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EPA Innovative Treatment Technologies: Annual Status Report

(Seventh Edition)

Applications of New Technologies at Hazardous Waste Sites

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Innovative Treatment Technologies: Annual Status Report

(Seventh Edition)

Applications of New Technologies at Hazardous Waste Sites

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NOTICE

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U.S. EPA/ National Center for Environmental Publications and Information (NCEPI)
P.O. Box 42419
Cincinnati, OH 45242
Fax Number: (513) 489-8695
Phone Verification: (513) 489-8190

Allow 4-6 weeks for delivery. The *ITT Database* is also available for downloading from the following sources:

- Cleanup Information Bulletin Board System (CLU-IN BBS). Via modem (301) 589-8366 (8 Data Bits, 1 Stop Bit, No Parity, VT-100 or ANSI). Voice help (301) 589-8368.
- Alternative Treatment Technology Information Center (ATTIC). Via modem (703) 908-2138 (8 Data Bits, 1 Stop Bit, No Parity, VT-100 or ANSI). Voice help (703) 908-2137.

FOREWORD

This report documents the status of application of innovative treatment technologies in the Superfund program. It presents information on some, but not all, projects applying innovative treatment technologies at non-Superfund sites such as those subject to corrective action under the Resource Conservation and Recovery Act (RCRA) and those being addressed by the Department of Defense (DoD), and the Department of Energy (DOE). We have expanded the report to include many new innovative projects selected by the EPA in fiscal year 1994 and numerous graphics and tables to assist the reader in understanding the data.

We are pleased to announce a new, software version of the report, called the *Innovative Treatment Technologies Annual Status Report Database (ITT Database)*, which is a Windows™-based system that contains all of the site-specific information that previously was presented in tabular form. Information provided about each site includes site type, technology selected or used, target contaminants, contaminated matrix, project status, and site contact names and telephone numbers. Additional information about completed projects includes periods of operation, typical pre- and post-treatment concentrations of key contaminants treated, cleanup goals, operating parameters (such as retention time and additives), materials handling required, and management of residuals. The database is searchable and can generate statistics and reports tailored to the user's specifications. Ordering information for the database and the hard-copy report is on the preceding page.

We intend this information to improve communication between experienced technology users and those who are considering innovative technologies to clean up contaminated sites, as well as enable technology vendors to evaluate the market for possible application of innovative treatment technologies at Superfund sites and other contaminated sites for the next several years.

Our goal with this report is to increase the application of new, less costly, and more effective technologies to address the problems at Superfund sites as well as other contaminated sites.

Walter W. Kovalick, Jr., Ph.D.
Director, Technology Innovation Office

ACKNOWLEDGEMENTS

This document was prepared under the direction of Ms. Linda Fiedler, work assignment manager for the EPA's Technology Innovation Office (TIO).

Special acknowledgement is due the Federal and state staff and other remediation professionals listed as contacts for individual sites. They provided the detailed information in this document. Their cooperation and willingness to share their expertise on innovative treatment technologies encourages the application of those technologies at other sites.

ABSTRACT

This yearly report documents and analyzes the selection and use of innovative treatment technologies in the EPA Superfund Program and at some non-Superfund sites subject to corrective action under the RCRA Program, and those being addressed by DoD, and DOE. The report updates the status of all the projects and includes projects for which innovative technologies were selected in Superfund Records of Decision (ROD) signed during fiscal year 1994. The information will improve communication between experienced technology users and those who are considering innovative technologies to clean up contaminated sites. In addition, the information will enable technology vendors to evaluate the market for innovative technologies at Superfund sites for the next several years.

Alternative treatment technologies are alternatives to land disposal. Innovative treatment technologies are alternative treatment technologies the use of which at Superfund and similar sites is inhibited by lack of data on cost and performance. This report documents the use of the following innovative treatment technologies to treat ground water (in situ), soils, sediments, sludge, and solid-matrix wastes:

Soil Technologies

- Bioremediation (ex situ)
- Bioremediation (in situ)
- Contained Recovery of Oily Wastes (CROW™)
- Cyanide oxidation
- Dechlorination
- In situ flushing
- In situ vitrification
- Plasma high temperature metals recovery
- Phyto-treatment
- Soil vapor extraction
- Soil washing
- Solvent extraction
- Thermal desorption

Groundwater Technologies

- Air sparging
- Bioremediation (in situ)
- Dual-phase extraction
- In situ oxidation
- Passive treatment walls
- Surfactant flushing

This document includes a list of sites and analysis of 332 applications of innovative treatment technologies for remedial actions, 29 applications for removal actions, 8 applications under RCRA corrective actions, and 28 applications under other federal programs. The analysis includes the number of applications by technology, types of contaminants treated, quantities of soil treated, and status of the project. The information for these sections was collected through analyses of RODs; review of 50 RCRA corrective action statements of basis (SB); review of EPA's Office of Solid Waste and Emergency Response (OSWER) tracking systems; and interviews with EPA regional staff, as well as with DoD and DOE staff.

OVERVIEW

Introduction

The Technology Innovation Office (TIO) of the U.S. Environmental Protection Agency's (EPA) Office of Solid Waste and Emergency Response (OSWER) has prepared this *Innovative Treatment Technologies: Annual Status Report, Seventh Edition*, to document the use of innovative treatment technologies to remediate contaminated hazardous waste sites. The report contains a list and an analysis of Superfund sites (both remedial and removal actions), Resource Conservation and Recovery Act (RCRA) corrective action sites, and other non-Superfund sites (that is, sites addressed under other federal programs) at which innovative treatment technologies are being used. Site managers can use this report to evaluate cleanup alternatives for similar sites. Innovative technology vendors can use it to identify potential markets. TIO also uses the information to track progress in the application of innovative treatment technologies.

