE Program. SCMPT, formerly known as CSCT, became part of the EPA's ETV Pilot Program in 1995.
- The program was established to increase the acceptance and use of innovative site characterization and monitoring techniques.
- SCMTP employs third-party organizations (DoE's ORNL and Sandia National Laboratory) to conduct validations.
- SCMTP selects technologies based on their applicability, their maturity, and vendor participation.
- SCMTP encourages states to participate in the verification process.

During the ITRC Verification Summit meeting, the verification programs discussed their visions for the future of verification. This discussion identified the following issues related to the continued success of verification programs.

Many verification programs are concerned about the availability and level of future funding. Most programs are funded by state and federal moneys, but are now being encouraged to seek more financial support from alternative sources. Verification programs will need to look into sources such as matching funds, subsidies, and fees. It was noted that a large portion of the costs associated with verification is related to analytical data, however, it may be possible to reduce these costs.

Customer support was also identified as important to the future of verification. The ITRC was encouraged to work with states to help identify incentives for vendors to use verification programs. Verification programs suggested that ITRC encourage state representatives to visit demonstration sites to see how the process works and determine the technology's value to the state. It was pointed out that state reciprocity of verification efforts would reduce cost and time of deployment associated with remediation technology and would therefore create an incentive for vendors to use the verification programs.

End of Section 4

Section 5 - Conclusions and Recommendations

The ITRC Verification Team developed a matrix identifying the minimum information (matrix elements) to be included in the verification process to enhance states' knowledge and confidence in verification results. States responded to this matrix by identifying elements as essential, nice to have, or unnecessary. Verification programs and other stakeholders also identified additional matrix elements in the same manner. This report summarizes that information along with information from other sources including the ITRC Verification Program Summit meeting held on November 2, 1998. The following conclusions and recommendations are based on the information in this report.

CONCLUSIONS

- Data elements have been identified which, if included in the verification process, would enhance states' confidence in verification results.
- States and verification programs agree that acceptance by the state of the minimum information needed (matrix) does not imply automatic acceptance of a technology, but rather, acceptance of the technology verification effort.
- At this printing, three states, Louisiana, Tennessee, and Illinois, have formally agreed that the elements identified in the matrix represent their state's minimum needs in the area of environmental technology verification.
- Verification programs are generally willing to incorporate state needs into their programs if they are identified and clearly communicated by the state.
- Verification programs believe that reciprocal state acceptance of an environmental technology would provide vendors with added incentive to use verification programs.

The summit meeting was a successful beginning in establishing cooperation and dialogue among verification programs and states. Additional summit meetings can build on this effort.

RECOMMENDATIONS

- ITRC can foster cooperation and dialogue among verification programs and states by encouraging state representatives to visit demonstration sites to observe the process and determine the technology's value to the state.
- States should consider ways in which they can develop reciprocal state acceptance of environmental technology verification.
- As a first step, states that participated in the ITRC Verification Team efforts should sign the agreement, indicating that the matrix represents the minimum information needed for acceptance of a technology verification effort for their state.
- A second Technology Verification Summit Meeting should be held during 1999.

End of Section 5

Section 6 - Useful Publications and Websites

This section lists several resources that interested parties can refer to for additional information on technology verification.

Publications:

U.S. Environmental Protection Agency (USEPA), February 1997. Environmental Technology Verification Program, Verification Strategy. EPA/600/K-96/003

Pacific Rim Enterprise Center and Colorado Center for Environmental Management, January 1999/ forthcoming. Catalog of Environmental Technology Verification Programs in North America

Websites:

Verification Programs:

CAL EPA	http://www.calepa.ca.gov
ESTCP	http://www.estcp.org/
ETV CANADA	http://www.etvcanada.com
EvTEC	http://www.cerf.org/evtec/index.htm
FIU-HCET	http://www.hcet.fiu.edu
ITRD	http://www.em.doe.gov/itrd
MASS STEP	http://www.state.ma.us/step/step.htm
NJCAT	http://cee.cece.stevenstech.edu.NJCAT
EPA-SCMTP	http://clu-in.com and http://www.epa.gov/etv
EPA-SITE	http://www.epa.gov/ORD/SITE/index.htm

States Responding to Matrix:

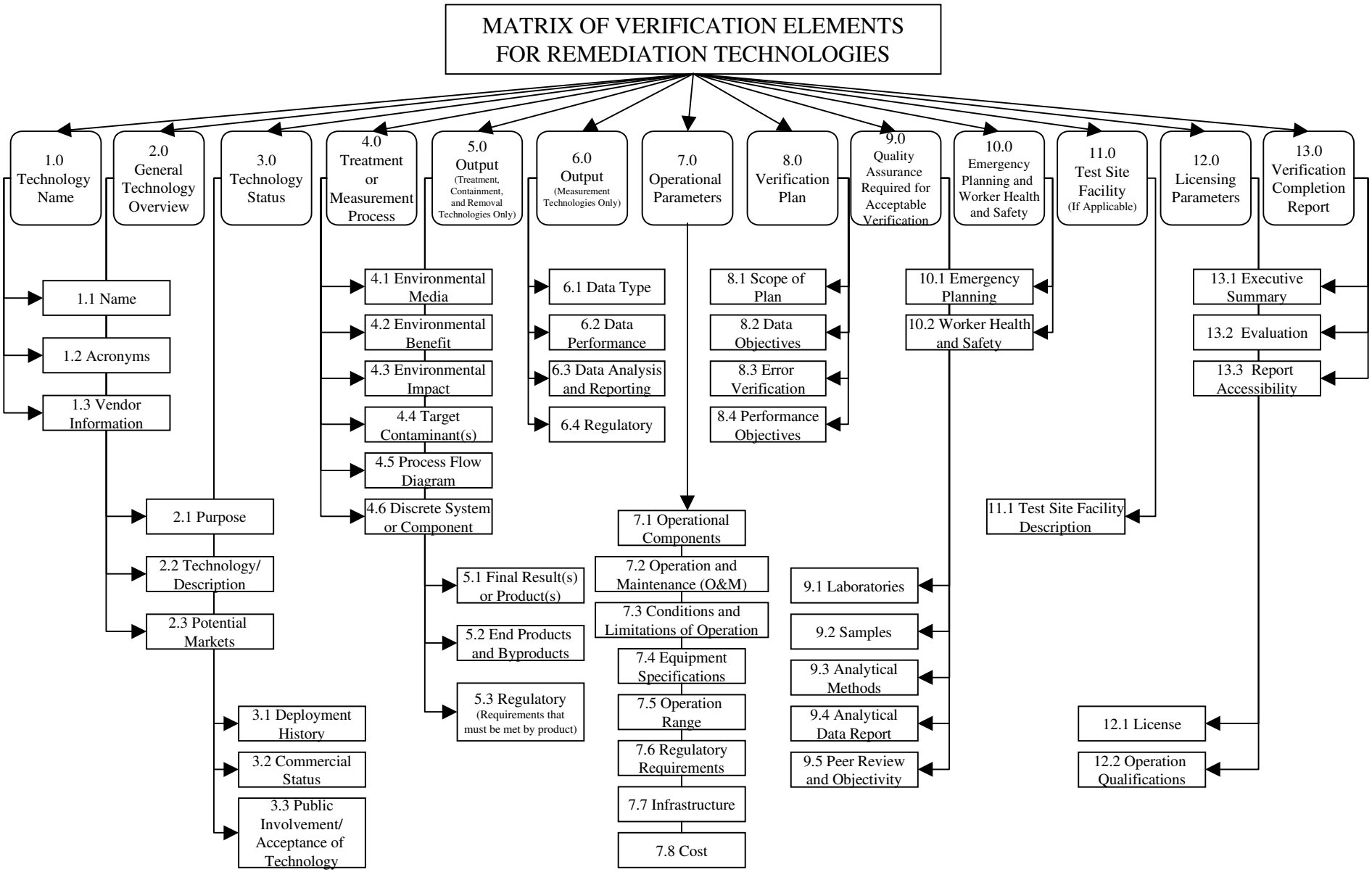
California	http://www.calepa.ca.gov/default.htm
Colorado	http://www.state.co.us/gov_dir/cdphe_dir/
Florida	http://www.dep.state.fl.us/
Illinois	http://www.hazard.uiuc.edu/wmrc/
Kentucky	http://www.state.ky.us/agencies/nrepc/nrhome.htm
Louisiana	http://www.deq.state.la.us/
Maryland	http://www.dnr.state.md.us/
Massachusetts	http://www.magnet.state.ma.us/dep/
Nebraska	http://www.nrc.state.ne.us/
New Jersey	http://www.state.nj.us/dep/srp/
New York	http://www.dec.state.ny.us/
Ohio	http://www.epa.state.oh.us/
Pennsylvania	http://www.dep.state.pa.us/
Tennessee	http://www.state.tn.us/environment
Texas	http://www.tnrcc.state.tx.us/
Virginia	http://www.deq.state.va.us/
Washington	http://www.wa.gov/ecology

Other Sites of Interest:

US EPA	http://www.epa.gov
ETV	http://www.epa.gov/etv
GNET	http://www.gnet.org
DoE	http://www.doe.gov/
ESTCP	http://www.estcp.org/
EPA/ATTIC	http://www.epa.gov/attic/index.html
EPA/CLU-IN	http://clu-in.org/
SERDP	http://www.acq.osd.mil/ens/
FRTR	http://www.frtr.gov/
Pacific Rim Enterprise Center	http://www.pacific-rim.org/

Appendix A

Verification Elements for Remediation Technologies


MATRIX OF VERIFICATION ELEMENTS FOR REMEDIATION TECHNOLOGIES
1.0 Technology Name
2.0 General Technology Overview
3.0 Technology Status
4.0 Treatment or Measurement Process
5.0 Output (Treatment, Containment, and Removal Technologies Only)
6.0 Output (Measurement Technologies Only)
7.0 Operational Parameters
8.0 Verification Plan
9.0 Quality Assurance Required for Acceptable Verification
10.0 Emergency Planning and Worker Health and Safety
11.0 Test Site Facility (If Applicable)
12.0 Licensing Parameters
13.0 Verification Completion Report
1.1 Name
1.2 Acronyms
1.3 Vendor Information
2.1 Purpose
2.2 Technology/ Description
2.3 Potential Markets
3.1 Deployment History
3.2 Commercial Status
3.3 Public Involvement/ Acceptance of Technology
4.1 Environmental Media
4.2 Environmental Benefit
4.3 Environmental Impact
4.4 Target Contaminant(s)
4.5 Process Flow Diagram
4.6 Discrete System or Component
5.1 Final Result(s) or Product(s)
5.2 End Products and Byproducts
5.3 Regulatory (Requirements that must be met by product)
6.1 Data Type
6.2 Data Performance
6.3 Data Analysis and Reporting
6.4 Regulatory
7.1 Operational Components
7.2 Operation and Maintenance (O&M)
7.3 Conditions and Limitations of Operation
7.4 Equipment Specifications
7.5 Operation Range
7.6 Regulatory Requirements
7.7 Infrastructure
7.8 Cost
8.1 Scope of Plan
8.2 Data Objectives
8.3 Error Verification
8.4 Performance Objectives
9.1 Laboratories
9.2 Samples
9.3 Analytical Methods
9.4 Analytical Data Report
9.5 Peer Review and Objectivity
10.1 Emergency Planning
10.2 Worker Health and Safety
11.1 Test Site Facility Description
12.1 License
12.2 Operation Qualifications
13.1 Executive Summary
13.2 Evaluation
13.3 Report Accessibility

MATRIX OF VERIFICATION ELEMENTS FOR REMEDIATION TECHNOLOGIES

Ratings for each element: ES -- essential; UN -- unnecessary; NH -- nice to have

CATEGORY:			PROGRAM ELEMENT: *Is it essential to have...*		ELEMENT RATING	COMMENTS
1.0 TECHNOLOGY NAME	1.1	Name		Full name of technology & relevant model number or trade name(s)		
	1.2	Acronyms		List of relevant acronyms		
	1.3	Vendor Information		Vendor name, address, phone and point of contact		
2.0 GENERAL TECHNOLOGY OVERVIEW	2.1	Purpose		Explanation of the intent of the technology process - What is the final goal for the treated material (Is this site specific?) - What process/technology does this technology replace, or supplement/complement - What is the goal of the technology - What is the final condition of the treated material		
	2.2	Technology Description		- A brief overview of components, and/or how the technology works - A description of the treated material		
	2.3	Potential Markets		A list of potential markets the Company/Vendor is interested in		
3.0 TECHNOLOGY STATUS	3.1	Deployment History	3.1.1	Status in relation to development and commercialization, e.g. Is the technology: - R&D - Bench Scale - Field Test - Operational test - Number of items produced, sold, etc. - Referenced regarding location and reports - Previous verification/certifications sought		
	3.2	Commercial Status	3.2.1	Is this commercially available vs. only available in prototype		
			3.2.2	List of commercial applications (include references and list of sites where there has been acceptance of technology by other public/government agencies)		
	3.3	Public Involvement & Acceptance of	3.3.1	A list of community outreach efforts and list of stakeholder involvement with contracts		
		Technology	3.3.2	A contact list (e.g. individuals that were involved in the development or deployment of the technology, list the stakeholders involvement in the verification process, address, telephone numbers of consultants, state and EPA contacts. List of technology users and contacts)		

CATEGORY:			PROGRAM ELEMENT: *Is it essential to have...*		ELEMENT RATING	COMMENTS
4.0 TREATMENT OR MEASUREMENT PROCESS	4.1	Environmental Media		Description of media which is/are subject to the process (e.g. soil, water, air)		
	4.2	Environmental Benefit		Explanation of how and what will benefit from the process (e.g. non-invasive containment vs. removal, destructive vs. stabilization, no generation of secondary wastes)		
	4.3	Environmental Impact		Explanation of how, what and who the treatment process will effect (e.g. changes to water table, generation or secondary waste)		
	4.4	Target Contaminant(s)		Description of contaminant(s) to be treated, removed, contained, or measured		
	4.5	Process Flow Diagram	4.5.1	Material balance		
			4.5.2	Energy balance		
			4.5.3	A conversion of media throughout the process (e.g. interim compound)		
	4.6	Discrete System or Component		Identify if this is a subset of a component or an overall system		
5.0 OUTPUT (Treatment, Containment, and Removal) Technologies Only	5.1	Final Result(s) or Product(s)	5.1.1	A description of the treatment efficiency (e.g. % of contaminant "removed" or % of contaminant "free" over time or as exists in final product or treatment level achieved)		
			5.1.2	A description of the lower limits of the treatment based on concentration along with any qualification regarding achieving lower limit (e.g. target levels)		
			5.1.3	A description of physical characteristics of the final product(s) (e.g. gas, solid, liquid)		
			5.1.4	Changes in physical state from input (e.g. volume, weight, state changes)		
	5.2	By-Products and End Products	5.2.1	Name description of by- and end-products (include qualitative and quantitative descriptions)		
			5.2.2	Impact or fate upon/within environment of Fugitive Emissions		
			5.2.3	Impact or fate upon/within environment of Stack Emissions		
			5.2.4	Impact or fate upon/within environment of Discharges (e.g. groundwater, surface water, air)		
			5.2.5	Impact or fate upon/within environment of Residuals/By-Products		
			5.2.6	Impact or fate upon/within environment of Noise Level/Odor		

CATEGORY:			PROGRAM ELEMENT: *Is it essential to have…*		ELEMENT RATING	COMMENTS
	5.3	Regulatory (Requirements that must be met by the final product)	5.3.1	Regulatory status of outputs'- Is it still a hazardous or regulated waste		
			5.3.2	Is the verification report giving the right type of information to make a determination of regulatory targets (e.g. is it still a hazardous or regulated waste? Is it subject to regulatory requirements? Will the end product(s) meet regulatory requirements without further treatment?)		
6.0 OUTPUT (Measurement Technologies only)	6.1	Data Type	6.1.1	Specific analytes instrument detects		
			6.1.2	Categories of contaminants instruments detect		
			6.1.3	Limitations of data produced (e.g. screening or definitive data)		
	6.2	Data Performance	6.2.1	Characteristics of samples that technology is suitable for (e.g. physical state, sample temperature, matrix composition)		
			6.2.2	Non-target interference(s) (e.g. high salinity or moisture content)		
			6.2.3	Method sensitivity and dynamic range		
			6.2.4	Bias - the expected value of the difference between the measured value and true value (where possible explain the factors contributing to bias)		
			6.2.5	Precision of the measurement - how reproducible (include the method used to determine precision)		
			6.2.6	Accuracy of the measurement - agreement between a measurement and an accepted or known value (include the method used to determine accuracy)		
			6.2.7	Comparability to relative standards and specifications		
			6.2.8	Calculation of false negative and false positive for each matrix per SW-846 method requirement(s)		
			6.2.9	Performance tested relative to a recognized reference method(s) (e.g. SW-846, ASTM, AOAC)		
			6.2.10	Performance evaluated based on real world samples		
			6.2.11	Use of blind performance evaluation (PE) samples in method verification		
	6.3	Data Analysis and Reporting	6.3.1	Equations used to calculate final sample results		
			6.3.2	Equations used to document detection limits		
			6.3.3	A data package which includes raw data and can be independently validated		

CATEGORY:		PROGRAM ELEMENT: *Is it essential to have...*		ELEMENT RATING	COMMENTS
7.0 OPERATIONAL PARAMETERS	7.1 Operational Components		List of essential components and specific steps of operation or measurement process		
	7.2 Operation & Maintenance (O & M)		Documented operating procedures and maintenance requirements (e.g. SOPs for remedial technologies and measurement procedures/methods and protocols)		
	7.3 Conditions and Limitations of Operation		Conditions under which the technology operates (e.g. loading rates, temperature, pressure, matrix interference, environmental limits)		
	7.4 Equipment Specifications	7.4.1	Summary including efficiency		
		7.4.2	Summary including reliability		
		7.4.3	Summary including portability and ruggedness		
		7.4.5	Summary including logistics (e.g. topography limitations, electrical use, water needs, temperature, vibrations)		
		7.4.6	Summary including weight and size of technology		
		7.4.7	Summary including ancillary equipment list		
	7.5 Operation Range	7.5.1	Maximum treatment or measurement capacity and throughput		
		7.5.2	Minimum treatment or measurement capacity and throughput		
		7.5.3	Optimum treatment or measurement ranges of operation		
	7.6 Regulatory Requirements		Necessary information to make a regulatory permit (approval) determination for construction and operation		
	7.7 Infrastructure		Infrastructure needed to support the technology (e.g. transportation, store waste handling, staffing or shift needs, continuous operations, single shift or batch operations)		
	7.8 Cost	7.8.1	Cost factors (site specific cost(s) use actual costs from vendors where possible) - Mobilization / time and distance - Energy / units - Material / volume - Maintenance / hours		
		7.8.2	Projected cost of deployment (use actual costs from vendors where possible) (e.g. unit operations cost per samples and/or volume of material treated)		