New in this Report

- *42 innovative technologies selected in FY 94 RODs*
- *8 RCRA corrective actions using innovative technologies*
- *Now available as a windows-platform searchable database system*

The report is updated annually. This September 1995 issue of the report updates and expands information provided in the September 1994 report. Information added to this update includes 42 innovative treatment technologies selected for remedial actions in fiscal year (FY) 1994 Superfund records of decision (RODs)—a ROD is the decision document used to specify the way a site, or part of a site, will be remediated. In addition, 15 additional projects have been completed since the last edition of this report. Also added to this report is information about eight innovative technologies selected in statements of basis (SBs) for implementation at RCRA corrective action sites.

This report does not address sites that use non-treatment remedies, such as landfilling and capping. It contains only minimal information about sites that use incineration, solidification and stabilization, or pump-and-treat remedies. More information about RODs that specify such remedies is presented in the series of ROD annual reports published by the Office of Emergency and Remedial Response (OERR). For more information about those reports, call the Superfund Hotline at (800) 424-9346 (outside the local calling area) or (703) 412-9810 (inside the local calling area).

Sources of Information for this Report

EPA initially used RODs for individual sites to compile information on remedial action, and pollution reports, on-scene coordinators' reports, and the OSWER Removal Tracking System to compile data on emergency response actions. The U.S. Army Corps of Engineers (USACE) Hazardous, Toxic, and Radioactive Waste (HTRW) Mandatory Center of Expertise in Omaha, Nebraska; *Synopses of Federal Demonstrations of Innovative Site Remediation Technologies, Third Edition* (EPA-542-B-93-009); and RCRA corrective action SBs were consulted to compile information on projects under other federal programs. EPA then verified and updated the draft information through interviews with remedial project managers (RPM), on-scene coordinators (OSC), and other contacts for each site. The data on project status supplements data in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's Superfund tracking system, by providing more detailed information on the specific portion of the remedy that involves an innovative technology. In addition, information about technologies and sites identified here might differ from information found in the ROD annual reports and the RODs database. Such differences are the result of changes in the remedy during the design phase of the project. The changes may or may not have required official documentation (that is, a ROD amendment or an explanation of significant differences [ESD]).

What are Established and Innovative Treatment Technologies?

Treatment technologies are alternatives to land disposal. Established treatment technologies are those for which cost and performance information is readily available. The most frequently used established technologies are incineration, solidification and stabilization, and pump-and-treat technologies for groundwater. Treatment of groundwater after it has been pumped to the surface often resembles traditional water treatment; therefore, in general, pump-and-treat groundwater remedies are considered established technologies.

OVERVIEW

Innovative treatment technologies are alternative treatment technologies for which routine use at Superfund and similar sites is inhibited by lack of data on performance and cost. In general, a treatment technology is considered innovative if it has had limited full-scale application. Often, it is the application of a technology or process to soils, sediments, sludge, and solid-matrix waste (such as mining slag) or groundwater that is innovative. This report documents the use of the following innovative treatment technologies to treat groundwater, soils, sediments, sludge, and solid-matrix waste:

Soil Technologies

- Bioremediation (ex situ)
- Bioremediation (in situ)
- Contained Recovery of Oily Wastes (CROW™)
- Cyanide oxidation
- Dechlorination
- In situ flushing
- In situ vitrification
- Plasma high temperature metals recovery
- Phyto-treatment
- Soil vapor extraction
- Soil washing
- Solvent extraction
- Thermal desorption

Groundwater Technologies

- Air sparging
- Bioremediation (in situ)
- Dual-phase extraction
- In situ oxidation
- Passive treatment walls
- Surfactant flushing

Over the past several years, a number of remedial technologies that are considered innovative have seen increased use at Superfund and other contaminated sites. In particular, an increasing number of soil vapor extraction and thermal desorption projects have been completed. Although those technologies have become accepted more generally, because the results of most of the projects are not widely known, this report will continue to track soil vapor extraction and thermal desorption as innovative technologies.

Definitions of Specific Innovative Treatment Technologies

This document reports on the use of the innovative remediation technologies listed above and, to a lesser extent, on the use of established technologies. The technologies reported in the following sections treat contaminants in very different ways. This section provides brief definitions of the 13 types of source control (primarily soil) innovative technologies and six types of innovative in situ groundwater technologies as they are used in this document.

Source Control Technologies

EX SITU BIOREMEDIATION uses microorganisms to degrade organic contaminants in excavated soil, sludge, and solids. The microorganisms break down the contaminants by using them as a food source. The end products typically are CO_2 and H_2O. Ex situ bioremediation includes slurry-phase bioremediation, in which the soils are mixed in water to form a slurry, and solid-phase bioremediation, in which the soils are placed in a cell or building and tilled with added water and nutrients. Land farming and composting are types of solid-phase bioremediation.

In applications of IN SITU SOIL BIOREMEDIATION, an oxygen source and sometimes nutrients are pumped under pressure into the soil through wells, or they are spread on the surface for infiltration to the contaminated material. Bioventing is a common form of in situ bioremediation.

The CONTAINED RECOVERY OF OILY WASTES (CROW™) process displaces oily wastes with steam and hot water. The contaminated oils are swept into a more permeable area and are pumped out of the soil.

In CYANIDE OXIDATION organic cyanides are oxidized to less hazardous compounds through chemical reactions.

DECHLORINATION results in the removal or replacement of chlorine atoms bonded to hazardous compounds.

For IN SITU FLUSHING, large volumes of water, at times supplemented with treatment compounds, are introduced into soil, waste, or groundwater to flush hazardous contaminants from a site. Injected water must be isolated effectively within the aquifer and recovered.

IN SITU VITRIFICATION treats contaminated soil in place at temperatures of approximately 3000°F (1600°C). Metals are encapsulated in the glass-like structure of the melted silicate compounds. Organics may be treated by combustion.