CATEGORY:		PROGRAM ELEMENT: *Is it essential to have…*		ELEMENT RATING	COMMENTS
8.0 VERIFICATION PLAN	8.1 Scope of Plan	8.1.1	List of relevant standards (e.g. engineering standards, calibration standards)		
		8.1.2	Test specifications		
		8.1.3	Vendor claims		
		8.1.4	Test procedures		
		8.1.5	Calculation procedures		
	8.2 Data Objectives	8.2.1	Source of data (e.g. pre-existing, demonstration data, vendor data, third party data)		
		8.2.2	Precision, accuracy, repeatability, completeness, comparability (PARCC)		
	8.3 Error Verification	8.3.1	Establish confidence intervals for data reporting (e.g. define data quality objective (DQOs), criteria for useable data and reporting some measure of the error)		
		8.3.2	Report on documented failures		
		8.3.3	Documented exceptions to failure (uncontrolled circumstances unrelated to the technology)		
	8.4 Performance Objectives		Pre-established level of performance the technology is expected to meet (e.g. establish criteria and tests that will be used to determine if performance objectives have been met)		
9.0 QUALITY ASSURANCE REQUIRED FOR ACCEPTABLE	9.1 Laboratories		Accredited/certified by the appropriate state required program		
	9.2 Samples	9.2.1	A sampling and analysis plan and appropriately filed QA/QC		
		9.2.2	Independent labs should utilize sample(s) acquired from a self/personally provided source		
		9.2.3	Independent labs should utilize sample(s) acquired from an on-site company provided source		
	9.3 Analytical Methods	9.3.1	U.S. EPA guidelines (e.g. U.S. EPA published methods)		
		9.3.2	Generally accepted scientific community standards and/or recognized reference methods (e.g. ASTM, AOAC)		
		9.3.3	Referred publications in professional journals		
	9.4 Analytical Data Report	9.4.1	Laboratory data supporting purpose/claim, presented in a recognized form that allows independent verification		
		9.4.2	Field data supporting purpose/claim, presented in a recognized form that allows independent verification		

CATEGORY:		PROGRAM ELEMENT: *Is it essential to have...*	ELEMENT RATING
	9.5 Peer Review and Objectivity	9.5.1 Oversight by the verifying body to ensure procedures are in accordance with approved plan	
		9.5.2 Field oversight of demonstration by verification organization	
		9.5.3 Objectivity of verifying body - who collected data, who reviewed data, who executed data analysis (contacts should be provided)	
10.0 EMERGENCY PLANNING & WORKER HEALTH AND SAFETY	10.1 Emergency Planning	10.1.1 A description of the minimal credible accident scenario	
		10.1.2 Emergency Plan - outlined course of action to be executed in case of emergency	
	10.2 Worker Health & Safety	10.2.1 Worker Safety Plan - includes analysis consisting of hazard and risk assessment, information on past accidents, and how to respond in case of malfunctions, spills or any other problem which might effect worker health and safety	
		10.2.2 Description of structure or method applied to physically protect public and/or environment during demonstration (e.g. clean zone, personal protective equipment)	
11.0 TEST SITE FACILITY (if applicable)	11.1 Test Site Facility Description	11.1.1 A hydrologic, geologic description of site (include spatial distribution of contaminants and other site specific conditions that would impact technology performance)	
		11.1.2 Ranges of concentration expected for each tested	
12.0 LICENSING PARAMETERS	12.1 License	Permission to use technology, requirements associated with operation of technology under license	
	12.2 Operation Qualifications	Operation qualifications (e.g. license of individual(s) overseeing/operating process, training, experience)	
13.0 EXECUTIVE SUMMARY	13.1 Executive Summary	13.1.1 A definition for "whom" the report was prepared (e.g. board review of report, submit final report)	
		13.1.2 Both the success and failure descriptions	
		13.1.3 Limitations of the technology	
		13.1.4 Cost considerations for the technology	
		13.1.5 Stakeholder involvement process and acceptance	
	13.2 Evaluation	13.2.1 Report must reference, provide, or summarize specific data, reports, literature, or other relevant information	
		13.2.2 Report must describe equipment or process	
		13.2.3 Report must describe scope of application	
		13.2.4 Report must describe evaluation of proposed claim/objective	
		13.2.5 Report must describe suggested conditions or regulatory applications	
		13.2.6 Report must describe elements of test plan	
		13.2.7 Report must document total completion of verification plan	
	13.3 Report Accessibility	13.3.1 Internet access	
		13.3.2 Hard copies	
		13.3.3 Video documentation of demonstration	

Appendix B

List of Acronyms

LIST OF ACRONYMS

Acronym	Complete Spelling	Organization
ASCE	American Society of Civil Engineers	Professional
ASTM	American Society for Testing and Materials	Professional
ASTSWMO	Association of State and Territorial Solid Waste Management Officials	States
Cal-DTSC	California Department of Toxic Substances Control	State
Cal-DTSC	Department of Toxic Substances Control	California
Cal/EPA	California Environmental Protection Agency	California
Cal-OPPTD	Office of Pollution Prevention and Technology Development	California
CERCLA/ SARA	Comprehensive Environmental Response, Compensation and Liability Act/Superfund Amendments and Reauthorization Act	USEPA
CERF	Civil Engineering Research Foundation	ASCE
CPSR	Cost and Performance Summary Report	ESTCP
CSCT	Consortium for Site Characterization Technology	USEPA/ORD/
D&D	Deactivation and Decommissioning	NA
DEP	Department of Environmental Protection	States
DoC	Department of Commerce	Government
DoD	Department of Defense	Government
DoE	Department of Energy	Government
DoE-OST	Office of Science and Technology	DoE
ECOS	The Environmental Council of the States	States
EPAETV	Environmental Protection Agency Environmental Technology Verification Program	DoD
ESTCP	Environmental Security Technology Certification Program	DoD
ETV-Canada	Canada's Environmental Technology Verification Program	Government
ETVR	Environmental Technology Verification Reports	USEPA/ETV
EvTEC	Environmental Technology Evaluation Center	CERF
FES	Florida Engineering Society	Professional
FIU	Florida International University	University
HCET	Hemispheric Center for Environmental Technology	DOE/FIU
ITER	SITE's Innovative Technology Evaluation Report	USEPA
ITRC	Interstate Technology and Regulatory Cooperation	State
ITRD	Innovative Treatment Remediation Demonstration	DoE (EM-40)
Mass-STEP	Massachusetts Strategic Envirotechnology Partnership	State
MOU	Memorandum of Understanding	NA
NERL	National Exposure Research Laboratory	USEPA
NETI	National Environmental Technology for Waste Prevention Institute	UMass, Amherst
NJCAT	New Jersey Corporation for Advanced Technology	Public/Private
NRMRL	ORD's National Risk Management Research Laboratory	USEPA
ORD	Office of Research and Development	USEPA
ORNL	Oak Ridge National Laboratory	DoE
OSWER	Office of Solid Waste and Environmental Response	USEPA
POC	Point of Contact	NA
QA/QC	Quality Assurance/Quality Control	NA
R&D	Research and Development	NA
RCI	Rapid Commercialization Initiative	USEPA
RI/FS	Remedial Investigation/Feasibility Study	NA
SCMTP	Site Characterization and Monitoring Technology Pilot (formerly CSCT)	USEPA/ORD/
SERDP	Strategic Environmental Research and Development Program	DoD
SITE	Superfund Innovative Technology Evaluation	USEPA
SPPTP	Science, Pollution Prevention, and Technology Program	Cal-EPA
TIO	Technology Innovation Office	USEPA
UMass	University of Massachusetts	Massachusetts
UXO	Unexploded Ordnance	NA
VP	Verification Program	NA
VT	Verification Team	NA
WGA	Western Governors Association	States

Appendix C

States Signing Acceptance Letters

STATES SIGNING ACCEPTANCE LETTERS

Appendix C contains the following three items:

(1) The list of states signing the agreement form attached to the cover letter (page C-1)
(2) The body of a cover letter sent to the state reviewers (page C-2)
(3) A blank agreement form (page C-3).

States Signing Agreement Form
(Note: All signers checked line A of the Agreement)

State	Name of Signer and Affiliation	Date of Signature
Louisiana	Hall Bohlinger, Department of Environmental Quality	October 6, 1998
Illinois	William C. Child, Bureau of Land	November 5, 1998
Tennessee	James W. Hayes, Department of Environmental Conservation, Division of Superfund	December 17, 1998
Kentucky	Jeffrey W. Pratt, Department for Environmental Protection, Division of Waste Management	April 14, 1999

Interstate Technology & Regulatory Cooperation Work Group

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Thank you for your response to our request for information regarding verification elements important to your state for evaluating environmental remediation technologies. We believe the value of this project to your state is that it will encourage verification programs to incorporate states' needs so that the output from these programs can be utilized by the states to make better and faster remediation technology decisions. The ITRC recognizes that verification does not necessarily replace site specific performance testing, but strives to eliminate redundant technology demonstrations.

The ITRC report, "*Multi-State Evaluation of Elements Important to the Verification of Remediation Technologies"* will document minimum state needs for verification of environmental technologies. The report is designed to describe critical performance elements necessary to accelerate the deployment of new technologies in multiple states.

We have incorporated your comments in the matrix, except for those noted in the response to comments (attachment). The only changes to the matrix elements were clarifications and additional examples. No primary data elements were deleted, and no new elements were identified by the states. We will use the information you provided and those of other states and stakeholders in the ITRC report to be published in December**.**

We would appreciate your action on the following:

1. Conduct a final review of data from your state on "essential, nice to have, and unnecessary" elements, and incorporate any modifications to your states responses.

2. Obtain 'formal' agreement that these are the minimum elements, which if included in existing North American verification programs, would enhance your states' confidence in verification results.

3. Obtain an agency signature, at the highest level, indicating this agreement as identification of your states' minimum elements or needs from a verification program and agreement that your state's information can be published as part of the ITRC Verification team report and shared with verification programs.

4. Return the final matrix with any additional comments incorporated to Nancy Uziemblo by NOVEMBER 2, 1998.

Thank you for your participation in this important ITRC effort.

****

AGREEMENT LETTER FOR *MATRIX OF VERIFICATION ELEMENTS FOR REMEDIATION TECHNOLOGIES*

[check on one line]

A. _____ We agree that the elements identified in the matrix provided represents our state's minimum needs in the area of Environmental Technology Verification and agree to inclusion of our state's information in the ITRC Verification Team Report

B. _____ We agree that the elements identified in the matrix provided represents our state's minimum needs in the area of Environmental Technology Verification; with the followings conditions (please specify conditions). We agree to inclusion of our states' information in the ITRC Verification Team Report.

X_____ signature of representative of Department/Agency authorizing agreement and direction for use of this information

****

Appendix D

Verification Program Summaries

SUMMARY FOR CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY (Cal/EPA) DEPARTMENT OF TOXIC SUBSTANCES CONTROL HAZARDOUS WASTE ENVIRONMENTAL TECHNOLOGY CERTIFICATION PROGRAM

A. Background

In 1993, Cal/EPA and the California Trade and Commerce Agency solicited input from an advisory council of stakeholders to the California Environmental Technology Partnership (CETP). One of the advisory council's recommendations which was implemented by Cal/EPA in 1994 was the Hazardous Waste Environmental Technology Certification Program (Certification Program). Cal/EPA sponsored legislation, Assembly Bill (AB) 2060, to implement the concept first at the Department of Toxic Substances Control (DTSC), which regulates hazardous wastes. This program is operated within DTSC's Science, Pollution Prevention, and Technology Program (SPPTP).

The Program is operated within DTSC's Science, Pollution Prevention, and Technology Program (SPPTP).

The purpose of AB2060 was to assist the environmental industry in marketing and regulatory acceptance of innovative hazardous waste technologies. This legislation was followed by AB3215 which authorized the California Air Resources Board to implement a pre-certification program for commonly used air pollution control technologies. (This program is known as pre-certification because it determines if requirements will be met for the individual air districts which may have their own certification programs.) Later, Senate Bill (SB) 1943 authorized all Cal/EPA agencies to implement such programs. Under SB 1943, the State Water Resources Control Board is establishing a program to certify water pollution control technologies. This summary focuses on the Hazardous Waste Environmental Technology Program operated by DTSC.

B. Organization and Facilities

DTSC's SPPTP currently is under the management of Dr. Robert Stephens. SPPTP is divided into three sections: the Office of Pollution Prevention and Technology Development (OPPTD), managed by Dr. James T. Allen, the Hazardous Materials Laboratory (HML), managed by Dr. Bart Simmons, and the Human and Ecological Risk Division (HERD), managed by Dr. Jeff Wong. Greg

The Certification Program is currently a pilot project as part of the U.S. Environmental Protection Agency (USEPA) Environmental Technology Verification (ETV) Project.

Williams, Chief, Technology Development Branch of OPPTD, directs the day-to-day functions of the Certification Program. HML has two sites: one in Berkeley and the other in southern California. Other testing facilities have included laboratories operated by the University of California and several national laboratories via a Memorandum of Understanding (MOU). Other MOUs have been signed with Canada, Bavaria, and five states which are members of the Interstate Technology and Regulatory Cooperation (ITRC) Workgroup. The Certification Program is also currently a pilot project as part of the U.S. Environmental Protection Agency (US EPA) Environmental Technology Verification (ETV) Program. Under a Cooperative Agreement with US EPA, the pilot project focuses on verifying hazardous waste pollution prevention, recycling, and waste treatment technologies. A Stakeholder Advisory Group has been formed.

C. Customers and Vendors

The Program has certified 26 technologies to date.

As illustrated in Table D-1, customers have included a variety of field bioassay monitoring vendors, the U.S. Navy, Rayovac Corporation, and the U.S. Department of Energy. The Program has certified 26 technologies to date.

Table D-1. Examples of the Cal/EPA customers, technology and action being performed.

Customer	Action	Technology
Rayovac Corporation	Verification	Rechargeable alkaline batteries
U.S. Navy	Certification	Site characterization and analysis and penetrometer system
puraDYN	Recertification	Mobile oil refining system
Thermatrix	Certification	Thermal treatment
Katec	Certification/Verification	Aerosol can treatment

D. Technology Verification Program

Certification goes beyond verification by predicting the performance when the technology is operated under a range of conditions specified in the certification statement.

California certification verifies the performance of a technology with respect to specific conditions, and goes beyond verification in that it predicts the performance that can be achieved when the technology is operated under a range of conditions specified in the certification statement. In addition, after regulations are adopted, certified technologies may be placed by DTSC within a permit tier

which reduces or streamlines certain California-imposed permitting requirements. A primary goal of California's certification program is to accelerate the entrance and acceptance of new environmental technologies into the domestic and international marketplaces. Hazardous waste technologies eligible for California certification include, but are not limited to, those for treatment, recycling, site mitigation, waste minimization, pollution prevention, and measurement and monitoring.

The process for evaluating a technology for certification can be divided into three phases:

1. The prospective applicant submits summary information which is reviewed to assure that the technology meets eligibility and screening criteria;

2. The applicant submits more detailed information so that a multi-disciplinary team can assess what performance claims will be evaluated for certification and what activities will be necessary to complete the evaluation; and

Verification is similar except that USEPA is also involved in the review.

3. DTSC reviews the submitted information including new data (e.g. field tests) obtained during the evaluation to assure it meets established data quality standards. Field testing is generally required for most technologies, although review of existing data is a significant element of the program. DTSC activities include review and approval of the test plans submitted by the Applicant. Finally, an evaluation report is prepared which documents the basis for each certification decision. The proposed certification decision is published for public comment in the California Regulatory Notice Register, comments are responded to and the report and decision modified as appropriate, then the final certification decisions is published. Successful technologies receive California certification.

Verification is similar except that US EPA is also involved in the review, eligibility and screening criteria which reflect US EPA priorities (e.g. Common Sense Initiative industries, pollution prevention or waste treatment technologies). US EPA subsidizes some of the fees, and there is no public noticing, but US EPA issues a national Verification Statement.

E. Verification Program Objectives

The Program's objectives are to expedite the acceptance, permitting, and implementation of hazardous waste management, measurement, monitoring, and mitigation technologies, and to promote pollution prevention.

F. Facility Description

The Program has no testing facilities other than the hazardous materials laboratories and universities. Typically, tests are conducted in field demonstrations.

G. Data Acquisition

The Program uses a variety of means to communicate success or failure.

California will consider using data which has been previously collected. Data must be collected using accepted protocols and all QA/QC procedures must be followed. If accepted protocols do not exist, a statement of how the protocol was or will be developed must be determined to be acceptable by California. Typically, data gaps exist and a protocol must be developed or modified if not already available. Data quality is examined for adequacy based on independence, methods, accuracy, precision, and statistical confidence. Where no reasonable quantitative test methods exist, for example, cleanliness of parts in auto repair, California will consider the industry standard of subjective ratings by operators. However, California ranks objective quantitative analyses higher than subjective qualitative analyses for verification purposes.

H. Communication

The statute that authorizes California's program requires that DTSC fully recover its costs in performing the certification evaluation.

The Program uses a variety of means to communicate success or failure: An evaluation report is published and is circulated to ITRC states for comment, a proposed certification decision is published in the California Regulatory Notice Register and on the Internet for public comment, a final decision is also published, technology transfer advisories (one page fact sheets) are developed and distributed through a variety of methods, and the successful applicant receives a certificate, and is authorized to use the Program logo in marketing efforts.

I. Costs

The statute that authorizes California's program requires that DTSC fully recover its costs in performing the certification evaluation.

SUMMARY FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION (SITE) PROGRAM

A. Background

The EPA SITE Program was established by EPA's Office of Solid Waste and Emergency Response and the Office of Research and Development (ORD).

The U.S. Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) Program was established by EPA's Office of Solid Waste and Emergency Response and the Office of Research and Development (ORD). SITE was established in response to the 1986 Superfund Amendments and Reauthorization Act, which recognized a need for an "Alternative or Innovative Treatment Technology Research and Demonstration Program."

The SITE Program was created to encourage the development and routine use of innovative treatment and monitoring and measurement technologies. The SITE Demonstration Program encourages the development and implementation of innovative treatment technologies for hazardous waste site remediation and monitoring and measurement.

B. Organization and Facilities

The program has potential access to both Superfund and other hazardous waste sites.

The SITE Program is administered by the ORD National Risk Management Research Laboratory (NRMRL), which is headquartered in Cincinnati, Ohio. The program has potential access to both Superfund and other hazardous waste sites. The SITE Demonstration Program encourages the development and implementation of innovative treatment technologies for hazardous waste site remediation and monitoring and measurement.

C. Customers and Vendors

Sites interested in hosting an innovative technology demonstration may apply with one or more technology vendors in mind. Under the SITE Program, the EPA enters into cooperative agreements with technology developers and those financially responsible for site remediation. With the EPA's support, technology venders demonstrate their technology at the hazardous waste site. As a result, the

As of July 1998, 95 treatments and 40 monitoring and measurement technologies have been field-tested.

SITE Program provides environmental decision-makers with data on new, viable treatment technologies that may have performance or cost advantages compared to traditional treatment technologies. As of July 1998, 95 treatments and 40 monitoring and measurement technologies have been field-tested.

Table D-2 lists a few of the EPA/SITE program customers, their technology, and the action being performed. SITE uses a market-driven approach and can work with all 50 states.

Table D-2. Examples of EPA/SITE program customers, technology, and action being performed.

Customer	Action	Technology
J. R. Simplot	Completed SITE Demonstration	Biological treatment of dinoseb in soil
Terra Kleen	Completed SITE Demonstration	PCB solvent extraction
Solucorp	Completed SITE Demonstration	Metals stabilization
EET Inc.	Completed SITE Demonstration	PCB extraction from porous surface

At the conclusion of a SITE demonstration, the EPA prepares an Innovative Technology Evaluation Report (ITER), Technology Capsule, and Demonstration Bulletin.

D. Technology Verification Program

An evaluation team is formed consisting of members from DoD, DoE, the different regions of EPA, EPA TIO (OSWER), Superfund, ITRC, and several technical reviewers from ORD. The team develops a set of test objectives designed to verify the cost and performance of the technology. Data collected during the field demonstration are used to assess the performance of the technology, the potential need for pre- and post-processing of the waste, applicable types of wastes and waste matrices, potential operating problems and approximate capital and operating costs. At the conclusion of a SITE demonstration, the EPA prepares an Innovative Technology Evaluation Report (ITER), Technology Capsule, and Demonstration Bulletin. These reports evaluate all available information on the technology and analyze its overall applicability to other site characteristics such as the type of waste and the waste matrices. The testing procedures, performance and cost data, and quality assurance and quality standards are presented. Engineering and cost data are gathered on the innovative technology so those potential users can assess the technology's applicability to a particular site.

E. Verification Program Objectives

SITE provides credible and unbiased technology cost and performance data. In the SITE Demonstration Program, the technology is field-tested on hazardous waste materials.

F. Facility Description

In the SITE Demonstration Program the technology is field-tested on hazardous waste materials.

The EPA's SITE program is administered by the ORD through its National Risk Management Research Laboratory (NRMRL), in partnership with the National Exposure Research Laboratory (NERL). Field demonstrations are conducted at the hazardous waste sites. Consequently, most of the field demonstrations are conducted at Superfund National Priority List sites or those on the Brownfields list.

G. Data Acquisition

Prior to, during, and following the field demonstration, very extensive independent field audits are conducted by EPA's QA/QC office. The audits are conducted to determine the validity of the analysis procedures, and conclusions. The audits also establish the validity of the sampling and objectivity of the test as stated in the technology evaluation plan. Following the fieldwork, the samples are analyzed according to the test plan approved methods of EPA contracted pre-audited laboratories. Early in the laboratory analysis, very extensive independent audits are conducted by EPA's QA/QC office. The validity of conclusions, the technology evaluation plan, realization of project objective, and the QA data are evaluated and reviewed by EPA's Project Managers and QA/QC office before the results are publicized in a series of documents, papers, and videotapes. Testing procedures, performance and cost data, quality assurance, and quality standards are reviewed internally by the EPA. At the conclusion of a SITE demonstration, EPA prepares a Demonstration Bulletin, a Technology Capsule, and an ITER. These reports evaluate all of the data collected during the demonstration, included within the treatability studies, and analyze its overall applicability to other site characteristics, such as waste types, and waste matrices. Testing procedures, performance and cost data, and quality assurance and quality standards are also presented. In addition, any and all information on the technology is present in an additional appendix, written by the vendor(s).

H. Communication

The goal of information transfer is to promote communication among individuals that require up-to-date technical information. At the conclusion of a SITE demonstration, USEPA prepares two brief bulletin capsule reports and a more extensive ITER for each technology. These reports evaluate all of the data collected during the demonstration, included within the treatability studies, and analyze its overall applicability to other site characteristics, waste types, and waste matrices. Testing procedures, performance and cost data, and quality assurance and quality standards are also presented.

A technology profile document is also produced, describing all technologies participating in the program. A new vendor's technology profile contains: (1) a technology developer and process name, (2) a technology description including a schematic diagram or photograph of the process, (3) a discussion of waste applicability, (4) a project status report, and (5) EPA project manager and technology developer contacts. The profiles also include summaries of demonstration results, if available. In addition, information is distributed via the Internet through the SITE homepage, OSWER homepage, GNET homepage, and the databases: VSITT, GNET, and GWRTAC, along with prepared videotapes, and presentations at conferences. Additional information is available on the SITE website http://wwwepa.gov/ORD/SITE/index.htm.

EPA provides all financial resources through in-kind support.

I. Costs

EPA provides all financial resources through in-kind support. SITE, the site owner, and the vendor share the responsibilities for verification. SITE is responsible for the test plan, sampling, analytical work, and report. The site owner is responsible for the infrastructure, residual waste disposal, and a Visitor's Day. The vendor is responsible for the equipment and its operation and maintenance.

SUMMARY FOR ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP)

A. Background

The program selects only those technologies with broad DoD market application.

The primary goal of the Environmental Security Technology Certification Program (ESTCP) is to accelerate the implementation of technology across the U. S. Department of Defense (DoD) to save money and reduce risk. The ESTCP was established in 1995 to accomplish three goals: (1) to demonstrate and validate innovative environmental technologies under real-world conditions; (2) to address the real and most urgent environmental needs of the DoD; and (3) to promote the rapid implementation and direct technology insertion of advanced environmental technologies. The program identifies laboratory-proven technologies that can significantly reduce the costs, risks, and time associated with cleanup, compliance, and pollution prevention problems; selects only those technologies with broad DoD market application; and moves these technologies to the field for rigorous trials. To accelerate transfer of environmental technologies to the DoD user, field demonstrations are designed to provide the operational cost, performance, and market data required to facilitate regulatory and user acceptance of these technologies

B. Organization and Facilities

All funded projects are reviewed annually during In-Progress Reviews (IPR).

Selected environmental technologies progress through a rigidly structured and closely monitored demonstration/validation program. All funded projects are reviewed annually during In-Progress Reviews (IPR). The ESTCP Manager and staff for technical and programmatic progress review projects during the IPR. All projects are also required to submit a formal written demonstration plan, which must be approved prior to field-testing. Personnel not involved with the project conduct this review. In addition, the structure of each project is established to ensure that an independent evaluation of the technology is performed. Many projects directly involve the regulatory community in this process.

The ESTCP also includes quarterly financial and milestone reports and reviews, demonstration plan reviews, and technical performance oversight in the field. Since the DoD commissioned the ESTCP to facilitate the movement of technology from the laboratories to the users, the program is specifically designed to generate the operational cost, performance, and market data required to facilitate regulatory

and user acceptance of the technology. ESTCP projects culminate with a final technical and, Cost and Performance Summary Report (CPSR), both of which are published.

C. Customers and Vendors

The program is specifically designed to generate the operational cost, performance, and market data .

Since the program's inception in 1995, several technologies have been successfully transferred to the DoD and commercial markets. Table D-3 lists a few of the ESTCP customers and vendors, their technology, and the action being performed. The first formal set of cost and performance reports will also be issued this year.

Table D-3. Examples of the ESTCP customers, technology and action being performed.

Customer	Action	Technology
Naval Research Laboratory, Environmental Quality Services	Ongoing – Demonstration	Non-toxic Anti-Fouling Coatings (to prevent barnacle and zebra mussel adhesion on ships and in utility industry water intake tunnels)
US Army Environmental Center and the US Naval Facilities Engineering Service Center	Verified	Joint Small Arms Range Remediation (to recover and recycle the lead left in soil at small-arms ranges)
NCCOSC RDT & E San Diego	Verified	The Metalyzer 5000 is an Automated Lead Analyzer (to rapidly field test for lead and other heavy metals in drinking water)
Naval Research Laboratory, Washington D.C.	Verified	Multi-Sensor Towed Array Detection System (to accurately detect and characterize underground unexploded ordnance)
Spawar Systems Center, San Diego	Verified	POL Sensor for Site Characterization an Analysis Penetrometer System (SCAPS) to provide rapid field screening for petroleum contaminants in the soil

D. Technology Verification Program

ESTCP projects focus on three of the DoD's environmental pillars—pollution prevention, compliance, and cleanup.

ESTCP projects focus on three of the DoD's environmental pillars—pollution prevention, compliance, and cleanup. The primary criterion for proposed projects is laboratory data that documents proof of the concept. The technology must be

mature enough for the field and promising enough to warrant a scale-up. Projects that meet proposal criteria undergo a rigorous review process conducted by an expert panel of scientists. More than 100 proposals are reviewed each year and ranked according to several tests. Each ESTCP project must address a DOD environmental priority requirement, show potential for a DOD wide market application, and provide for return-on-investment. Projects that complete all steps in the review process are prioritized for funding consideration—only the most innovative and potentially useful projects receive funding awards. All selected projects are required to include an independent test and evaluation component. The approach varies between projects.

E. Verification Program Objectives

ESTCP projects were granted authority to enter into cooperative agreements with state and local government agencies.

In the case of the ESTCP, "verification/certification" refers to the process by which the program takes laboratory-proven environmental technologies and moves them to the field for rigorous trials while documenting the cost and performance of the technologies. The overall goal of the verification is to accelerate the implementation of the technology at DOD facilities.
In order to enhance Federal and state cooperative efforts to transfer technologies, ESTCP projects have sought and were granted authority to enter into cooperative agreements with state and local government agencies to demonstrate, validate, and certify environmental technologies. ESTCP projects work closely with the federal and state regulatory communities. Program administrators are active in many key regulatory and industry organizations that promote environmental technology transfer. These include various interstate regulatory meeting groups (in addition to the Federal Roundtable) such as the Interstate Technology Regulatory Cooperation (ITRC). A number of ESTCP projects have been reviewed by the ITRC.

F. Facility Description

The ESTCP program carries out field demonstrations at DOD facilities across the United States.

G. Data Acquisition

No standard quantitative criteria have been established for the ESTCP. All projects are required to include an independent test and evaluation component. The approach varies between projects. All projects are required to submit a formal written demonstration plan, which must be approved prior to field-testing. Personnel who are not involved with the project conduct the demonstration plan review.

H. Communication

Within the DOD, ESTCP encourages Tri-Service cooperation.

All ESTCP projects are required to publish a final technical report that documents the technology demonstration. ESTCP also publishes Cost and Performance Summary Report's (CPSRs) after the completion of each project, that document how the project has performed. The intended audiences for these CPSRs are governmental validation agencies, site offices, field-level technology project managers, and the general public. ESTCP intends to put these reports on its website as they are published. There is a technology transfer component goal to ESTCP projects. Projects are expected to take an active part in conferences, symposium presentations, "Tiger Teams," and interact with the various DOD Service Centers.

Within the DOD, ESTCP encourages Tri-Service cooperation and information exchange and is actively identifying DOD markets—the necessary first step in technology transfer. ESTCP is also partnering with working groups such as Joint Group Pollution Prevention (JG-PP) and the Joint Depot Environmental Panel (JDEP) that play critical roles in spreading the word about the availability of new technologies and in promoting user acceptance. The program contact is Dr. Jeffrey Marqusee (703) 696-2120. In addition, general information can be obtained from the ESTCP website http://www.estcp.org.

I. Costs

Projects are funded on a competitive basis through an annual solicitation process (DOD service call and broad agency announcement). Demonstrations are funded via DOD appropriations and fees are not requested.

SUMMARY FOR CANADA'S ENVIRONMENTAL TECHNOLOGY VERIFICATION (ETV) PROGRAM

A. Background

The ETV program was developed by Environment Canada (lead department) in cooperation with Industry Canada and in consultation with the Canadian environment industry. ETV was developed in keeping with the *Strategy for the Canadian Environmental Industry (CEIS)*. The CEIS was announced in 1994 by Industry Canada and Environment Canada, called for the examination of Initiative 5, the certification of products, processes and services. In response, Environment Canada and Industry Canada, in partnership with the Canadian Environment Industry Association (CEIA) and other stakeholders, embarked on an examination of options in October 1994 for a national certification program. In November 1995, the initiative was refocused on the concept of an Environmental Technology Verification (ETV) Program. As the ETV program developed, the environmental industry made it clear that there was a greater need for industry representation on the ETV Program Steering Committee. As a result, in July 1996, the Steering Committee was restructured to include a majority of industry representation. Under the agreement of the license, Environment Canada is responsible for Program policy and general direction, while the CEIA and private sector representatives provide input to Environment Canada on Program oversight and direction through participation in semi-annual performance reviews. Based on recommendations of the Steering Committee, the ETV Program is administered by a private sector partner – ETV Canada Inc (ETVCI).

The ETV Program is administered by a private sector partner – ETV Canada Inc (ETVCI).

B. Organization and Facilities

ETVCI operates the ETV Program on behalf of the Government of Canada and is licensed to use the ETV Logo and issue Verification Certificates, Fact Sheets and Final Reports. In order to deliver an effective program, the ETV Program has focused on Provincial Government Recognition. A *Statement of Recognition* has been drafted and is presently being reviewed by the provinces. This recognition will reduce the need for costly testing that is often required to obtain regulatory approvals. Acceptance of claims that are verified by the ETV program should reduce paper work, time, and cost. To enhance this process, an extensive cross-Canada network of environmental organizations, qualified to serve as Verification

Entities and Sector Specialists, are subcontracted to provide verification and related technical services.

Another area on which the ETV Program recently focused was the movement of proven technologies into foreign markets and obtaining reciprocity with programs in other countries. Currently, Environment Canada and California EPA have signed a Memorandum of Understanding (MOU) establishing reciprocity between the two verification programs. In addition, a MOU has been signed with New Jersey's Department of Environmental Protection in order to exchange information and seek reciprocity. The ETV Program has also established a cooperative agreement between Canada and USEPA, in order to examine the harmonization of verification initiatives. Further exploration of foreign markets is being established by Canada's ETV Program effort to build a rapport with several international organizations, which include the International Standards Organization (ISO), United Nations' Economic Commission of Europe, and NAFTA's Commission for Environmental Cooperation.

The ETV Program has also established a cooperative agreement between Canada and USEPA

C. Customers and Vendors

Environmental technology vendors apply to Canada's ETV Program for verification of the claims they make concerning the performance of their environmental technologies. If the claim is verified, the company is issued three documents: (1) a verification certificate, (2) a technology fact sheet and (3) a final verification report. In addition, approved applicants/technologies can utilize the ETV Logo, along with the three documents, in their marketing activities. Suppliers of equipment-based environmental services, where performance can be verified, are also eligible to apply to the ETV Program.

Table D-4 lists a few of the Canada-ETV customers, their technology, and the action (verification/certification/re-certification, etc.) being performed.

Table D-4. Examples of ETV-Canada's customers, technology, and action being performed.

Customer	Action	Technology
Testo Inc.,New Jersey	Verified	Models 350 & 360 Portable Combustion Analyzers
Goodfellow Technologies Inc., Mississauga, Ontario, Canada	Verified	Expert Furnace System Optimization Process, EFSOP
Cable Arm (Canada) Inc.	Verified	LEVEL-CUT Clamshell Bucket
Greenland Corporation, Calgary, Alberta, Canada	Verified	Greenplus Hydraulic Fluid ES

D. Technology Verification Program

In order to evaluate a claim adequately, the protocol focuses on five major steps:

1. Review of Application
2. Evaluation of Technology
3. Assessment of Data Quality
4. Verification of Claims
5. Report Preparation.

Step four can be further divided into four stages:

Stage one: This stage serves as the "Pre-Screening" process. The objective of this stage is to acquire a basic understanding of the technology and claim(s) in order to establish merits for eligibility. In order to be eligible, a technology must; (1) be an environmental technology or an equipment-based environmental service where equipment performance can be verified; (2) offer an environmental benefit or address an environmental problem; (3) meet minimum Canadian standards and/or national guidelines; and (4) be currently commercially available or commercially ready for full-scale application. Technologies that fail to meet the last criteria, but are ready for demonstration at pilot-scale or as a prototype commercial unit can contact ETV Canada for advice regarding the planning of test programs to generate relevant data for subsequent claim verifications.

Stage two involves an initial review of the formal application by ETV Canada. ETV Canada ensures the applicant has provided adequate information. ETV Canada also arranges for a mutually agreeable and suitable Verification Entity (VE) to conduct the verification of the applicant's claim. All contracts, confidentiality agreements, and conflict of interest issues are resolved during this phase.