PLASMA HIGH TEMPERATURE METALS RECOVERY is a thermal treatment process that purges contaminants from solids and soils as metal fumes and organic vapors. The organic

vapors can be burned as fuel and the metal fumes can be recovered and recycled.

PHYTO-TREATMENT involves the cultivation of specialized plants that are capable of taking up specific soil contaminants into their roots or foliage. Uptake of contaminants by the plants reduces concentrations of contaminants in the soil. Periodic harvesting of the plants may be necessary.

SOIL VAPOR EXTRACTION (SVE) removes volatile organic constituents from the soil in situ through the use of vapor extraction wells, sometimes combined with air injection wells, to strip and flush the contaminants into the air stream for further treatment.

SOIL WASHING is used for two purposes. First, the mechanical action and water (sometimes with additives) physically remove the contaminants from the soil particles. Second, agitation of the soil particles allows the more highly contaminated fines to separate from the larger soil particles, thus reducing the volume of material requiring further treatment.

SOLVENT EXTRACTION operates on the principle that, in the correct solvent, organic contaminants can be solubilized preferentially and removed from the waste. The solvent used will vary, depending on the waste to be treated.

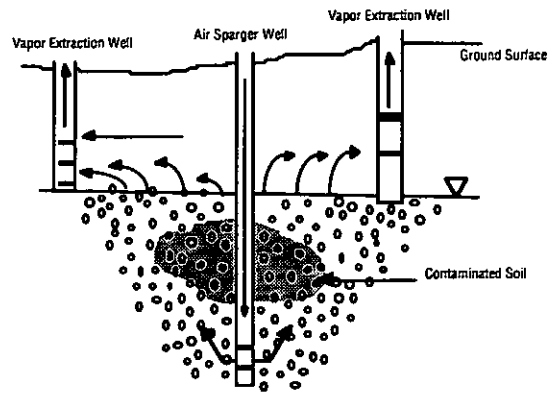
For THERMAL DESORPTION, the waste is heated in a controlled environment to cause organic compounds to volatilize from the waste. The operating temperature for thermal desorption is usually less than 1000°F (550°C). The volatilized contaminants usually require further control or treatment.

Groundwater Treatment Technologies

AIR SPARGING involves injecting air or oxygen into the aquifer to strip or flush volatile contaminants as the air bubbles up through the groundwater and is captured by a vapor extraction system. The entire system acts as an in situ air stripper. Stripped or volatilized contaminants usually will be extracted through soil vapor extraction wells and usually require further treatment.

Air sparging often is combined with IN SITU GROUNDWATER BIOREMEDIATION, in which nutrients or an oxygen source (such as air) are pumped under pressure into the aquifer through wells to enhance biodegradation of contaminants in the groundwater.

Model of an Air Sparging System



DUAL-PHASE EXTRACTION extracts contaminants simultaneously from both the saturated and the unsaturated zone soils in situ. This new technology applies soil vapor extraction techniques to contaminants trapped in saturated zone soils, which are more difficult to treat than are those in the unsaturated zone. In some instances, this result may be achieved by sparging the groundwater section of a well that penetrates the groundwater table. Other methods also may be employed.

PASSIVE TREATMENT WALLS act like chemical slurry walls. Contaminated groundwater comes into contact with the barrier and a chemical reaction takes place. Limestone barriers, one type of treatment wall, increase the pH. The increase in pH effectively immobilizes dissolved metals in the saturated zone. Another type of passive treatment wall contains iron filings that dechlorinate chlorinated compounds.

IN SITU OXIDATION oxidizes contaminants that are dissolved in groundwater, converting them into insoluble compounds.

SURFACTANT FLUSHING of non-aqueous phase liquids (NAPL) increases the solubility and mobility of the contaminants in water, so that the NAPL can be biodegraded more easily in the aquifer or recovered for treatment aboveground via a pump-and-treat system.

OVERVIEW

Contents of this Report

The following sections contain summary information about and analysis of sites at which innovative treatment technologies are being or have been applied. Section 1: Superfund Remedial Actions covers all Superfund sites at which an innovative treatment technology is being or has been implemented under a remedial action. Such actions usually are documented in a ROD. Soil and groundwater technologies are discussed separately. Section 2: Superfund Removal Actions provides information on Superfund removal action sites. Removals are conducted in response to an immediate threat caused by a release of a hazardous substance or substances. Section 3: Actions Under Other Federal Programs covers non-Superfund sites being addressed under RCRA and other federal programs.

SECTION 1: SUPERFUND REMEDIAL ACTIONS

Overview of RODs

As of August 1995, there are 1,232 sites on the National Priorities List (NPL), excluding 82 sites deleted from the NPL. An additional 49 sites are proposed for the NPL. As of the end of FY 1994, 1,472 RODs (including ROD amendments) had been signed. Most RODs for remedial actions address the source of contamination, such as soil, sludge, sediments, and solid-matrix wastes. Such RODs are referred to as "source control" RODs. In addition to the source, source control RODs may address remedial action required for groundwater. Other, non-source control RODs address groundwater only or specify that no action is necessary. Figure 1 shows the number of source control RODs compared with the total number of RODs for each fiscal year since 1982.

A total of 165 RODs (including ROD amendments) were signed in FY 1994, a decrease of 25 from the number signed in FY 1993. The number of source control RODs decreased by 19 during that year. However, the percentage of source control RODs relative to the total number of RODs remained the same from FY 1993 to FY 1994.