Stage three involves the activities of the VE. Following confirmation and acceptance of adequate data, the next task of the VE is to verify the claim(s). The VE conducts a thorough review of the formal application, an evaluation of the technology, and an assessment of all the supporting data and information. The purpose of this stage is to confirm that the technology has been operated under appropriate conditions and that the supporting data are representative of the performance of the technology. In addition, the quality of the supporting data undergoes a rigorous assessment to ensure

that independent, quality data are used in validating the claim. The evaluation of the technology and assessment of the data is conducted according to procedures, forms and checklists provided in the Verification Protocol.

Stage four is the Award. If the applicant's claim is substantiated, ETV Canada prepares a final Verification Report and a Fact Sheet defining conditions of performance, and a Verification Certificate to be awarded to the successful applicant. The applicant is then entitled to use the Certificate, Fact Sheet and Final Report in marketing activities.

From this process, quantitative and statistical evaluations can be conducted in order to ensure qualified technologies.

E. Verification Program Objectives

This program is an initiative designed to accelerate the growth and marketability of the Canadian environmental industry.

The objective of the ETV Program is to provide a protocol for the evaluation of data supplied by an applicant or testing agency. This protocol allows the Verification Entity (VE) to determine if there is adequate data to substantiate the performance claim(s) made by the applicant. The ETV Program also provides validation and independent verification for the performance claims of environmental technology. This program is an initiative designed to accelerate the growth and marketability of the Canadian environmental industry.

The program is a voluntary program developed to promote the commercialization of new environmental technologies into the marketplace. Additionally, to provide industry with the tools to address environmental challenges efficiently, effectively, and economically.

F. Facility Description

The VE registered under the ETV Program does not conduct on-site testing at their facilities. Instead, the VEs focus on published data and information provided with the applications. The ETV program eliminates the need for testing or re-testing by requiring the following specifications prior to submission of the application: (1) data supporting the claim must be generated from an

independent test; and (2) all supporting data and information must be analyzed by a qualified third party, or be referenced and substantiated by documented literature.

G. Data Acquisition

Data provided by an applicant can be derived from one of two sources. First, they can be derived from analytical data that already exists and other information sources. The documentation must be peer-reviewed and meet the data quality requirements specified by ETV. Alternatively, quality data can be generated through tests conducted by an accredited independent testing facility. If the data submitted is from one of these two sources, the application is then submitted to ETV for verification.

Currently, a CD ROM database is under construction.

H. Communication

In order to maintain contact with applicants and other stakeholders, the ETV Program produces a quarterly newsletter, as well as participating in tradeshows, conferences, etc. The program also maintains check-and-balances with the CEIA and private sector representatives through participation in semi-annual performance reviews.

Currently, a CD ROM database is under construction. This database will allow interested parties to view the program's guidelines and requirement criteria, along with other relevant information. ETV-Canada can be contacted by phone (905) 336-4546, fax (905) 336-4519, or via the Internet www.etvcanada.com.

I. Costs

Although there is no charge for the pre-screening assessment, a non-refundable $1,000(Cdn) application fee must accompany the formal application.

The cost of verification will vary from application to application, and will depend on the scope of effort involved in the verification program. After the level of effort and the VE are agreed upon, one-half of the verification cost is payable prior

to commencement of the verification process, with the balance due upon its completion, regardless of whether or not the performance claim is validated. An annual fee is payable on the anniversary date of the Certificate, and is equivalent to 0.25% of the gross annual sales of the technology for which the claim(s) applies. There is a minimum annual fee of $1,250 (Cdn) and a maximum of $10,000 (Cdn). The annual fee covers the costs associated with the ongoing marketing and promotion of the ETV program and its participants, as well as monitoring compliance with program guidelines by Certificate holders.

SUMMARY FOR CIVIL ENGINEERING RESEARCH FOUNDATION'S (CERF) ENVIRONMENTAL TECHNOLOGY EVALUATION CENTER (EvTEC)

A. Background

The Environmental Technology Evaluation Center (EvTEC) is one of the U.S. Environmental Protection Agency's (USEPA) Environmental Technology Verification (ETV) pilot programs. EvTEC is operated as a program of the Civil Engineering Research Foundation (CERF), the research arm of the American Society of Civil Engineers (ASCE). It is the responsibility of CERF, under a cooperative agreement with USEPA to create a self-supporting, market-based program to evaluate environmental technology performance. The EvTEC program is considered by USEPA to be the ETV "private sector" pilot because CERF, not USEPA, will issue the final verification statement and report. The EvTEC contact is Mr. Will Kirksey.

The EvTEC program is considered by USEPA to be the ETV "private sector" pilot.

B. Organization and Facilities

EvTEC is a "virtual center," which means that it has a small staff at its Washington, D.C headquarters and uses the CERF network of technical experts, testing facilities and stakeholders to assist in the verification process. EvTEC has no testing facilities, laboratories or other facilities of its own.

EvTEC is a "virtual center".

C. Customers and Vendors

EvTEC is structured specifically to accept a wide range of environmental products. These products are defined as: " technologies, materials, systems, processes, equipment or services." Only commercial ready products that are sufficiently developed and ready to be sold are accepted for verification.

Table D-5 lists a few of the EvTEC customers, their technology, and the action being performed.

Table D-5. Examples of the EvTEC customers, technology and action being performed.

Customer	Action	Technology
Ice Ban	Verification	Environmentally friendly anti-icing/ de-icing product
ThermoEnergy	Conducting three related technology-specific verifications	Innovative wastewater treatment process
Washington State Department of Transportation	Group verification	Six stormwater best management practices and technologies
Integrated Environmental Technologies, LLC	Verification	Plasma arc melter to be used on a variety of wastes, from mixed wastes to municipal solid waste
Ternbird	Verification	New, environmentally friendly, dirt road dust suppressant and stabilizer

D. Technology Verification Program

The program uses a six-step process in conducting verifications. Verification can be conducted on a single technology or on a group of technologies meant to meet a type of need (e.g., verification on behalf of potential technology users).

Step 1: Invite *Applications*: - EvTEC accepts applications from companies or potential technology users as a group evaluation. If a group evaluation is to be performed, technologies will be solicited from the technology developer community.

Step 2: Review *Application*: - EvTEC uses the following criteria to determine eligibility for the program: 1) the applicant must own the product or control the right to use it; 2) the product has innovative features which cannot be easily measured by an existing standard; 3) the product must be market-ready or at least at the prototype stage; and 4) definitive tests can be devised to obtain clear, unambiguous results. Products that address the primary needs and concerns of the environmental marketplace will be given priority.

Step 3: Assemble *Evaluation Panel*: - EvTEC assembles a unique evaluation panel of 10 to 12 members from industry, government, academia and other stakeholders. The panel is composed of individuals that will recommend, specify, approve, authorize, purchase, or operate the product. The goal is to identify the crucial technical issues and concerns to be addressed during an evaluation. The focus of the evaluation is to address the technology information needs necessary for adoption by the product's market.

Step 4: Develop *Evaluation Criteria and Plan*: - The evaluation panel develops evaluation criteria and an evaluation plan. The plan includes scope of evaluation, criteria, testing and data collection procedures, schedule, proposed site location, facilities to be used, consulting services required, and an evaluation budget or fee. Depending on the level of data related to the product, the plan can range from recommending a "white paper" review of existing data to a full operating field demonstration.

Step 5: *Execute Plan*: - The evaluation plan is executed with oversight by the panel.

Step 6: Prepare *Evaluation Report*: - The evaluation report and verification statement are prepared in accordance with the plan and EvTEC technical protocol.

Another goal of EvTEC is to provide verification for technologies whose performance cannot be easily or directly evaluated using existing standards or specifications.

E. Verification Program Objectives

The main of objective of EvTEC is to foster the introduction of innovation to improve the environmental performance of our nation's public works and industries. By providing a value-added service to innovators, entrepreneurs, and users alike, the EvTEC verification process will lead to an overall reduction of time and expense needed to move new environmental products into the marketplace. Another goal of EvTEC is to provide verification for technologies whose performance cannot be easily or directly evaluated using existing standards or specifications (e.g., those that do not "fit" within the other ETV pilot programs or state programs).

F. Facility Description

EvTEC does not maintain its own facilities for testing, demonstration, and analysis. Consequently, EvTEC contracts such services through laboratories, test facilities, or consulting firms. The evaluation plan serves as the scope of work for these services. A complex evaluation may require a formal request for proposals, which are reviewed, ranked, and selected by the evaluation panel. Although cost-effectiveness is considered, EvTEC states that the primary governing feature for selecting a facility is its technical credentials. Potential facilities are university research centers, private laboratories, federal and state labs, as well as public and private test sites.

G. Data Acquisition

EvTEC contracts with consultants, laboratories and other experts to conduct any testing, analyses or data gathering.

EvTEC has an *EvTEC Technical Protocol* that guides the development of each Evaluation Plan. The applicant provides the initial information about the technology, market acceptance issues, and areas of technical understanding. The evaluation panel further develops requirements to assure that the technology can be rapidly and effectively introduced into the market. Any data acquisition requirements are set out under the evaluation plan as required by the panel. Since EvTEC does not use a single lab or facility, the panel determines the generic requirements for such things as QA/QC and laboratory accreditation. EvTEC contracts with consultants, laboratories and other experts to conduct any testing, analyses, or data gathering.

H. Communication

EvTEC distributes the Evaluation Report and Verification Statement publicly per the EvTEC *Policy on Publication and Release of Evaluation Reports*. The distribution of the report generally includes a cross section of federal, state, and local environmental officials, public works officials, consulting engineers, and other potential users. Reports are also available for purchase via ASCE's web site. Applicants can request that the report not be widely circulated; however, if the applicant should later make reference to the evaluation performed by EvTEC, EvTEC will release the report to the public. EvTEC may also release information related to safety or environmental issues, which EvTEC believes requires public release. Additional information is also available on the EvTEC website http://www.cerf.org/evtec/index.htm.

I. Costs

The applicant is ultimately responsible for the tasks outlined in the evaluation plan; however, EvTEC will endeavor to refer aplicants to sources of financial assistance if necessary.

SUMMARY FOR THE HEMISPHERIC CENTER FOR ENVIRONMENTAL TECHNOLOGY (HCET)

A. Background

HCET was established in 1995 by DOE-OST.

The Hemispheric Center for Environmental Technology (HCET) was established in 1995 by the United States Department of Energy Office of Science and Technology (DoE-OST), in partnership with Florida International University (FIU). HCET conducts work throughout all phases of technology development including R&D, testing, evaluation and validation, facilitation of maturation, and technology transfer throughout the Western Hemisphere.

B. Organization and Facilities

HCET has five main organizational units: (1) deactivation and decommissioning (D&D), (2) characterization, monitoring and sensor technology, (3) tanks, (4) international technology integration and (5) robotics. The mainstay of work for the HCET centers on the selection and assessment of technologies that are potentially beneficial to DoE environmental remediation projects. Current R&D activities focus on the D&D of nuclear facilities, and the characterization, management, and reduction of radioactive and hazardous waste.

HCET has performed some 54 demonstrations and assessments of innovative D&D technologies.

The facilities include an analytical laboratory; a technology assessment site for D&D technologies and dismantlement techniques; an experimental laboratory for R&D in characterization, monitoring and sensor technology; a fabrication shop; and a licensed radiological laboratory.

C. Customers and Vendors

HCET has performed some 54 demonstrations and assessments of innovative D&D technologies at its testing facility. It has participated, and continues to participate, in all seven large-scale technology demonstration projects at DOE nuclear production and research facilities (FEMP, CP-5 Reactor, Hanford Reactor 105-C, INEEL, Mound, SRS, and LANL).

Table D-6 lists a few of the HCET customers and/or vendors, their technology, and the action being performed.

Table D-6. Examples of the HCET customers technology and action being performed.

Customer/Vendor	Action	Technology
LTC Americas	Masonry and Metal Decontamination Technology Assessment	Steel Grit Blasting
Bartlett Services, Inc.	Strippable Coating Assessments	Strippable Coating
Pentek, Inc.	Strippable Coating Assessments	Strippable Coating
Pegasus International	Masonry and Metal Decontamination Technology Assessments	Steel Abrasive Blasting

D. Technology Verification Program

The Technology Assessment Program was developed in 1995 to evaluate commercially available and innovative technologies under standardized, non-nuclear conditions. The assessment site consists of test beds and surrogate material for the evaluation of technologies in the fields of masonry and metal decontamination and the dismantling of equipment. During the assessment, comprehensive and comparative performance data are collected in the areas of health and safety, operation and maintenance, and waste generation. New programs for 1999 include facility characterization, facility dismantlement, and waste management.

E. Verification Program Objectives

The FIU-HCET technology assessment program has three principal objectives:

1. To perform comparative analysis of commercially available and innovative technologies for the deactivation, decontamination, and decommissioning of nuclear and/or hazardous facilities;
2. To disseminate information about technologies and the result of the assessments to environmental professionals in the nuclear and/or hazardous waste fields; and
3. To provide decision-makers with tools to assist in the selection of the most appropriate technology based on their site-specific needs.

F. Facility Description

The FIU-HCET technology assessment site includes a number of test-bays.

The FIU-HCET technology assessment site consists of a number of test-bays, each consisting of a concrete pad with approximately 10-foot-high concrete or brick walls on three sides and, in some bays, a concrete ceiling covering half of the pad. Several test surrogates are available to assess masonry decontamination/ dismantlement technologies.

The metal decontamination assessments are performed in an enclosure adjacent to the test bays, with several test surrogates available for technology assessment purposes. In addition, equipment dismantlement surrogates (e.g., I-beams, pipes) are available in several of the masonry test beds. Support facilities are available to serve as a field office, changing facility and cool down area. A 6-foot-tall chain link fence provides security and restricts access to the area.

G. Data Acquisition

Quantitative criteria have been established for performance, health and safety, maintenance, and waste generation. Data are collected through (1) direct observation and measurement by FIU-HCET evaluators; (2) vendor supplied information; and (3) outside reference sources. For each technology assessment, the International Union of Operating Engineers collects data to evaluate health and safety aspects such as airborne dust generation, noise levels, and hazards.

H. Communication

Monthly and yearly written reports, which include technology assessment results, are prepared for the customer funding the technology assessment. These reports are available to users through the HCET web-site http://www.hcet.fiu.edu or the Remedial Action Program Information Center (RAPIC). In addition, a multimedia information system for decontamination is currently being designed to organize and handle all of the performance data that has been collected on decontamination technologies by the Technology Assessment Program.
The program contact is Ms. Susan Madaris.

I. Costs

Information not available.

SUMMARY FOR THE UNITED STATES DEPARTMENT OF ENERGY INNOVATIVE TREATMENT REMEDIATION DEMONSTRATION (ITRD) PROGRAM

A. Background

The ITRD Program is an operational testing and evaluation program that supports the mission of EM-40.

The Innovative Treatment Remediation Demonstration (ITRD) Program was initiated in 1993 by the U.S. Department of Energy (DoE) Environmental Restoration Program Office (EM-40) to accelerate the adoption and implementation of innovative remediation technologies. The program was developed as a Public-Private Partnership in cooperation with the U.S. Environmental Protection Agency's (EPA) Technology Innovation Office (TIO) and Clean Sites, Inc. The ITRD Program is an operational testing and evaluation program, rather than a research and development program. This program supports the mission of EM-40 by identifying new technologies that can be used to remediate sites and facilities in a cost-effective and responsible manner.

B. Organization and Facilities

In the ITRD program, DoE facilities work cooperatively with government, industry, and regulatory agencies to assess, implement, and evaluate technologies. The DoE Sandia National Laboratories will coordinate the program.

C. Customers and Vendors

The program is designed to assist sites from throughout the DoE complex. The innovative technologies considered for evaluations are those that lack the cost and performance information that would otherwise permit their full consideration as remedial alternatives. These technologies have often shown promise in pilot-scale applications, but have limited full-scale data. The technologies considered include both government (DoE, EPA, DoD) and industry developed systems.

Table D-7 lists a few customers of the ITRD program, their technology, and the action being performed.

Table D-7.Eamples of some of the customers of the ITRD program, technology, and action being performed

Customer	Action	Technology
Panels STAR Center, Largo, Florida, Northeast Site Project (initiated in 1993)	Over 20 technologies to address chlorinated solvent contamination of ground water were reviewed	Three selected for site studies; membrane separation, rotary steam stripping, and in situ anaerobic biotreatment
Ohio Heavy Metals Project (initiated in 1995)	Over 30 technologies to address heavy metal (uranium, plutonium, thorium) contaminated soil were reviewed	Several were selected for site specific studies including; advanced excavation methods using geostatistical models and real-time sensors, volume reduction technologies, and soil chemical treatment technologies
Panted and Los Alamos Explosives Project (initiated in 1998).	Reviewed over 20 in situ and ex situ treatment techniques to address the treatment of explosives (ROX) contaminated soil and groundwater	Several studies underway including in-situ bioremediation, in situ and ex situ chemical treatment, and in situ water treatment
Hanford, Washington 100-N Project (initiated 1998)	Over 40 technologies to address remediation of strontium-90 contaminated groundwater were reviewed	Several studies underway including soil flushing and chemical stabilization
Oak Ridge Y-12 Project (initiated 1998)	Over 40 technologies to address VOC contaminated fractured rock	Studies underway include passive pump-and-treat, and in situ bioremediation

D. Technology Verification Program

This program is designed to accelerate the use and acceptance of new remediation technologies. The program goal is to reduce barriers for the use of innovative remediation technologies by involving government, industry, and regulatory agencies in the identification, assessment, implementation, and validation of emerging technologies at DoE sites.

E. Verification Program Objectives

Technologies that are selected are used to remediate small sites in order to generate the full-scale and real-world operating, treatment, performance, and cost data needed to validate these technologies and gain acceptance by industry and regulatory agencies. The goal is to generate accurate cost and performance data on the operational capabilities of the technology needed for consideration at other sites.

F. Facility Description

The program is designed to assist sites from throughout the DOE complex.