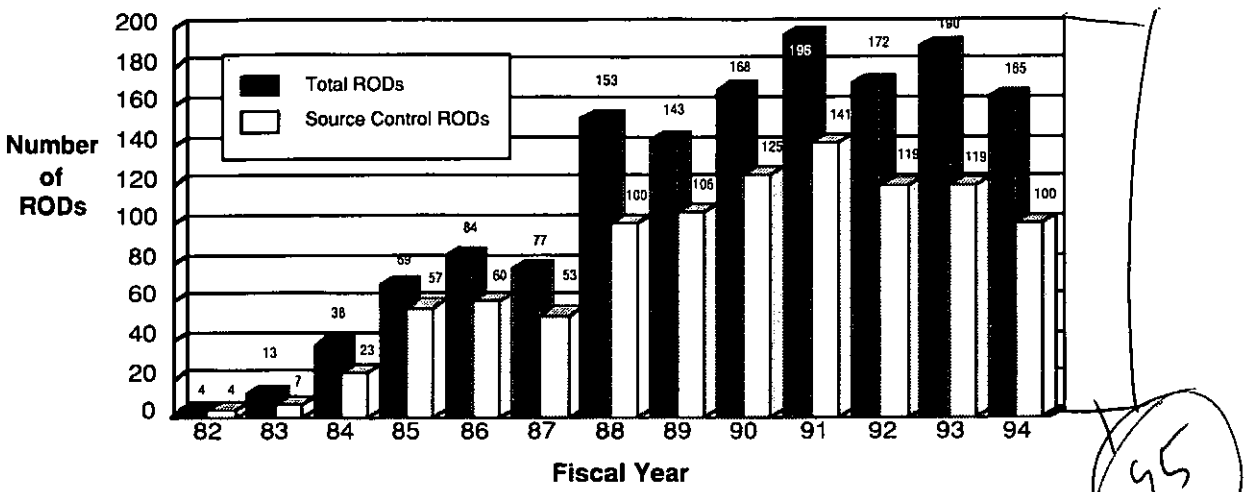
Source Control RODs

Source control RODs can be classified by the general type of technology selected: (1) RODs specifying some alternative treatment, (2) RODs specifying containment or disposal only, and (3) RODs specifying institutional controls or other actions (such as restrictions on land use, monitoring, or relocation of the affected community). Figure 2 shows the number of source control RODs that fall under each category. RODs in which some treatment is selected may include containment of treatment residues or waste from another part of the site. In FY 1994 there was an increase in the number of source control RODs that specify containment or disposal, compared with RODs under which some treatment of the source material was selected. Overall, for 64 percent of all source control RODs (from FY 1982 to FY 1994) at least one treatment technology for source control was selected (Figure 3).

The Superfund Amendments and Reauthorization Act of 1986 (SARA) required that EPA favor permanent remedies (that is, alternative treatment) over containment or disposal to remediate Superfund sites. From FY 1988 through

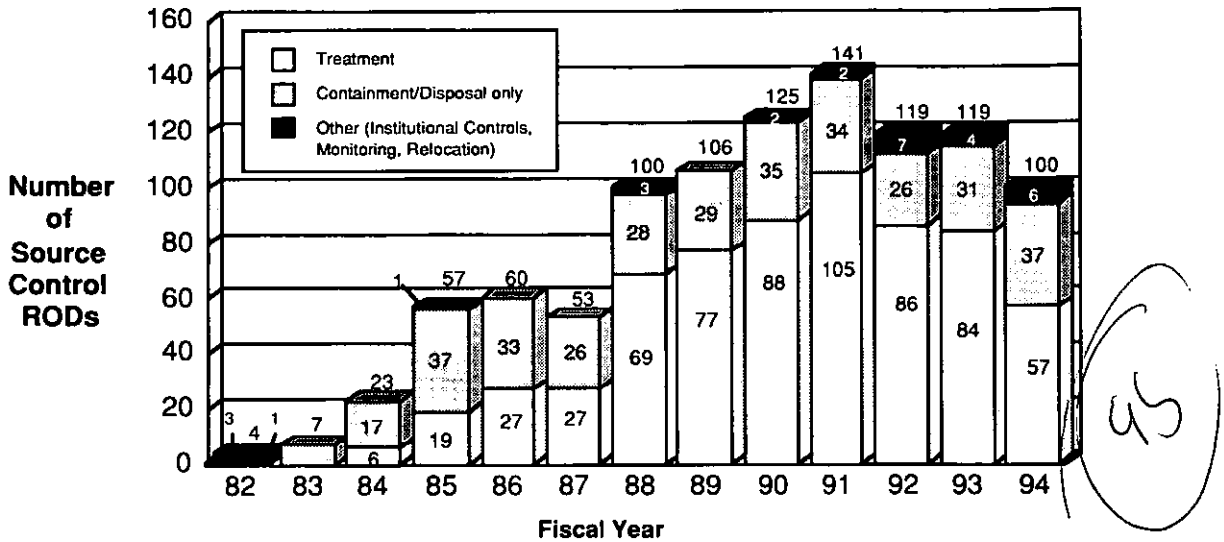
Figure 1: Superfund Remedial Actions: RODs Signed by Fiscal Year

(Total Number of RODs = 1,472)