G. Data Acquisition

Validation of a technology uses an independent performance evaluation group consisting of the DOE, the EPA, industry and regulatory agencies to develop a QA/QC, monitoring, and work plan for the implementation of a technology at a site. The data gathered follow the guidelines provided by the Federal Remediation Technologies Roundtable and presented in cost and performance reports.

H. Communication

The results of the ITRD Program are presented at technical meetings, and in quarterly reports, DOE publications, and EPA journals. The program contact is Mr. Mike Hightower at Sandia National Laboratories. Additional information can be found on the ITRD website http://www.em.doc.gov/itrd/.

I. Costs

Program funding has traditionally been provided by EM-40. FY99 funding will include joint funding from EM-40 and EM-50. ITRD funds are used to;

FY99 funding will include joint funding from EM-40 and EM-50.

coordinate DoE, EPA, industry and regulatory participation; fund site specific treatment or site optimization studies; monitor technology performance; and prepare cost and performance reports of pilot and full-scale technology implementations. Sites provide funds for technology implementations. Vendors are not required to provide any funding.

SUMMARY FOR THE MASSACHUSETTS STRATEGIC ENVIROTECHNOLOGY PARTNERSHIP (Mass-STEP) PROGRAM

A. Background

The Massachusetts Strategic Envirotechnology Partnership (Mass-STEP) was established in 1994 to promote the growth of new environmental and energy efficient technologies in Massachusetts. The STEP Program is a partnership between the Massachusetts Executive Office of Environmental Affairs, the Massachusetts Executive Office of Economic Affairs and the University of Massachusetts system. The STEP program offers a variety of services to assist the envirotechnology and energy industry. They include; technology assessment, business support, applied research & development, technology demonstration, regulatory assistance and expedited permitting, and access to state markets. For the purposes of the ITRC Verification Team effort, this summary will focus on STEP technology assessments and pilot or field demonstrations. The ultimate goals of the STEP Program are to promote the use of environmental and energy technologies that can better protect the environment and to increase the commercial viability by reducing risks and barriers to successful commercialization.

B. Organization and Facilities

Facilities include each of the four UMass campuses.

A principal investigator (PI) is chosen based on expertise, usually from the University of Massachusetts (UMass), whenever a technology is accepted into the STEP program. The Director of the Department of Environmental Protection (DEP) laboratory, for example, has acted as the PI for analytical technologies. Facilities include each of the four UMass campuses, the existing demonstration centers (e.g. Buzzard's Bay Test Center for alternative on-site wastewater technologies or Massachusetts Military Reservation's Environmental Technology Center) and state facilities (e.g. the Massachusetts Water Resources Authority).

The STEP process is a flexible one, offering vendors the services they need.

The STEP process is a flexible one, offering vendors the services they need. Because the state DEP is part of the technology review, regulatory or policy barriers are identified early. The review of any permit applications is expedited when appropriate, and the assessment or demonstration provides enough information to comply with data needs for permit applications.

C. Customers and Vendors

Many technologies have been assisted as a result of the STEP program by receiving regulatory guidance, funding assistance, and commercialization strategies. All technologies that are Massachusetts-based or important to Massachusetts business and environmental protection goals are eligible for services. Table D-8 lists a few of the Mass-STEP customers, their technology, and the action being performed.

Table D-8. Examples of the Mass STEP customers, technology, and action being performed.

Customer	Action	Technology
AIRxpert Systems	Technology Assessment	Microprocessor-based air monitoring
Cellini Purification Systems	Technology Assessment	Distillation and recovery of process wastewater
Erickson Materials	Technology Assessment	Tire crumbling and devulcanization
Thermatrix	Technology Assessment	Flameless thermal oxidizer
Urban Contamination	Technology Assessment	Immunoassay for field screening of soil

STEP identifies the best expertise available to the program and assigns a principal investigator.

D. Technology Verification Program

The STEP provides expert, independent assessment of the technical and environmental benefits and performance of a technology, including its ability to meet regulatory standards and permit requirements. The verification report documents the success or failure of the technology, and is a tool to gain rapid acceptance and use of the technology.

After the appropriate agencies do a lateral review of regulatory, market, permitting, and business plan issues, STEP identifies the best expertise available to the program and assigns a PI. The next steps vary depending on the stage of technology development and the use of the technology. If data exists, it is reviewed and a decision is made to confirm the quality and quantity of the data based on the specific STEP application made by the vendor. The agencies and the PI conduct this review. If the data is complete and acceptable, the results are documented in a technology assessment report.

If sufficient quality data does not exist, the PI works with the company to develop a pilot or demonstration protocol. The DEP and other agencies review the data collection methodology. The PI oversees the demonstration, assists the agencies

in reviewing the data collected, and drafts a report on the demonstration or pilot results. Protocols depend on the type of technology and demonstration needs. The appropriate sampling, analysis, and quality assurance/quality control follow the requirements of the Massachusetts Contingency Plan (MCP) which allow for justified alternative methods. Massachusetts does not certify soil testing laboratories, but if a permit program requires the use of a certified laboratory, then one is used (for example, water and wastewater). Statistical analysis of data is performed as needed.

E. Verification Program Objectives

The objectives for the STEP program are:

- To promote the use of environmental and energy technologies for environmental protection.
- To provide a one-stop point of contact for all interested developers or users of environmental technologies.
- To effectively respond to and support the needs of the envirotech industries being served.
- To use existing organizations and resources to provide coordinated, effective, and non-duplicative provision of needed services.
- To identify and provide services that the envirotech industry needs and cannot find or access through any other source.
- To facilitate identification of, and access to, the array of public, quasi-public and private funding and business development services currently available.

F. Facility Description

Demonstrations have occurred at state-owned facilities, including the University of Massachusetts campuses and at private or municipally owned locations. University facilities include each of the four UMass campuses, Amherst, Boston, Lowell, and Dartmouth. UMass Amherst is the location of the Nation Environmental Technology for Waste Prevention Institute (NETI) and the Energy and Diagnostic Center (EADC). UMass Boston is the location of the Environmental Business and Technology Center. UMass Dartmouth is where the center for Marine Science and Technology is located, and UMass Lowell is where the Center for Environmentally Appropriate Materials (CEAM) and Chelsea Center for Materials Reuse is located. The appropriate technologies are directed to the corresponding facility for testing.

Also, the existing demonstration centers (e.g. Buzzard's Bay Test Center for alternative on-site wastewater technologies or Massachusetts Military Reservation's Environmental Technology Center) and state facilities (e.g. the Massachusetts Water Resources Authority) are still being used.

G. Data Acquisition

Acquiring new data depends on the stage of development of a technology (applied research, proof of concept, pilot, prototype, limited demonstration or commercially available) and the commercial uses a developer wants to pursue (for example, a technology proven in one field may expand its use in another market). Available data is reviewed and, if sufficient in terms of quality and quantity, is documented in a technology assessment report. If the data is insufficient, then the PI develops a protocol to obtain the information needed for cost and performance demonstration.

Technology Assessment Reports are issued upon completion of the review.

H. Communication

Technology Assessment Reports are issued upon completion of the review. These reports are widely distributed and discussed at appropriate meetings with potential users including state agencies, regulators who might see the technology in the field or in a permit application, and potential investors or insurers.

A letter of support generated as part of the verification process from the Secretary of the Environment may be useful to companies trying to market their product. STEP also assists in disseminating their results to potential purchasers (including state agencies), regulatory field staff, investors, and insurers.

I. Costs

In order to coordinate the activities of all the agencies effectively, $1.5 million was dedicated in the first year to STEP start-up and implementation. This $1.5 million was allocated to the 4 campuses accordingly. Subsequent years have shown that the Massachusetts Legislature again provided $1.5 million to the program.

There are no fees for the program.

Massachussetts Department of Environmental Protection received: $100,000 from the Environmental Protection Agency's (EPA) Environmental Technology Initiative (ETI) to support the hiring of a full time STEP Innovative Coordinator at the Department of Environmental Protection (DEP). Additionally, they received $200,000 from DOER to contract for STEP technical assistance services from the EADC.

UMass Amherst received $600,000. While UMass Boston and UMass Lowell both received $300,000 each.

There are no fees for the program. Vendors are responsible for equipment installation and maintenance as well as most sampling and analytical costs.

SUMMARY FOR NEW JERSEY CORPORATION FOR ADVANCED TECHNOLOGY (NJCAT)

A. Background

The New Jersey Corporation for Advanced Technology (NJCAT) was established approximately six years ago. However, the verification program is about one year old. NJCAT is a New Jersey public/private venture designed to promote the retention and growth of technology based business in emerging fields such as environmental and energy technologies. The verification effort was created to overcome barriers to new and innovative technologies in the environmental and energy markets.

B. Organization and Facilities

NJCAT is an organization made up of a small permanent staff, with a Board of Directors and a number of public and private members. Members include Stevens Institute, New Jersey Institute of Technology, Stockton College, Burlington Community College, Geotech, Isotech, United Retek, Connective Energy, Public Service Electric and Gas, Ballard Generation, Exxon, AE Engineering, and ECDC. NJCAT does not have testing facilities, but makes use of the university laboratories for services. NJCAT expects to be hiring staff to assist with the technical verifications in the next 6 to 12 months.

NJCAT has signed a Memorandum of Understanding with the California Certification Program and the Province of Ontario, Canada to issue joint technology verifications.

C. Customers and Vendors

Though no verifications have been issued to date, Table D-9 lists a few of the NJCAT applicants, their technology, and the action being performed.

Table D-9. Examples of the NCAT applicants, technology, and action being performed.

Customer	Action	Technology
United Retek of America	Verification Application	Soil stabilization
Sybron Chemicals	Verification Application	Bioremediation at scrapyards
Dynocology	Verification Application	Gasification technology
Berdy	Verification Application	Air emissions control
Isotech	Verification Application	Water remediation

D. Technology Verification Program

The NJCAT Verification Program is new.

The NJCAT Verification Program is new and the program is still being developed and refined. Some NJCAT documents are working drafts. To be eligible, the technology must offer an environmental benefit, address an environmental problem, or be equipment-based on measurable performance. Technologies that address any media or any environmental area (i.e., remediation, control, or pollution prevention) can be accepted into the program.

The process is well defined. It begins with a screening application that includes pertinent information about the applicant and a general statement of claims. The Executive Director performs the screening, with input from the New Jersey Department of Environmental protection (NJDEP). The verification process consists of four stages: (1) review of application, (2) assessment of data quality, (3) verification of claims, and (4) report preparation.

The Executive Director assembles a three-member team of NJCAT members who are not associated with the vendors of the technology being reviewed. This review ensures that the technology will provide an environmental benefit and be protective of the health and the safety of workers and the public. It also ensures that the technology is reliable and makes a claim that is specific, meaningful, measurable, and verifiable. The review also checks to see that the technology has adequate documentation with actual test data that is based on sound technical principles and supported by peer reviewed technical literature or references.

The second step is the creation of a Technical Advisory Committee (TAC). This committee determines the scope, and sets a budget to assess the relevance and quality of the data. If they determine that the existing data is inadequate to verify the claims, they ask that more data be collected.

The third step is identification and verification of claims. The applicant must

complete a Performance Claim Verification Form for each claim that is reviewed by the TAC. Data sets that are determined satisfactory in the last step are reviewed to verify claims at the 95% confidence level. If the data does not verify the claim, the applicant can modify their claim, collect more data, or withdraw from the program.

For successful verifications, NJCAT will provide a verification seal and develop and distribute a fact sheet.

The last step involves reporting the results of the effort. A report will be issued detailing the findings and reasoning. For successful verifications, NJCAT will provide a verification seal and develop and distribute a fact sheet.

E. Verification Program Objectives

NJCAT functions to:

- Develop and advance policy strategies and regulatory mechanisms that promote commercialization of emerging technologies.
- Identify, evaluate, and recommend specific technologies for which the regulatory and commercialization process should be facilitated.
- Establish funding and commercial relationships/alliances between developers, NJCAT members, and outside investors to bring a new technology to market and new business to the state.
- Assist in the identification of potential markets and applications for comercialized technologies.

NJCAT relies on the facilities of its members, which are generally universities.

F. Facility Description

NJCAT does not have testing facilities. It relies on the facilities of its members, which are generally universities.

G. Data Acquisition

Data must be collected using acceptable protocols and all QA/QC procedures must be followed. The verification entity will evaluate whether data that is submitted is acceptable based on the following criteria:

- Acceptability of independence in data generation;
- Acceptability/soundness/consistency of the methods used to generate the data;

- Accuracy, as determined by its calibration;
- Precision, as determined by its calibration; and
- Statistical confidence, as measured by the number of independent samples

H. Communication

Reports are issued at the end of the verification process. An approved seal and a fact sheet are issued for successful demonstrations. The executive director of NJCAT is Ms. Rhea Weinberg Brekke. The contact is Mr. Mike Winka of the NJDEP. Additional information is available on the NJCAT website http://cee.cece.stevenstech.edu.NJCAT.

I. Costs

Any company that takes advantage of a NJCAT membership will benefit from early, focused exposure on new technologies; opportunities to form strategic alliances with other members, participants and universities to collaborate on the development of these technologies; and investment opportunities.

The contribution towards a membership that is expected of a large company (250 or more employees) is a $5,000 membership fee, 200 personnel hours *, sponsorship of one event, and the provision of the facilities for one event or technology. A mid-sized company (10 to 249 employees) is expected to contribute a $2,500 membership fee, 50 personnel hours *, and co-sponsor one event. A small company (less than 10 employees) is only expected to contribute a $1,000 membership fee and 25 personnel hours *. A university non-profit is expected to contribute a $2,000 membership fee, 100 personnel hours *, co-sponsor one event; and provide the facilities for one event or technology.

**Personnel hours includes participation in working committees, staff assistance, technology reviews and business networking*

SUMMARY FOR RAPID COMMERCIALIZATION INITIATIVE (RCI)

A. Background

The Rapid Commercialization Initiative (RCI), founded in 1995, is a part of the Administration's efforts to build cooperative interactions between the private sector, states, and federal agencies. RCI is also designed to advance the national environmental technology strategy and to bring environmental technologies to market more rapidly and efficiently. The primary mission of the RCI is to identify and reduce barriers that impede market entry of new technologies. RCI also supports further commercialization of the four categories of environmental technologies defined in *Bridge to a Sustainable Future*: *Avoidance, Monitoring and Assessment, Control, and Remediation and Restoration technologies.*

The primary mission of the RCI is to identify and reduce barriers that impede market entry of new technologies.

Both federal and state partners are looking for improved methodologies to test, demonstrate, and verify innovative environmental technologies, and encourage industry suggestions. Additional RCI efforts will identify other important barriers to commercialization, such as unpredictable commercialization pathways or incomplete environmental technology market data.

The states will be able to accelerate cooperation with other states on environmental issues. States can acquire the knowledge to assist in a faster, more data-rich process to evaluate technologies for environmental application through a verification process. This leads to an accelerated permitting process, faster and less expensive cleanup of waste sites, and interstate recognition of technical data.

B. Organization and Facilities

The RCI partner organizations, Department of Commerce (DOC), Department of Defense, (DOD), Department of Energy, (DOE), Environmental Protection Agency (EPA), Southern States Energy Board, Western Governor's Association, and the State of California Environmental Protection Agency, will work with industry participants to accelerate the commercialization of environmental technologies. The RCI cooperative interagency-interstate approach is not a funded partnership, but rather intended to leverage other environmental programs. These programs include EPA's Environmental Technology

Verification programs, including the Superfund Innovative Technology Evaluation (SITE) program for remediation technologies, DOD's Strategic Environmental Research and Development Program (SERDP), and DOE's remediation efforts within the Office of Environmental Management.

C. Customers and Vendors

The primary customer of RCI is the environmental technology vendor.

The primary customer of RCI is the environmental technology vendor. The secondary customer is the user/purchaser of environmental technologies and the affected stakeholders (regulators and local citizens). Table D-10 lists some of the RCI customers and vendors, their technology, and the action being performed.

Table D-10. Examples of some of the RCI customers and vendors, their technology, and the action being performed.

Customer	Action	Technology
Bio-Imaging Research, Inc.	Selected from first competitive solicitation	Waste Inspection Tomography (WIT) - A mobile system designed to x-ray examine and gamma assay drums containing nuclear waste
Commodore Environmental	Selected from first competitive solicitation	Solvated Electron Chemistry – Agent 313 is a solvated electron chemistry materials process used to destroy hazardous waste
Commodore Environmental	Selected from first competitive solicitation	Hydrocarbon contamination in soils
ORS Environmental Systems	Selected from first competitive solicitation	Hand-Held Instruments for Measuring Low Levels of Trihalomethanes - A suite of hand-held instruments using innovative sensor technology for detecting and measuring total trihalomethanes in water to ppb levels
Selective Environmental Technologies, Inc. (SELENTEC)	Selected from first competitive solicitation	MAG-SEP Technology - A magnetic separations technology for groundwater treatment using specially designed particles (polymer coated magnetite) to selectively adsorb contaminant metals
TERRA-KLEEN Response Group, Inc.	Selected from first competitive solicitation	TERRA-KLEEN Solvent Extraction Technology - A solvent extraction technology which uses non-toxic solvents to mobilize hazardous soil contaminants, and then collects those contaminants for destruction off-site in an EPA approved facility

D. Technology Verification Program

A typical RCI project begins by addressing three key barriers to commercialization:

1. Assistance in finding appropriate sites for demonstrating/testing near-commercial environmental technologies;
2. Assistance in verifying the performance and the cost of technologies; and
3. Assistance in facilitating and expediting the issuance of permits.

Industry may request assistance in any or all of the RCI services, and are invited to propose innovative approaches to address the RCI services. The RCI Pilot Program includes activities beyond verification.

The verification component is focused on validating performance and cost of environmental technologies. This is typically based on data obtained from demonstration testing conducted by third-party verifiers as part of RCI. Technology holders or partners may also provide data for consideration in the verification process. The data will be evaluated and may be used as part of, or the entire basis for, issuing a verification statement.

E. Verification Program Objectives

The overall goals of the program are:

- To provide assistance in identifying appropriate technology demonstration testing sites;
- To provide assistance in technology performance verification activities; and
- To provide assistance in meeting technology demonstration permitting requirements while simultaneously facilitating multi-state participation in the demonstrations.

RCI services will result in the verification of the performance and cost of environmental technologies typically based on data obtained from demonstration testing conducted as part of RCI. Technology holders/partners may also provide additional data for consideration in the verification process; data will be evaluated and may be used as all or part of the basis for issuing a verification statement. The RCI verification process is intended to show that EPA and the states can use credible, verified data to accelerate and facilitate the commercialization of new environmental products for use by both the private and public sectors. Technology holders may also request Califor-

nia Certification. Cal/EPA will conduct oversight of the certification activities.

F. Facility Description

RCI is a collaborative effort and has used facilities throughout the Departments of Commerce, Defense, Energy, and the US Environmental Protection Agency.

G. Data Acquisition

A complete guidance for data acquisition is defined in the, *Guidance Manual for the Preparation of Technology Test Plans*, and typically adheres to standard USEPA methods.

H. Communication

Most of the project costs will be the responsibility of the technology holder.

A test report and verification statement is prepared for technologies demonstrated through RCI. The verification statement is broadly distributed.

I. Costs

Most of the project costs, which can include those associated with the issuance of permits; the development of test plans; demonstration and testing; sampling; analysis; and reporting will be the responsibility of the technology holder. The EPA and Cal/EPA will have the primary responsibility for technology verification under RCI. Costs of verification and California certification are born by the federal government.

SUMMARY FOR THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM (ETV) SITE CHARACTERIZATION AND MONITORING TECHNOLOGY PILOT (SCMTP)

The Pilot began in fiscal year 1995 and has verified 28 innovative technologies.

A. Background

Operating under the Environmental Protection Agency's (EPA) Environmental Technology Verification (ETV) Program, the Site Characterization and Monitoring Technology Pilot (SCMTP or the Pilot) was established to increase the acceptance and use of innovative site characterization and monitoring technologies by establishing a process for technology performance verification. The Pilot identifies, verifies, and transfers performance information about innovative and alternative monitoring, measurement, and site characterization technologies.

The Pilot began in fiscal year 1995 and has verified 28 innovative technologies including: 2 cone penetrometer-deployed sensors; 2 field portable gas chromatograph/mass spectrometers (GC/MS); and 7 field portable X-ray fluorescence (FPXRF) analyzers; 6 polychlorinated biphenyl kits and analyzers; 6 soil and soil gas sampling technologies; and 5 volatile organic compound detection (in water) techniques.

The Pilot employs third-party verification organizations.

In 1998, 6 decision support system software packages are being verified. In 1999, groundwater sampling technologies, geophysical methods, explosive detection techniques, total petroleum hydrocarbon test kits, and sediment sampling technologies will be verified.

B. Organization and Facilities

The Pilot employs third-party verification organizations (U.S. Department of Energy's Oak Ridge and Sandia National Laboratories) to develop demonstration plans, administer the field testing, conduct the evaluations, and write the Environmental Technology Verification Reports (ETVR). The Pilot periodically solicits technology vendors, identifies commercial ready technologies for testing, and conducts performance evaluations. Technologies are selected based on their

applicability to a category of need, their maturity (commercially ready, full-scale field units), and the willingness of the vendors to participate. The culmination of the verification process is the publication of an ETVR and a Verification Statement. The Verification Statement, which accompanies the report, contains an ETV and an EPA logo, and is signed by the Director of the National Exposure Research Laboratory.

The process begins with the identification of the user community's needs by consulting with the Pilot's stakeholders. The Pilot then determines the commercial availability of technologies to meet those needs. Qualified vendors are then invited to participate in the verification process. Vendors participating in the program work with the Verification Organization to develop test plans. Field-testing is usually done at two separate sites. The ETVR is prepared by the Verification Organization with input from EPA, the vendor, and technical experts by peer-review. A report is prepared for each participating technology.

C. Customers and Vendors

The customers for the output from this program include the Federal and private technology user community, problem owners, state and Federal regulatory agencies, the environmental consulting community, and technology vendors. The problem owners want reliable and more cost-effective field analysis alternatives that will allow faster and more seamless remediation of contaminated sites. Federal and state regulators typically want to know how the new technologies perform in comparison to fixed-laboratory analysis. The environmental consulting community may want to know about technological alternatives that will help bring their projects in under budget and time constraints. The vendors want the independent evaluation of the product's capabilities as an additional marketing tool. Table D-11 lists just a few of the EPA/SCMTP customers and vendors, their technology, and the action being performed.

Table D-11. Examples of the EPA/SCMTP customers and vendors, their technology, and the action being performed

Customer	Action	Technology
U.S. Navy – SPAWAR	Verification	Site Characterization and Analysis Penetrometer System (SCAPS)
EnviroLogix Inc. (ELI) Jonathan Matt	Verification	PCB in Soil Tube Assay
Geoprobe Systems, Inc. Wes McCall	Verification	Large Bore Soil Sampler
Clements & Associates, Inc. Jim Clements	Verification	Environmentalist's Sub Soil Probe

Reports are available electronically and in hard copy for the cone penetrometer-deployed sensors, the field portable GC/MSs, and the FPXRF technologies. The PCB and the soil/soil gas reports are available electronically. Hard copies of these reports will be available January 1, 1999.

D. Technology Verification Program

The Pilot supports site characterization and monitoring technology developers by assisting with site selection, approving the demonstration plan and auditing the demonstration. Data interpretation, verification report preparation, and issuance of the verification statement are the prime responsibilities of EPA and the verification organization.

The demonstration plan contains the experimental design, the sampling and analysis plan, site logistics, data management plan, and quality assurance/quality control procedures. The demonstrations usually include at least five different technologies that are tested concurrently. Given that the costs associated with testing and report preparation are so high, it only makes sense to test multiple technologies during the demonstration. The verification organization takes the lead in preparing the demonstration plan, however, the vendors and stakeholders are expected to actively participate in the preparation.

Once the demonstration plan is finalized, the vendors mobilize to the site(s). The data generated in the field is provided to the verification organization at the completion of the testing phase of the demonstration.

E. Verification Program Objectives

The main objective of the Pilot program is to increase the acceptance and use of innovative site characterization and monitoring technologies. It tries to meet this objective by managing a process for the EPA verification of technology performance. An important component of this process is the transfer of verification information to all parties potentially interested in technology performance.

F. Facility Description

There are no "fixed" facilities used to conduct the demonstrations.

There are no "fixed" facilities to conduct the demonstrations. Typically, the technologies are taken to two sites that have real contamination problems. Even though the DOE's Oak Ridge National Laboratory and Sandia National Laboratory serve as the verification organizations, field-testing can be done at any site where the appropriate conditions exist. Most often, the sites chosen are Federal facilities. However, testing at a Federal facility is not a requirement.

G. Data Acquisition

All the data are compiled, evaluated, analyzed, and maintained by the verification organization for use in preparing the ETVR and verification statement.

The data acquisition process begins with the development of the demonstration plan. Once the demonstration plan is finalized, the vendors mobilize to the site(s). The data generated in the field is provided to the verification organization at the completion of the testing phase of the demonstration. All the data are compiled, evaluated, analyzed, and maintained by the verification organization for use in preparing the ETVR and the verification statement.

H. Communication

The Pilot maintains contact with and receives feedback from State agencies, EPA Regional Offices, and the technology user community through the following panels and networks.

Pilot Stakeholder Group: The Pilot consults regularly with a stakeholder group comprised of representatives from the federal and private technology user community (site owners), state and federal agencies, the consulting engineering community, small business, and associations representing manufacturers and providers of field instrumentation. The stakeholders provide information on the needs for new technologies, and it assists with the dissemination of reports to ensure maximum utility to the user communities.

Regional Technology Advocates Network: EPA has established a network of technology advocates in each of EPA's 10 Regional offices. The Regional Tech-

nology Advocates serve as the point of contact within their region for the latest information on field analytical and site characterization technology developments. The Network meets monthly, via teleconference, to be briefed by the Pilot on progress on technology verification and other Pilot activities. The Regional Advocates also review Pilot publications and activities and provide information on the needs for new technologies in the regions.

State Engagement: Results of the verification activities are embodied in the verification reports. The Technology Innovation Office (TIO) and the National Exposure Research Laboratory (NERL) are working to develop briefings on the technology verification results for state technical audiences. They are working through the ITRC, Association of State and Territorial Solid Waste Management Officials (ASTSWMO), and individual states to provide information on field analytical technologies in general and the verified technologies in particular. Additionally, the results of verification activities are routinely incorporated into EPA training courses on field analytical methods available to federal and state audiences.

ETV pays for about 90% of the verification costs.

General outreach: Information on the ETV and this Pilot is available on World Wide Web at http://clu-in.com and http://www.epa.gov/etv. Information on the Web includes a general description of the Pilot, demonstration plans, verification statements, full verification reports, schedules, lists of vendors, and meeting summaries. EPA TIO supports an electronic email service called TechDirect that currently has 4600+ subscribers in over 40 countries. Included on the TechDirect list are over 700 state waste cleanup related staff in all 50 states. Pilot vendor solicitations, verification reports, and statements are announced on TechDirect regularly. TIO and ORD have exhibit booths that travel to major cleanup related conferences each year. ETV Pilot products are distributed through the exhibits on a regular basis. TIO and ORD also coordinate on presentations about the Pilot program at numerous conferences and events each year.

The contacts for the ETV Pilot for Site Characterization Technologies are:

U.S. EPA National Exposure Research Laboratory
Eric Koglin (702) 798-2432
Stephen Billets (702) 798-2232

U.S. EPA Technology Innovation Office
Daniel Powell (703) 603-7196

I. Costs

To date, the Pilot has not required the vendors to pay for the costs of verification beyond their in-kind contribution (estimated at about 10%). ETV pays for about 90% of the verification costs. On average, the cost for verifying a technology is about $100K. Starting in FY99, all vendors will be required to pay a fee to participate in the program. The fee schedule is under development.

Appendix E

Responses to Matrix Elements

Table E-1: State Response to Matrix Elements

Matrix Elements			States															
			CA	CO/CERCLA	CO/RCRA	FL	IL	KY	LA	MD	MA	NE	NJ	NY	OH	TN	TX	VA	WA
1.0 TECHNOLOGY NAME	1.1 Name		ES	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	1.2 Acronyms		ES	NH	NH	NH	ES	NH	ES	ES	ES	ES	NH	ES	ES	NH	ES	NH	ES
	1.3 Vendor Information		ES	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES
2.0 GENERAL TECHNOLOGY OVERVIEW	2.1 Purpose		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	2.2 Technology Description		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	2.3 Potential Markets		NH	UN	UN	ES	ES	NH	NH	ES	NH	NH		UN	NH	NH	NH		NH
3.0 TECHNOLOGY STATUS	3.1 Deployment History	3.1.1 Status	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	NH	ES	ES	ES
	3.2 Commercial Status	3.2.1 Commercially Available vs. Prototype	ES	ES	NH	NH	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES	ES	NH	ES
		3.2.2 List of commercial apps	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	NH	ES	NH	ES	ES	NH
	3.3 Public Involvement/ Acceptance of Technology	3.3.1 Community Outreach	NH	NH	UN	UN	NH	NH	ES	ES	UN	NH	NR	NH	ES	NH	ES	NH	UN
		3.3.2 Contact List	NH	UN	NH	NH	NH	UN	ES	ES	NH	ES	ES	NH	ES	ES	ES	NH	ES
4.0 TREATMENT OR MEASUREMENT PROCESS	4.1 Environmental Media		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.2 Environmental Benefit		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.3 Environmental Impact		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.4 Target Contaminant(s)		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.5 Process Flow Diagram	4.5.1 Material balance	ES	ES	NH	ES	ES	ES	ES	NH	ES	ES	ES	NH	ES	ES	ES	NH	ES
		4.5.2 Energy balance	ES	ES	NH	NH	ES	NH	ES	NH	NH	ES	ES	NH	ES	NH	ES	NH	ES
		4.5.3 Conversion of media	ES		ES	NH	ES	ES	ES	NH	NH	ES	ES	NH	ES	NH	ES	NH	ES
	4.6 Discrete System or Component		ES	NH	ES	NH	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES
5.0 OUTPUT (Treatment, Containment, and Removal Technologies Only)	5.1 Final Result or Product	5.1.1 Description of treatment efficiency	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.1.2 Description of lower limits	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.1.3 Description of physical characteristics	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.1.4 Changes in state	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES

Matrix Elements			States															
			CA	CO/CERCLA	CO/RCRA	FL	IL	KY	LA	MD	MA	NE	NJ	NY	OH	TN	TX	VA	WA
	5.2 End Products and By-Products	5.2.1 Name description	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.2.2 Impact of fugitive emissions	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		5.2.3 Impact of stack emissions	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		5.2.4 Impact of discharges	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		5.2.5 Impact of residuals/by-products	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		5.2.6 Impact of noise level/odor	ES	ES	NH	NH	ES	ES	ES	ES	NH	NH	ES	ES	ES	ES	ES	ES	ES/NH
	5.3 Data Type	5.3.1 Regulatory status of outputs	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
		5.3.2 Verification report	ES	ES	ES	UN	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
6.0 OUTPUT (Measurement Technologies Only)	6.1 Data Type	6.1.1 Specific analytes	ES		ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.1.2 Contaminants detected	ES		ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.1.3 Limitations of data	ES		ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	6.2 Data Performance	6.2.1 Characteristics of samples technology is suited for	ES		ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.2.2 Non-target interference(s)	ES		ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.2.3 Method sensitivity and dynamic range	ES		ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.2.4 Bias	ES		ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		6.2.5 Precision of measurement	ES		ES		ES	ES	ES		ES	ES	ES	NH	ES	ES	ES	ES	ES
		6.2.6 Accuracy of measurement	ES		ES		ES	ES	ES		ES	ES	ES	NH	ES	ES	ES	ES	ES
		6.2.7 Comparability to relative standards and specs	ES		ES		ES	ES	ES		ES	ES	ES	NH	ES	ES	ES	ES	NH
		6.2.8 Calculation of false negative and positive	ES		NH		ES	ES	ES	ES	NH	NH	ES	NH	ES	ES	ES	NH	NH
		6.2.9 Performance tested relative to reference methods	ES		ES		ES	ES	ES	ES	ES	NH	ES	NH	ES	ES	ES	NH	ES
		6.2.10 Based on real-world	ES		NH		ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES/NH
		6.2.11 Blind performance evaluation	ES		ES		ES	ES	ES	ES	NH	NH	ES	ES	NH	ES	ES	NH	ES/NH

Matrix Elements			States															
			CA	CO/CERCLA	CO/RCRA	FL	IL	KY	LA	MD	MA	NE	NJ	NY	OH	TN	TX	VA	WA
	6.3 Data Analysis and Reporting	6.3.1 Equations for sample results	ES		NH		ES	ES	ES	ES	ES	ES	ES	NH	NH	ES	ES	ES	ES/NH
		6.3.2 Equations for detection limits	ES		NH		ES	ES	ES	ES	NH	ES	ES	NH	NH	ES	ES	ES	ES/NH
		6.3.3 Data package	ES		NH		ES	ES	ES	ES	ES	ES	ES	NH	UN	ES	ES	NH	ES/NH
	6.4 Regulatory	6.4.1 Decision error determination	ES		NH		ES	NH	ES	ES	UN	ES	ES	NH	NH	ES	ES	NH	ES/NH
7.0 OPERATIONAL PARAMETERS	7.1 Operational Components		ES	ES	ES		ES	ES	ES	ES	ES	ES		ES	ES	ES	ES	ES	NH
	7.2 O & M		ES	ES	ES		ES	ES	ES	ES	ES	ES		ES	ES	ES	ES	ES	NH
	7.3 Conditions and Limitations of Operation		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	7.4 Equipment Specifications	7.4.1 Summary including Efficiency,	ES	NH	ES		ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	NH	ES
		7.4.2 Reliability,	ES	NH	ES		ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES
		7.4.3 Portability and ruggedness,	ES	NH	ES		ES	ES	ES	ES	NH	ES	NH	NH	ES	NH	NH	NH	ES
		7.4.4 Protectiveness,	ES	NH	ES		ES	ES	ES	ES	NH	NH	NH	ES	ES	ES	ES	ES	ES
		7.4.5 Logistics,	ES	NH	NH		ES	ES	ES	ES	NH	ES	NH	ES	ES	ES	ES	ES	ES
		7.4.6 Weight and size of technology	ES	NH	NH		ES	ES	ES	ES	NH	ES	NH	NH	ES	NH	ES	ES	ES
		7.4.7 Ancillary equipment list	NH	NH	NH		ES	ES	ES	ES	NH	ES	NH	NH	ES	NH	ES	ES	ES
	7.5 Operation Range	7.5.1 Max throughput	ES	ES	NH		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		7.5.1 Min throughput	ES	ES	NH		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		7.5.3 Optimum	ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH	ES
	7.6 Regulatory Requirements		ES	NH	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	7.7 Infrastructure		ES	ES	NH		ES	ES	ES	ES	ES	NH	NH/NP	ES	ES	ES	ES	ES	NH
	7.8 Cost	7.8.1 Cost factors	ES	ES	UN		ES	ES	NH	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES
		7.8.2 Projected cost of deployment	ES	ES	UN		ES	ES	NH	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES
8.0 VERIFICATION PLAN	8.1 Scope of Plan	8.1.1 List of relevant standards	ES		NH		ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	NH
		8.1.2 Test specs	ES		UN		ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES
		8.1.3 Vendor claims	ES		UN		ES	ES	NH	ES	NH	ES	ES	NH	NH	NH	ES	ES	NH
		8.1.4 Test procedures	ES		NH		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH
		8.1.5 Calculation procedures	ES		UN		ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES

Matrix Elements			States																
			CA	CO/CERCLA	CO/RCRA	FL	IL	KY	LA	MD	MA	NE	NJ	NY	OH	TN	TX	VA	WA
	8.2 Data Objectives	8.2.1 Source of data	ES		ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		8.2.2 PARCC	ES		ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	8.3 Error Verification	8.3.1 DQOs	ES		NH		ES	ES	ES	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES
		8.3.2 Report on documented failures	ES		NH		ES	ES	ES	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES
		8.3.3 Exceptions to failure	ES		NH		ES	ES	ES	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES
	8.4 Performance Objectives		ES		NH		ES	ES	NH	ES	NH	ES	ES	NH	ES	ES	ES	ES	ES
9.0 QUALITY	9.1 Laboratories		ES		NH		ES	ES	ES	ES	NH	ES	ES	ES	ES	NH	ES	NH	NH
ASSURANCE REQUIRED FOR ACCEPTABLE VERIFICATION	9.2Samples	9.2.1 Sampling and Analysis plan with field QA/QC	ES		ES		ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	NH
		9.2.2 Samples from personal source	ES		UN		ES	ES	ES	ES	NH	UN	NR	UN	NH	NH	ES	NH	NH
		9.2.3 Samples from company source	ES		UN		ES	ES	ES	ES	UN	ES	NR	NH	ES	NH	ES	NH	NH
	9.3 Analytical Methods	9.3.1 US EPA guidelines	ES		ES		ES	ES	ES	ES	NH	ES	NR	NH	ES	ES	ES	ES	ES
		9.3.2 Generally accepted scientific	ES		NH		ES	ES	ES	ES	NH	NH	NR	NH	ES	NH	ES		ES
		9.3.3 Referred publications	NH		NH		ES	ES	NH	ES	NH	NH	NR	NH	NH	NH	NH		NH
	9.4 Analytical Data Report	9.4.1 Lab data	ES		NH		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		9.4.2 Field data	ES		ES		ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	NH
	9.5 Peer Review and Objectivity	9.5.1 Oversight by verifying body	ES		NH		ES	ES	ES	ES	NH	ES	ES	ES	NH	ES	ES	ES	NH
		9.5.2 Field Oversight	ES		NH		ES	ES	ES	ES	NH	NH	ES	NH	NH	ES	ES	ES	NH
		9.5.3 Objective of verifying body	ES		NH		ES	ES	ES	ES	NH	ES	ES	NH	NH	ES	ES	ES	ES
10.0 EMERGENCY PLANNING & WORKER HEALTH AND SAFETY	10.1 Emergency Planning	10.1.1 Description of scenario	ES	NH	NH		NH	ES	NH	NH	UN	NH	ES	ES	ES	NH	ES	ES	ES
		10.1.2 Emergency Plan	ES	NH	NH		NH	ES	ES	NH	UN	NH	ES	NH	ES	ES	ES	ES	ES
	10.2 Worker Health & Safety	10.2.1 Worker Safety Plan	ES	ES	NH		NH	ES	ES	NH	UN	NH	ES	ES	ES	ES	ES	ES	ES
		10.2.2 Description of structure	ES	NH	NH		NH	ES	ES	NH	UN	NH	ES	NH	ES	ES	ES	ES	ES
11.0 TEST SITE FACILITY	11.1 Test Site Facility Description	11.1.1 Hydrologic/ Geologic description of site	ES	NH	NH		ES	ES	ES	ES	ES	ES	ES	NH	ES	ES	ES	ES	ES
		11.1.2 Ranges of concentrations	ES	NH	UN		ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES

Matrix Elements			States															
			CA	CO/CERCLA	CO/RCRA	FL	IL	KY	LA	MD	MA	NE	NJ	NY	OH	TN	TX	VA	WA
12.0 LICENSING PARAMETERS	12.1 License		ES	UN	UN		ES	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES
	12.2 Operation Qualifications		ES	UN	NH		ES	ES	ES	NH	NH	ES	ES	ES	ES	ES	ES	ES	ES
13.0 EXECUTIVE SUMMARY	13.1 Executive Summary	13.1.1 "Whom"	ES	UN	NH		ES	ES	ES	ES	ES	ES	ES	NH	ES	NH	ES	ES	NH
		13.1.2 Successes and failures	ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.1.3 Limitations	ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.1.4 Cost considerations	ES	ES	UN		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.1.5 Stakeholder involvement	ES	NH	UN		ES	ES	ES	ES	NH	NH	ES	NH	ES	UN	NH	ES	ES
	13.2 Report Accessibility	13.2.1 Specific info	ES		NH		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.2 Equipment or process	NH	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.3 Scope of application	ES	ES	ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.4 Evaluation of proposed claim/objective	ES		ES		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.5 Conditions or regulatory applications	ES		NH		ES	ES	ES		ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.6 Elements of test plan	NH		NH		ES	ES	ES		NH	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.7 % Completion	NH		ES		ES	ES	ES		NH	ES	ES	NH	ES	ES	ES	ES	ES
	13.3 Report Accessibility	13.3.1 Internet access	NH	NH	NH		NH	ES	NH	NH	ES	ES	NH	NH	NH	NH	NH	NH	NH
		13.3.2 Hard copies	ES	ES	ES		ES	ES	ES	ES	NH	ES	ES	ES	NH	ES	ES	ES	ES
		13.3.3 Video documentation	NH	NH	NH		NH	ES	NH	NH	NH	UN	NH	NH	NH	NH	NH	NH	NH

NC Indicates No Consensus
NR Indicates Not Required
Blank Indicates No Evaluation Provided

Table E-2: Verification Programs Response to Matrix Elements

Matrix Elements			Verification Programs										
			SCMTP	ESTCP	ITRD	FIU	** CAL-EPA	NJCAT	Mass-STEP	EvTEC	EPA-SITE	RCI	ETVCANADA
1.0 TECHNOLOGY NAME	1.1 Name		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	1.2 Acronyms		NH	ES	ES	ES	NH	NH	NH	ES	ES	ES	ES
	1.3 Vendor Information		ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
2.0 GENERAL TECHNOLOGY OVERVIEW	2.1 Purpose		NH	ES	ES	ES	ES	ES	ES	ES	ES/NH	ES	ES
	2.2 Technology Description		ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
	2.3 Potential Markets		UN	NA		NH	NH	***	ES	NH	NH	NH	UN
3.0 TECHNOLOGY STATUS	3.1 Deployment History	3.1.1 Status	ES	ES	ES	ES	ES	ES	ES	ES	ES/NH	ES/NH	ES
	3.2 Commercial Status	3.2.1 Commercially Available vs. Prototype	ES	ES		ES		ES	ES	ES	ES	ES	ES
		3.2.2 List of commercial apps	NH	NA	NH	NH		ES	ES	NH	ES	NH	ES
	3.3 Public Involvement/ Acceptance of Technology	3.3.1 Community Outreach	UN	NA		NH		NR	S/S	NH	NH	NH	UN
		3.3.2 Contact List	NH	ES		NH	ES	ES	ES	NH	ES		UN
4.0 TREATMENT OR MEASUREMENT PROCESS	4.1 Environmental Media		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.2 Environmental Benefit		NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.3 Environmental Impact		NH	ES	NH	ES	ES	ES	ES	ES	ES	ES	ES
	4.4 Target Contaminant(s)		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	4.5 Process Flow Diagram	4.5.1 Material balance	NA	ES		NH	ES	ES	ES	NH	NH	ES	ES
		4.5.2 Energy balance	NA	ES		NH	ES	ES	ES	NH	NH	NH	ES
		4.5.3 Conversion of media	NA	ES	ES	NH	ES	ES	ES	NH	ES	ES	ES
	4.6 Discrete System or Component		NA	ES	ES	ES		ES	ES	ES	ES		ES
5.0 OUTPUT (Treatment, Containment, and Removal Technologies Only)	5.1 Final Result or Product	5.1.1 Description of treatment efficiency		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.1.2 Description of lower limits		ES	ES	ES	ES	ES	ES	NH	ES	ES	ES
		5.1.3 Description of physical characteristics		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		5.1.4 Changes in state		ES	ES	ES	ES	ES	ES	ES	ES	NH	ES

Matrix Elements			Verification Programs										
			SCMTP	ESTCP	ITRD	FIU	** CAL-EPA	NJCAT	Mass-STEP	EvTEC	EPA-SITE	RCI	ETVCANADA
	5.2 End Products and Products	5.2.1 Name description		ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		5.2.2 Impact of fugitive emissions		ES	ES	NH	ES	ES	ES	NH	ES	ES	NH
		5.2.3 Impact of stack emissions		ES	ES	NH	ES	ES	ES	NH	ES	ES	ES
		5.2.4 Impact of discharges		ES	ES	NH	ES	ES	ES	NH	ES	ES	ES
		5.2.5 Impact of residuals/by-products		ES		NH	ES	ES	ES	NH	ES	ES	ES
		5.2.6 Impact of noise level/odor		ES		NH	ES	ES	ES	NH	ES	ES	NH
	5.3 Data Type	5.3.1 Regulatory status of outputs		ES		ES	ES	****	ES	NH	ES	ES	NH
		5.3.2 Verification report		S/S		ES	ES	ES	ES	NH	ES	ES	NH
6.0 OUTPUT (Measurement Technologies Only)	6.1 Data Type	6.1.1 Specific analytes	ES	ES		ES		ES	ES	ES	NA	NH	ES
		6.1.2 Contaminants detected	ES	ES		ES		ES	ES	ES	NA	NH	NH
		6.1.3 Limitations of data	ES	ES		ES		ES	ES	ES	NA	ES	ES
	6.2 Data Performance	6.2.1 Characteristics of samples technology is suited for	ES	ES		ES		ES	ES	ES	NA	ES	ES
		6.2.2 Non-target interference(s)	ES	ES		ES		ES	ES	NH	NA	ES	ES
		6.2.3 Method sensitivity and dynamic range	ES	ES		ES		ES	ES	NH	NA	ES	ES
		6.2.4 Bias	ES	ES		ES		ES	ES	NH	NA	ES	ES
		6.2.5 Precision of measurement	ES	ES		ES		ES	ES	NH	NA	ES	ES
		6.2.6 Accuracy of measurement	ES	ES		ES		ES	ES	NH	NA	ES	ES
		6.2.7 Comparability to relative standards and specs	ES	ES		ES		ES	ES	NH	NA	NH	ES
		6.2.8 Calculation of false negative and positive	ES	ES		ES		ES	ES		NA	ES	NH
		6.2.9 Performance tested relative to reference methods	ES	ES		NH		ES	ES	NH	NA	ES	ES
		6.2.10 Based on real-world	ES	ES		NH		ES	ES	NH	NA	NH	ES
		6.2.11 Blind performance evaluation	ES	ES		NH		ES	NR	NH	NA	ES	ES

Matrix Elements			Verification Programs										
			SCMTP	ESTCP	ITRD	FIU	** CAL-EPA	NJCAT	Mass-STEP	EvTEC	EPA-SITE	RCI	ETVCANADA
	6.3 Data Analysis and Reporting	6.3.1 Equations for sample results	ES	ES		NH		ES	ES	ES	NA	ES	ES
		6.3.2 Equations for detection limits	ES	ES		NH		ES	ES	ES	NA	ES	ES
		6.3.3 Data package	ES	ES		NH		ES	ES	NH	NA	NH/ES	ES
	6.4 Regulatory	6.4.1 Decision error determination	NH	ES		NH		ES	ES	NH	NA	NH	UN
7.0 OPERATIONAL PARAMETERS	7.1 Operational Components		ES	ES	ES	ES	ES		ES	NH	ES	ES	ES
	7.2 O & M		ES	ES	NH	NH	ES		ES	NH	ES	ES	ES
	7.3 Conditions and Limitations of Operation		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
	7.4 Equipment Specifications	7.4.1 Summary including Efficiency,	NH	ES		NH	ES	NH	ES	NH	ES	ES	ES
		7.4.2 Reliability,	NH	ES	ES	NH	ES	NH	ES	NH	ES	ES	NH
		7.4.3 Portability and ruggedness,	NH	ES		NH	ES	NH	ES	NH	ES	ES	NH
		7.4.4 Protectiveness,	NA	ES	ES	NH	ES	NH	S/S	NH	NH	ES	NH
		7.4.5 Logistics,	NH	ES	ES	ES	ES	NH	S/S	NH	ES	ES	NH
		7.4.6 Weight and size of technology	NH	ES	NH	NH	ES	NH	S/S	NH	ES	NH	UN
		7.4.7 Ancillary equipment list	NH	ES	ES	NH	ES	NH	S/S	NH	ES	ES	UN
	7.5 Operation Range	7.5.1 Max throughput	NH	ES	ES	NH	ES	ES	ES	ES	NH	ES	ES
		7.5.1 Min throughput	NH	ES	ES	NH	ES	ES	ES	ES	NH	ES	ES
		7.5.3 Optimum	NH	ES	ES	ES		ES	ES	ES	NH	ES	ES
	7.6 Regulatory Requirements		NH	*		ES	ES	ES	ES	ES	ES	ES	UN
	7.7 Infrastructure		NH	ES	ES	ES	NH	NH/NR	ES	NH	ES	NH	UN
	7.8 Cost	7.8.1 Cost factors	NH	ES	ES	ES	UN	NH	NH/ES	NH	ES	ES	UN
		7.8.2 Projected cost of deployment	NH	ES	ES	ES	UN	NH	NH/ES	NH	ES	ES	UN
8.0 VERIFICATION PLAN	8.1 Scope of Plan	8.1.1 List of relevant standards	ES	ES	NH	NH	ES	ES	ES	ES	ES	ES	ES
		8.1.2 Test specs	ES	ES	ES	NH	ES	ES	ES	ES	ES		ES
		8.1.3 Vendor claims	ES	ES		NH		ES	ES	ES	ES	ES	ES
		8.1.4 Test procedures	ES	ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		8.1.5 Calculation procedures	ES	ES	NH	NH	ES	ES	ES	ES	ES	ES	ES
	8.2 Data Objectives	8.2.1 Source of data	ES	ES		ES	ES	ES	ES	ES	NA	ES	ES
		8.2.2 PARCC	ES	ES		ES	ES	ES	ES	NH	ES	ES	ES

Matrix Elements			Verification Programs										
			SCMTP	ESTCP	ITRD	FIU	** CAL-EPA	NJCAT	Mass-STEP	EvTEC	EPA-SITE	RCI	ETVCANADA
	8.3 Error Verification	8.3.1 DQOs	ES	ES	NH	ES	ES	ES	ES	NH	ES	NH	ES
		8.3.2 Report on documented failures	NH	ES	UN	NH	ES	ES	ES	ES	ES	NH	NH
		8.3.3 Exceptions to failure	NH	ES		NH	ES	ES	ES	ES	ES	NH	NH
	8.4 Performance Objectives		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	UN
9.0 QUALITY ASSURANCE REQUIRED FOR ACCEPTABLE VERIFICATION	9.1 Laboratories		ES	ES	UN	ES	ES	ES	ES	NH	ES	ES	ES
	9.2 Samples	9.2.1 Sampling and Analysis plan with field QA/QC	ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
		9.2.2 Samples from personal source	ES	ES	UN	NH	ES	NR	NR	NH	ES	UN	ES
		9.2.3 Samples from company source	ES	ES	ES	NH	ES	NR	NR	NH	NA	ES	ES
	9.3 Analytical Methods	9.3.1 US EPA guidelines	NH	ES	ES	NH	ES	NR	******	ES	ES	ES	NH
		9.3.2 Generally accepted scientific standards	ES	ES	ES	ES	ES	NR	******	ES	ES		ES
		9.3.3 Referred publications	UN	ES		ES		NR	******	ES	ES	ES	NH
	9.4 Analytical Data Report	9.4.1 Lab data	ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
		9.4.2 Field data	ES	ES	ES	ES		ES	ES	ES	ES	ES	ES
	9.5 Peer Review and Objectivity	9.5.1 Oversight by verifying body	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	NH
		9.5.2 Field Oversight	ES	ES	ES	NH	ES	ES	NR	NH	ES	ES	NH
		9.5.3 Objective of verifying body		ES		NH	ES	ES	ES	ES	ES	ES	ES
10.0 EMERGENCY PLANNING & WORKER HEALTH AND SAFETY	10.1 Emergency Planning	10.1.1 Description of scenario	NA	*		NH		ES	ES	NH	ES	NH	UN
		10.1.2 Emergency Plan	NA	ES	NH	NH	ES	ES	ES	NH	ES	NH	UN
	10.2 Worker Health & Safety	10.2.1 Worker Safety Plan	NH	ES	NH	ES	ES	ES	ES	ES	ES	ES	NH
		10.2.2 Description of structure	NH	ES	NH	NH	ES	ES	ES	ES	ES	ES	NH
11.0 TEST SITE FACILITY	11.1 Test Site Facility Description	11.1.1 Hydrologic/Geologic description of site	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		11.1.2 Ranges of concentrations	NH	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
12.0 LICENSING PARAMETERS	12.1 License		NA	NA	NH	ES	ES	ES	S/S	NH	ES	ES	NH
	12.2 Operation Qualifications		NA	NA	NH	ES	ES	ES	ES	NH	ES	ES	NH

Matrix Elements			Verification Programs										
			SCMTP	ESTCP	ITRD	FIU	** CAL-EPA	NJCAT	Mass-STEP	EvTEC	EPA-SITE	RCI	ETVCANADA
13.0 EXECUTIVE SUMMARY	13.1 Executive Summary	13.1.1 "Whom"		*		NH	ES	ES	ES	ES	ES	NH	ES
		13.1.2 Successes and failures		ES	ES	NH	ES	ES	ES	ES	ES	ES	ES
		13.1.3 Limitations		ES		NH	ES	ES	ES	ES	ES	ES	ES
		13.1.4 Cost considerations		ES	ES	NH	ES	ES	S/S	NH	ES	ES	UN
		13.1.5 Stakeholder involvement		ES		NH	ES	ES	S/S	NH	ES	NH	UN
	13.2 Report Accessibility	13.2.1 Specific info		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.2 Equipment or process		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.3 Scope of application		ES	ES	ES	ES	ES	ES	NH	ES	ES	ES
		13.2.4 Evaluation of proposed claim/objective		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
		13.2.5 Conditions or regulatory applications		ES	ES	ES	ES	ES	ES	ES	NH	NH	ES
		13.2.6 Elements of test plan		ES		NH	ES	ES	ES	ES	ES	NH	ES
		13.2.7 % Completion		*		NH		ES	ES	ES	ES	ES	*****
	13.3 Report Accessibility	13.3.1 Internet access		ES	NH	NH		NH	NH	ES	ES	ES	NH
		13.3.2 Hard copies		ES	ES	ES		ES	ES	ES	ES	NH	ES
		13.3.3 Video documentation		ES	NH	NH		NH	NH	NH	NH	NH	UN