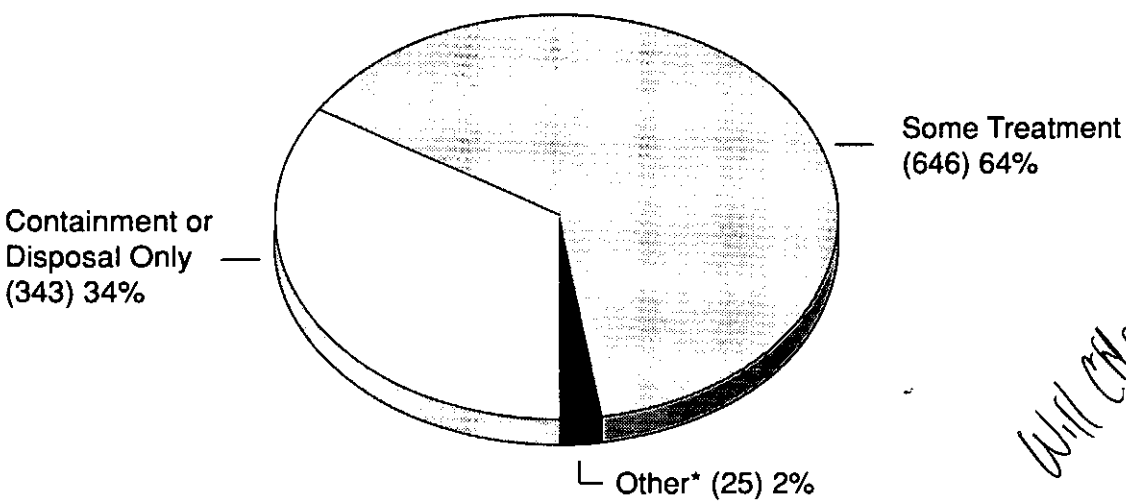
The difference between the total number of RODs and the number of source control RODs is the number of "groundwater treatment remedy" or "no action needed" RODs.
Source: USEPA Office of Emergency and Remedial Response

Figure 2: Superfund Remedial Actions
Source Control RODs by Fiscal Year



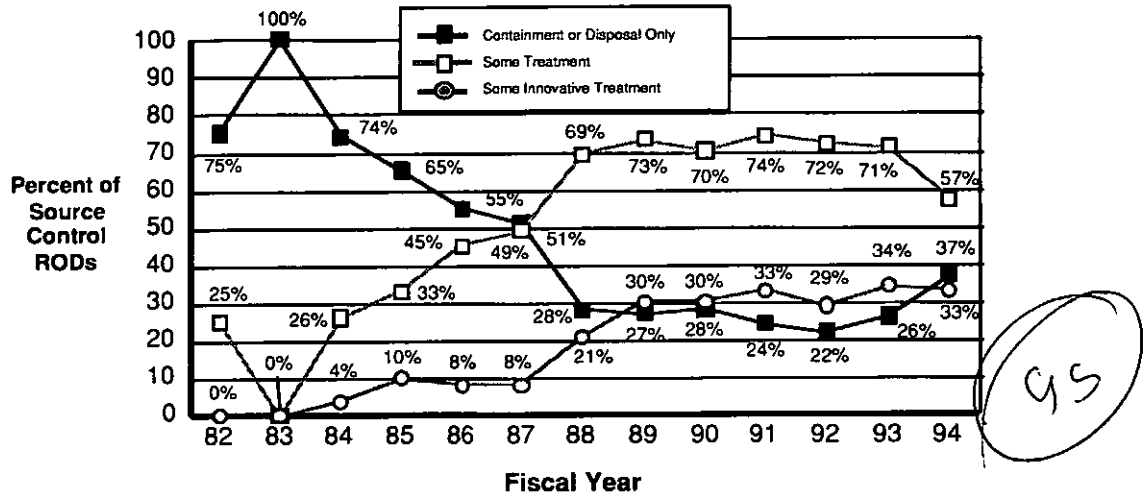
Source: USEPA Office of Emergency and Remedial Response

Figure 3: Superfund Remedial Actions
Overview of Source Control RODs Through Fiscal Year 1994



* *Includes institutional controls, monitoring, and relocation.*
() *Number of RODs*
Source: USEPA Office of Emergency and Remedial Response.

Figure 4: Superfund Remedial Actions Treatment and Disposal Decisions for Source Control



Note: *Data for innovative technologies are derived from Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995. A site may use more than one technology.*

Source: *USEPA Office of Emergency and Remedial Response*

FY 1993, at least 69 percent of source control RODs provided provisions for treatment of wastes (Figure 4). The increase was most dramatic in FY 1988. In 49 percent of RODs signed in FY 1987, some treatment for source control was selected, while some treatment was selected in 69 percent of those RODs signed in FY 1988. However, the percentage in FY 1994 decreased to 57 percent. Figure 4 also illustrates the percentage of RODs in which at least one innovative technology was selected, as updated by current project status information. Of a total of 1,014 source control RODs signed through FY 1994, innovative technologies were selected and still are being considered or used under approximately 26 percent of RODs. Overall, innovative technologies have been selected at 22 percent of the 1,472 RODs signed since FY 1982.

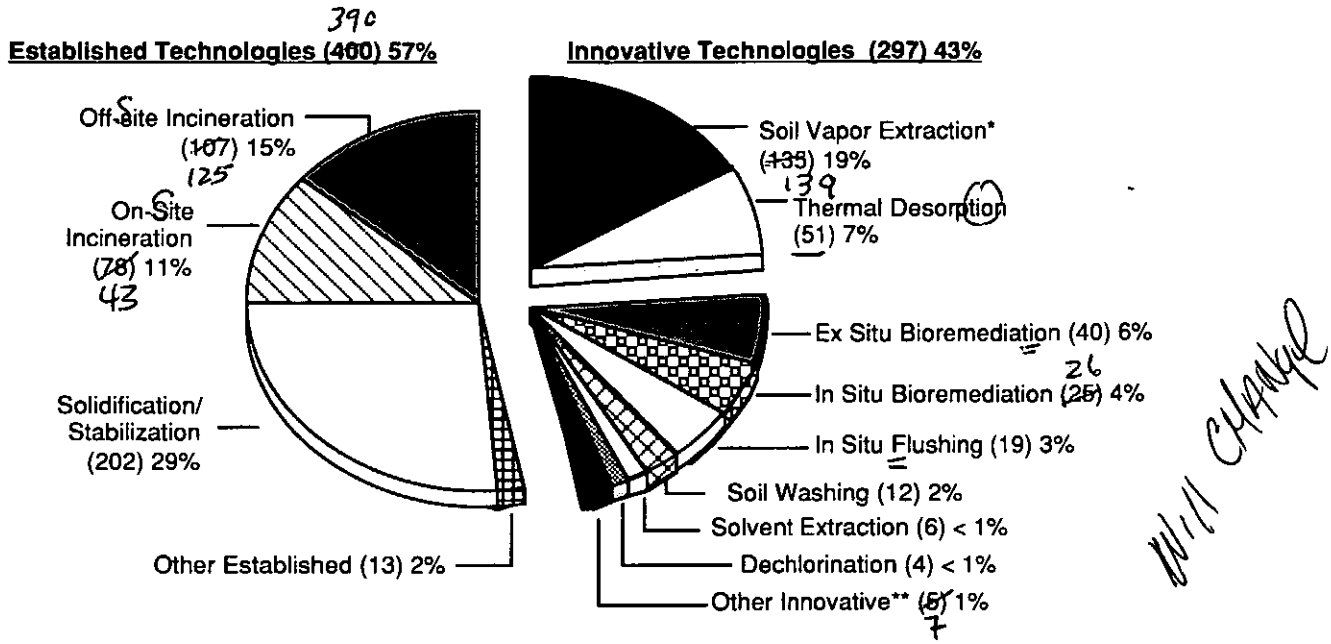
Source Control Technologies

This section discusses the number and kinds of treatment technologies selected and used for source control in the Superfund remedial program. Most of the rest of the information in this section focuses on technologies, rather than RODs. In each ROD in which treatment was specified, more than one type of treatment technology may have been selected.

Figure 5 gives an overview of the established and innovative treatment technologies selected for source control. Through FY 1994, a total of 697 treatment technologies were selected in 646 source control RODs specifying some treatment. The selection of multiple technologies results from the use of treatment trains or from the treatment of different wastes or areas of the site. Figure 5 illustrates that, through FY 1994, 43 percent of the 697 treatment technologies selected were innovative and 57 percent were established. Soil vapor extraction and thermal desorption are indicated as a separate wedge on Figure 5 because of the large number of applications of those two technologies. Appendix A provides data on the selection of the 697 source control treatment technologies by fiscal year.

Appendix B, the Innovative Technology Summary Matrix, lists each of the innovative and treatment technology projects for source control at remedial sites. (The summary matrix also includes innovative groundwater projects, removals, and non-Superfund projects that will be discussed in later sections.) Appendix C contains a matrix of established source control technologies. The *ITT Database* (see Notice) contains detailed information on specific sites at which innovative technologies are being implemented. Information on established treatment technologies is based on a review of RODs by OERR rather than interviews of Regional or state staff. Therefore, the only information provided for

Figure 5: Superfund Remedial Actions
Summary of Source Control Treatment Technologies Selected Through Fiscal Year 1994



Note: Data are derived from Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995. A site may use more than one technology.

( ) Number of times this technology was selected or used.

* *Includes two dual-phase extraction projects also listed as in situ groundwater technologies.*

** *"Other" established technologies are soil aeration, open detonation, and chemical neutralization. "Other" innovative technologies are, phyto-treatment, contained recovery of oily wastes (CROW ™), cyanide oxidation, in situ vitrification, and plasma high temperature metals recovery.*

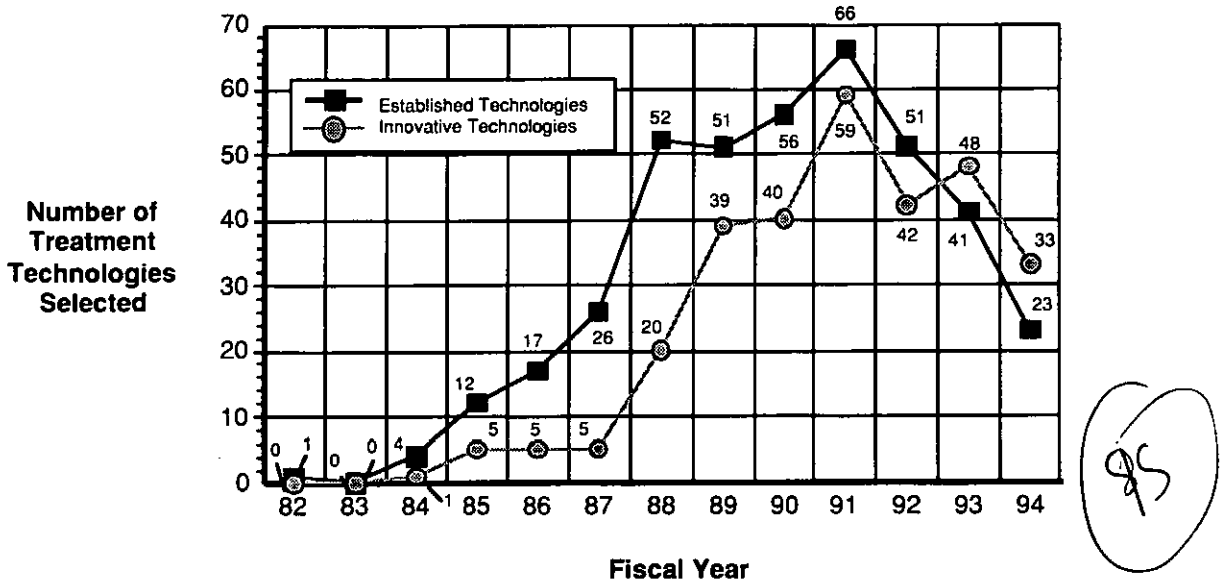
sites using established technologies is the name of the site and the year in which the ROD was signed. The list of sites does not reflect any changes in the remedy that may have occurred in the design phase of the cleanup and does not report the status of the projects.