NA Indicates Not Applicable
NR Indicates Not Required
S/S Indicates Site or Project Specific
* Indicates Vague
** Indicates CalEPA completed older version of matrix
*** Indicates New Jersey deems required for baseline screening but not marketing
**** Indicates part of what New Jersey provides for new envirotechnologies
***** Indicates ETV Canada only proceeds to 100% completion when all facets of verification plan can be assessed.
****** MA accepts alternative test methods if demonstrated to be scientifically valid

Table E-3: Others Response to Matrix Elements

Matrix Elements			Other Stakeholders			
			DoE-OST	DoE-EML	DuPont	FICE & FES
1.0 TECHNOLOGY NAME	1.1 Name		ES	ES	ES	ES
	1.2 Acronyms		ES		ES	ES
	1.3 Vendor Information		ES	ES	ES	ES
2.0 GENERAL TECHNOLOGY OVERVIEW	2.1 Purpose		ES	ES	ES/NH	ES
	2.2 Technology Description		ES	ES	ES	ES
	2.3 Potential Markets		NH		NH	NH
3.0 TECHNOLOGY STATUS	3.1 Deployment History	3.1.1 Status	ES	ES	ES	ES
	3.2 Commercial Status	3.2.1 Commercially Available vs. Prototype	ES	ES	ES	ES
		3.2.2 List of commercial apps	ES	ES	ES	NH
	3.3 Public Involvement/Acceptance of Technology	3.3.1 Community Outreach	ES	UN	NH	ES/NH
		3.3.2 Contact List	ES		NH	NH
4.0 TREATMENT OR MEASUREMENT PROCESS	4.1 Environmental Media		ES	ES	ES	ES
	4.2 Environmental Benefit		ES	ES	ES	ES
	4.3 Environmental Impact		ES	ES	ES	ES
	4.4 Target Contaminant(s)		ES	ES	ES	ES
	4.5 Process Flow Diagram	4.5.1 Material balance	ES	ES	ES	ES
		4.5.2 Energy balance	ES	ES	ES	
		4.5.3 Conversion of media	ES	ES	ES	ES
	4.6 Discrete System or Component		ES		ES	ES
5.0 OUTPUT (Treatment, Containment, and Removal Technologies Only)	5.1 Final Result or Product	5.1.1 Description of treatment efficiency	ES	ES	ES	ES
		5.1.2 Description of lower limits	ES	ES	ES	NH
		5.1.3 Description of physical characteristics	ES	ES	ES	ES
		5.1.4 Changes in state	ES	ES	ES	ES
	5.2 End Products and By-Products	5.2.1 Name description	ES	ES	ES	ES
		5.2.2 Impact of fugitive emissions	ES	ES	ES	ES
		5.2.3 Impact of stack emissions	ES	ES	ES	ES
		5.2.4 Impact of discharges	ES	ES	ES	ES
		5.2.5 Impact of residuals/by-products	ES	ES	ES	ES
		5.2.6 Impact of noise level/odor	ES	ES	ES	ES
	5.3 Data Type	5.3.1 Regulatory status of outputs	ES	ES	ES	ES
		5.3.2 Verification report	ES	ES	ES	ES

Matrix Elements			Other Stakeholders			
			DoE-OST	DoE-EML	DuPont	FICE & FES
6.0 OUTPUT (Measurement Technologies Only)	6.1 Data Type	6.1.1 Specific analytes	ES	ES	ES	ES
		6.1.2 Contaminants detected	ES	NH	ES	ES
		6.1.3 Limitations of data	ES	ES	ES	ES
	6.2 Data Performance	6.2.1 Characteristics of samples technology is suited for	ES	ES	ES	ES
		6.2.2 Non-target interference(s)	ES	ES	ES	ES
		6.2.3 Method sensitivity and dynamic range	ES	ES	ES	ES
		6.2.4 Bias	ES	ES	ES	ES
		6.2.5 Precision of measurement	ES	ES	ES	ES
		6.2.6 Accuracy of measurement	ES	ES	ES	ES
		6.2.7 Comparability to relative standards and specs	ES	NH	ES	ES
		6.2.8 Calculation of false negative and positive		ES	ES	ES
		6.2.9 Performance tested relative to reference methods	ES	ES	ES	ES
		6.2.10 Based on real-world	ES	ES	ES	ES
		6.2.11 Blind performance evaluation	NH	ES	ES	ES
	6.3 Data Analysis and Reporting	6.3.1 Equations for sample results	ES	ES	ES	ES
		6.3.2 Equations for detection limits	ES	ES	ES	ES
		6.3.3 Data package	NH	ES	ES	ES
	6.4 Regulatory	6.4.1 Decision error determination	ES	ES	ES	ES
7.0 OPERATIONAL PARAMETERS	7.1 Operational Components		ES	ES	ES	ES
	7.2 O & M		ES	ES	NH	ES
	7.3 Conditions and Limitations of Operation		ES	ES	ES	ES
	7.4 Equipment Specifications	7.4.1 Summary including Efficiency,	ES	ES	ES	ES
		7.4.2 Reliability,	ES	ES	ES	ES
		7.4.3 Portability and ruggedness,	ES	NH	NH	ES
		7.4.4 Protectiveness,	ES	ES	ES	ES
		7.4.5 Logistics,	ES	ES	NH	ES
		7.4.6 Weight and size of technology	ES	ES	NH	ES
		7.4.7 Ancillary equipment list	ES		NH	ES
	7.5 Operation Range	7.5.1 Max throughput	ES	ES	ES	ES
		7.5.1 Min throughput	ES	ES	ES	ES
		7.5.3 Optimum	ES		ES	ES
	7.6 Regulatory Requirements		ES	ES	ES	ES
	7.7 Infrastructure		ES	ES	NH	ES
	7.8 Cost	7.8.1 Cost factors	ES		ES	ES
		7.8.2 Projected cost of deployment	ES	ES	ES	ES

Matrix Elements			Other Stakeholders			
			DoE-OST	DoE-EML	DuPont	FICE & FES
8.0 VERIFICATION PLAN	8.1 Scope of Plan	8.1.1 List of relevant standards	ES	ES	ES	ES
		8.1.2 Test specs	ES	ES	ES	ES
		8.1.3 Vendor claims	ES	NH	NH	UN
		8.1.4 Test procedures	ES	ES	ES	ES
		8.1.5 Calculation procedures	ES	ES	ES	ES
	8.2 Data Objectives	8.2.1 Source of data	ES	ES	ES	ES
		8.2.2 PARCC	ES	ES	ES	ES
	8.3 Error Verification	8.3.1 DQOs	ES	ES	ES	ES
		8.3.2 Report on documented failures	ES	ES	ES	ES
		8.3.3 Exceptions to failure	ES	ES	ES	ES
	8.4 Performance Objectives		ES	ES	ES	ES
9.0 QUALITY ASSURANCE REQUIRED FOR ACCEPTABLE VERIFICATION	9.1 Laboratories				ES	ES
	9.2Samples	9.2.1 Sampling and Analysis plan with field QA/QC	ES	ES	ES	ES
		9.2.2 Samples from personal source	ES			NH
		9.2.3 Samples from company source	NH			NH
	9.3 Analytical Methods	9.3.1 US EPA guidelines	ES		ES	NH
		9.3.2 Generally accepted scientific standards	ES		ES	ES/NH
		9.3.3 Referred publications	NH		ES	NH
	9.4 Analytical Data Report	9.4.1 Lab data	NH	ES	ES	ES
		9.4.2 Field data	NH	ES	ES	ES
	9.5 Peer Review and Objectivity	9.5.1 Oversight by verifying body	ES	ES	ES	ES
		9.5.2 Field Oversight	ES	ES	ES	ES
		9.5.3 Objective of verifying body	ES	ES	ES	ES
10.0 EMERGENCY PLANNING & WORKER HEALTH AND SAFETY	10.1 Emergency Planning	10.1.1 Description of scenario	ES	UN	ES	ES
		10.1.2 Emergency Plan	ES	ES	ES	ES
	10.2 Worker Health & Safety	10.2.1 Worker Safety Plan	ES	ES	ES	ES
		10.2.2 Description of structure	ES	ES	ES	ES
11.0 TEST SITE FACILITY	11.1 Test Site Facility Description	11.1.1 Hydrologic/ Geologic description of site	ES	ES	ES	ES
		11.1.2 Ranges of concentrations	ES	ES	ES	ES
12.0 LICENSING PARAMETERS	12.1 License		ES	NH	NH	ES
	12.2 Operation Qualifications		ES	NH	NH	ES

Matrix Elements			Other Stakeholders			
			DoE-OST	DoE-EML	DuPont	FICE & FES
13.0 EXECUTIVE SUMMARY	13.1 Executive Summary	13.1.1 "Whom"	NH		ES	NH
		13.1.2 Successes and failures	ES		ES	NH
		13.1.3 Limitations	ES	ES	ES	ES
		13.1.4 Cost considerations	ES	ES	ES	NH
		13.1.5 Stakeholder involvement	ES	ES	NH	NH
	13.2 Report Accessibility	13.2.1 Specific info	ES		ES	ES
		13.2.2 Equipment or process	ES	ES	ES	ES
		13.2.3 Scope of application	ES	ES	ES	ES
		13.2.4 Evaluation of proposed claim/objective	ES	ES	ES	ES
		13.2.5 Conditions or regulatory	ES	NH	ES	ES
		13.2.6 Elements of test plan	ES	ES	ES	ES
		13.2.7 % Completion	ES		ES	ES
	13.3 Report Accessibility	13.3.1 Internet access	NH	ES	NH	NH
		13.3.2 Hard copies	ES		ES	ES
		13.3.3 Video documentation	NH	NH	NH	NH

Appendix F

Verification Program Summit Meeting

Agenda

Interstate Technology and Regulatory Cooperation
Verification Program Summit Meeting
San Diego Mission Valley Hilton
November 2, 1998

7:30am – 8:00am Registration

8:00am – 8:10am Welcome/Self Introductions

8:10am – 8:30am Purpose of Meeting

8:30am – 10:30am Discussion of Verification Programs and Matrix

- State matrix responses
- Program matrix responses
- Verification programs' objectives, commonalties, and uniqueness among programs
- Review of ITRC matrix for compatibility to verification program objectives
- Six state MOU

10:30am – 10:45am Break

10:45 – 12:30pm Further Discussion of Verification Program and Matrix

12:30pm – 1:30pm Working Lunch

1:30pm – 3:30pm Discussion of additional topics:

- Verification program future development
- Increased communication with states
- Training needs for states
- Examples of verification program partnering and MOUs

3:30pm – 4:00pm Wrap up and plans for next meeting

Appendix G

ITRC Fact Sheet

INTERSTATE TECHNOLOGY & REGULATORY COOPERATION WORK GROUP

Promoting innovative environmental technologies

October 1999

ITRC is a state-led national coalition dedicated to helping regulatory agencies, technology developers and vendors, and technology users achieve better environmental protection through the use of innovative technologies. By working together and sharing knowledge among themselves and with federal, industrial, and stakeholder partners, ITRC states are creating products and offering services to build the collective confidence of state regulators about using new technologies. ITRC also helps the environmental technology market by bolstering multistate deployments of better technologies.

BENEFITS

The benefits ITRC offers state regulators, technology developers and vendors, technology users, and stakeholders include

- helping regulators build their knowledge base about new technologies,
- raising the comfort level of state regulators about using new technologies,
- helping regulators save time and money when evaluating technologies for cleanup,
- helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations,
- guiding technology developers in the collection of performance data to satisfy the requirements of multiple states,
- providing the environmental technology industry a predictable regulatory path for commercializing new technologies,
- improving environmental protection, and
- lowering the overall cost of remediation.

PRODUCTS

To date, ITRC has developed approximately 30 guidance documents intended to help regulatory staff and technology vendors in the deployment of innovative technologies. In general, ITRC guidance documents provide a regulatory perspective on the informational needs (background and/or regulatory requirements) of state environmental agencies to approve the use of a specified technology. These documents offer a consistent approach for reviewing and approving specified technologies. A list of ITRC's documents and most of the documents themselves are available on the ITRC Web site. ITRC guidance documents fall into three categories:

Technical/Regulatory Guidelines

Previously called protocols, these documents reflect a consensus of state technical/regulatory concerns that should be considered when approving the use of a specified technology or in demonstrating a technology. Documents of this nature are formally circulated to state environmental agencies to seek their concurrence to use the proposed guidance.

Technology Overviews

These documents may come in the form of status reports on emerging technologies, descriptions of how state regulatory practices treat certain types of technologies, or state regulatory perspectives and input into guidance documents developed by complementary organizations.

Case Studies

These documents may come in the form of benchmarking state practices in demonstrating and approving the use of environmental technologies, as well as documenting state approaches to implementing various programs and policies that support the use of new technologies. These case studies often identify barriers to the deployment of innovative technologies and sometimes offer preliminary findings.

> ***"The whole process—from design through installation—took less than four months. That level of accelerated review is based upon a common pool of knowledge provided in the ITRC documents."***
>
> **Steve Tappert, Consultant, Vectre Corporation**

SERVICES

In addition to producing and disseminating guidance documents, ITRC also offers benefits through other services.

Training

During 1998, ITRC brought its first course, Natural Attenuation of Chlorinated Solvents in Groundwater, to more than 950 regulators from 46 states. The success of the course led ITRC to begin planning a series of workshops on permeable reactive barriers for delivery during 1999 and 2000. The workshops are being developed in cooperation with the industrial members of the Remediation Technologies Development Forum and the Technology Innovation Office of the U.S. Environmental Protection Agency.

Peer exchange

ITRC participants grow professionally as they share experiences in evaluating innovative technologies. ITRC involvement offers an opportunity to tap into networks of technical resources and support when making decisions about approving the use of an innovative technology.

Innovative technology advocates

Each of the 25 states actively participating in ITRC has assigned a staff member from its environmental agency to serve as the ITRC point of contact (POC). State POCs are knowledgeable and help convey information about ITRC to people within their states who can benefit from ITRC's products and services. POCs also help gain state concurrence on ITRC's technical/regulatory guidelines. POCs are part of ITRC's State Engagement program, which is led by Mary Yelken of Nebraska, (402) 471-2181. A list of state POCs is on ITRC's Web site.

"It is clear that the ITRC training has been very helpful to our staff in evaluating these sites."

Gary Baughman,
Colorado Department of Public Health & Environment

TECHNICAL TEAMS

ITRC technical work teams focus on developing guidance documents and providing opportunities for formal training and informal information sharing. State regulators lead the teams, which include representatives from federal agencies, industry, and stakeholder groups. In 1999, ITRC has eight active teams. An additional five teams closed out their activities in previous years. Many of the final documents are available on the ITRC Web site, or contact the team leads listed below for information about a team or its products.

LEADERSHIP TEAM

A 10-member Leadership Team provides advice and guidance for running ITRC. Members of the Leadership Team represent the various groups important to ITRC: state agencies, industry, and stakeholders. Representatives from federal agencies and state associations serve as ex officio members. The ITRC co-chairs are

- **Brian Sogorka, New Jersey**–(609) 633-1344
- **Roger Kennett, New Mexico**–(505) 845-5933

HISTORY

Originating in 1995 from a previous initiative by the Western Governors' Association, ITRC has expanded to include the environmental agencies of 25 states, multiple federal partners, and public and industry stakeholders. In January 1999, ITRC affiliated with the Environmental Research Institute of the States. ERIS is a 501(c) 3 nonprofit educational subsidiary of the Environmental Council of the States (ECOS), an organization of state environmental agencies. ITRC continues to receive regional support from the Southern States Energy Board (SSEB) and the Western Governors' Association (WGA) and financial support from the U.S. Department of Energy, U.S. Department of Defense, and the U.S. Environmental Protection Agency.

ADDITIONAL RESOURCES

To learn more about ITRC

- Check out the Web site at http://www.itrcweb.org.
- Contact Rick Tomlinson, ITRC project manager, at (202) 624-3660, rickt@sso.org.

New and Ongoing Technical Teams for 1999

Team Name	*Team Lead*	*State*	*Phone Number*	*e-mail address*
Dense Nonaqueous Phase Liquids	Baird Swanson	NM	(505) 841-9458	baird_swanson@nmenv. state.nm.us
In Situ Biodenitrification	Bart Faris	NM	(505) 841-9466	bart_faris@nmenv.state.nm.us
In Situ Bioremediation	Paul Hadley	CA	(916) 324-3823	phadley@dtsc.ca.gov
Permeable Reactive Barriers	Matt Turner	NJ	(609) 984-1742	mturner@dep.state.nj.us
Phytoremediation	Dib Goswami Bob Mueller	WA NJ	(609) 984-3910 (509) 736-3015	dgos461@ecy.wa.gov bmueller@dep.state.nj.us
Radionuclides	Tom Schneider Carl Spreng	OH CO	(937) 285-6466 (303) 692-3358	tom.schneider@epa.state.oh.us carl.spreng@state.co.us
Unexploded Ordnance	Jim Austreng	CA	(916) 255-3702	jaustren@dtsc.ca.gov
Verification	Jim Harrington Nancy Uziemblo	NY WA	(518) 457-0337 (509) 736-3014	jbharrin@gw.dec.state.ny.us nuzi461@ecy.wa.gov
Former Technical Teams				
Accelerated Site Characterization	Nancy Uziemblo	WA	(509) 736-3014	nuzi461@ecy.wa.gov
Low Temperature Thermal Desorption	Jim Harrington	NY	(518) 457-0337	jbharrin@gw.dec.state.ny.us
Metals in Soils	Dib Goswami	WA	(509) 736-3015	dgos461@ecy.wa.gov
Plasma Technologies	Terry Escarda	CA	(916) 322-7287	tescarda@dtsc.ca.gov
Policy	Linda Benevides	MA	(617) 292-5782	linda.benevides@state.ma.us

Appendix H

ITRC Verification Work Team Contacts

ITRC CONTACTS

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