Figure 6 compares the total number of established and innovative technologies for source control selected by fiscal year. The figure shows that more innovative technologies than established technologies were selected in RODs signed during FY 1993 and FY 1994. Figure 7 shows selection trends for the major established technologies, on-site and off-site incineration and solidification/stabilization. The number of sites implementing either on-site or off-site incineration decreased in FY 1994. Solidification/stabilization also decreased in FY 1994. Figure 8 graphically depicts, by fiscal year, the frequency of selection for the three most frequently selected innovative treatment technologies, soil vapor extraction, thermal desorption, and bioremediation. These three technologies are discussed in more detail in later sections. Appendix A gives the number of established and innovative treatment technologies for both source control and groundwater by fiscal year.

Status of Innovative Treatment Technology Projects

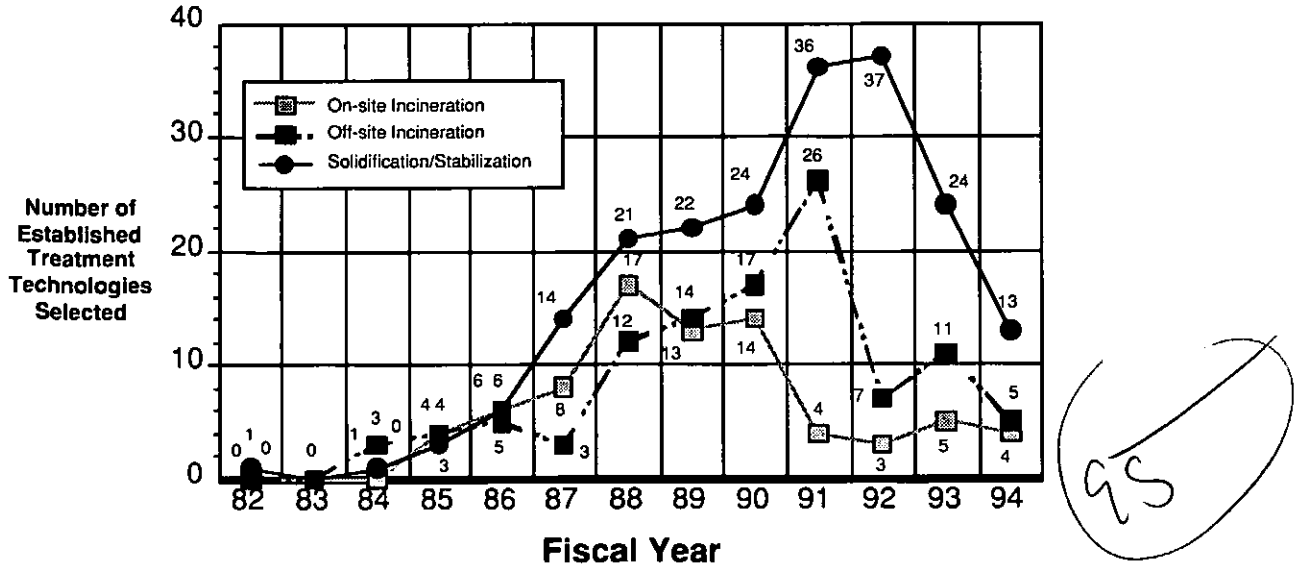
An increasing number of innovative treatment technology projects are being implemented at remedial Superfund sites. In the past year, 51 additional innovative treatment technology projects have been implemented, and 15 projects have been completed including both source control and in situ groundwater. Appendix B gives the status of each project, and Figure 9 provides a summary of their status by technology type. The design of such projects typically takes one to three years. The *ITT Database*

Figure 6: Superfund Remedial Actions
Number of Established Versus Innovative Treatment Technologies for Source Control



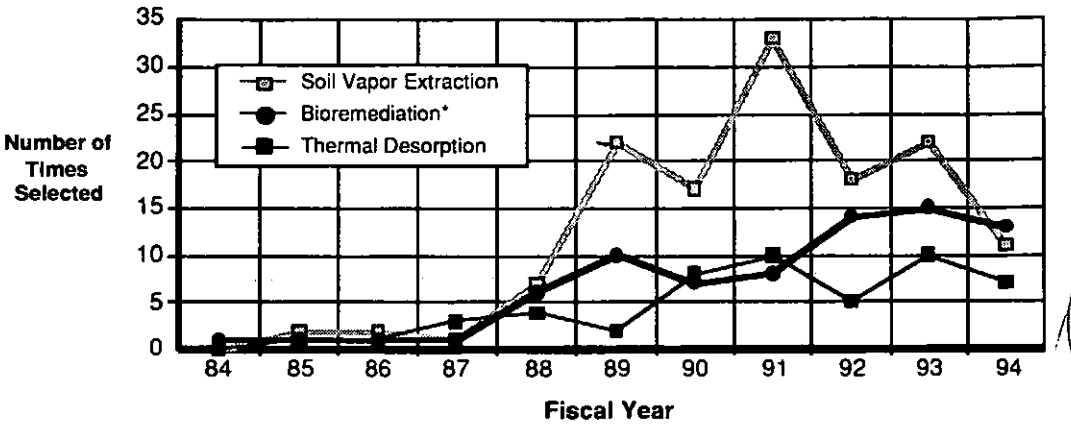
Note: Data for innovative technologies are derived from Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995. A site may use more than one technology.

Figure 7: Superfund Remedial Actions
Trends for Three Most Frequently Selected Established Technologies for Source Control



Source: USEPA Office of Emergency and Remedial Response.

Figure 8: Superfund Remedial Actions
Trends for Three Most Frequently Selected Innovative Technologies



95

* *Also includes in situ groundwater treatment.*

Figure 9: Superfund Remedial Actions
Project Status of Innovative Treatment Technologies as of August 1995

Technology	Predesign/ In Design	Design Complete/ Being Installed/ Operational	Project Completed	Total
Source Control Technologies				
Soil Vapor Extraction	52	70	13	135
Thermal Desorption	21	13	17	51
Bioremediation (Ex Situ)	17	19	4	40
Bioremediation (In Situ)	11	12	2	25
Soil Washing	10	1	1	12
In Situ Flushing	11	7	1	19
Dechlorination	2	0	2	4
Solvent Extraction	4	2	0	6
In Situ Vitrification	0	1	0	1
Cyanide Oxidation	1	0	0	1
Phyto-treatment	1	0	0	1
CROW	0	1	0	1
Plasma High Temperature Metals Recovery	1	0	0	1
Total	**131 (44%)**	**126 (42%)**	**40 (13%)**	**297**
Groundwater Technologies				
Air Sparging	10	6	0	16
Bioremediation (in situ)	6	6	0	12
Passive Treatment Wall	3	0	0	3
Dual Phase Extraction	2	0	0	2
Surfactant Flushing	1	0	0	1
In Situ Oxidation	1	0	0	1
Total	**23 (66%)**	**12 (34%)**	**0**	**35**

WILL TOTALS CHANGE

Note: Data are derived from Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995.

presents some brief performance and operating data on remedial, removal, and non-Superfund projects that have been completed. Data provided include periods of operation, typical pre- and post-treatment concentrations of key contaminants treated, cleanup goals, operating parameters (such as retention time and additives), materials handling required, and management of residuals.

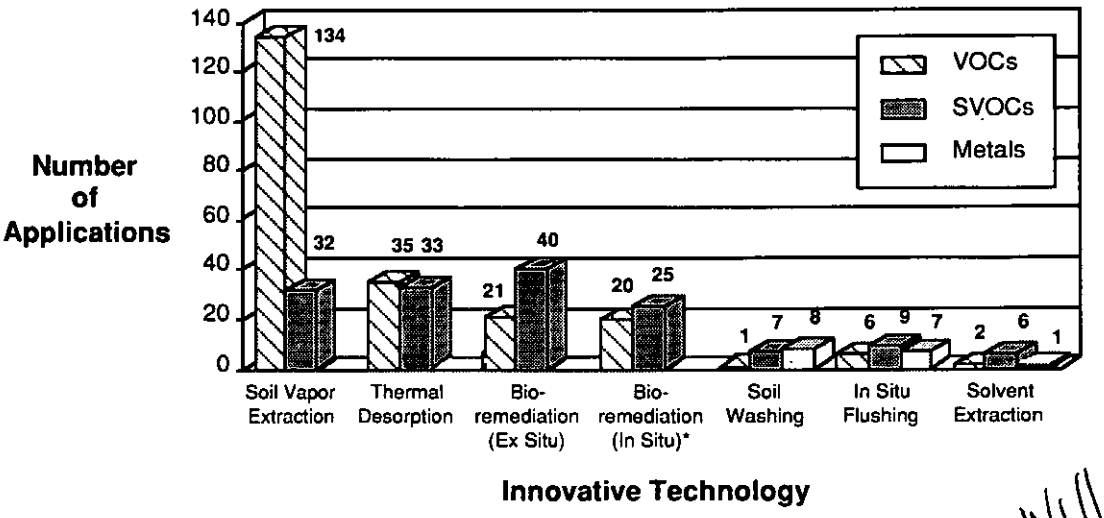
Contaminants Addressed

The data collected for this report form the basis for an analysis of the classes of contaminants treated by each technology type at remedial action sites. Figure 10 provides that information, by technology, for three major groups of contaminants: volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and metals. For this report, compounds are categorized as VOCs or SVOCs, according to the lists provided in EPA's SW-846 test methods 8240 and 8270, respectively. The *ITT Database* contains information about specific contaminants treated at each site at which an innovative technology has been or is being used.

Quantity of Soil Addressed

EPA analyzed the quantity of soil treated at 235 remedial action sites at which innovative treatment technologies have been or are being used, and for which data on the quantity of media treated were available (Figure 11). Not surprisingly, the tendency is to use in situ technologies to address larger quantities of soil, while ex situ technologies are used to treat smaller quantities. Because quantities for in situ projects cannot be accurately determined and many ex situ projects are not completed, the quantities in Figure 11 should be considered estimates.

Figure 10: Superfund Remedial Actions Applications of Innovative Treatment Technologies



**Does not include in situ groundwater bioremediation*

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Figure 11: Superfund Remedial Actions
Estimated Quantities of Soil To Be Treated By Innovative Technologies

TECHNOLOGY	TOTAL NUMBER OF SITES	SITES WITH DATA	QUANTITY (CUBIC YARDS)		
			RANGE	AVERAGE	TOTAL
Soil Vapor Extraction	135	103	70-7,100,000	176,000	18,100,000
Bioremediation (in situ soil)	24	13	5,000 - 484,000	122,000	1,580,000
In situ Flushing	18	12	5,200 - 750,000	96,000	1,150,000
Soil Washing	12	12	1,800 - 200,000	43,000	522,000
Bioremediation (ex situ)	37	34	500 - 208,000	40,000	1,350,000
Dechlorination	3	3	20,100 - 48,000	36,000	108,100
Solvent Extraction	6	6	7,000 - 85,000	31,000	184,000
Thermal Desorption	50	48	95 - 130,000	20,000	984,000
Cyanide Oxidation	1	1			3,000
Dual-Phase Extraction	2	0			
CROW™	1	1			200
Phyto-treatment	1	0			
Plasma High Temp. Recovery	1	1			65,000
In situ Vitrification	1	1			4,000
TOTAL	292	235			**24,100,000**

WHAT FOR CHANGE

Treatment Trains

Figure 12 compares the number of innovative technologies selected for both source control and in situ groundwater treatment with the number of RODs in which these technologies were selected. The graph shows that some sites use more than one innovative technology, often together in "treatment trains." Twenty-eight remedial sites use treatment trains for source control. Figure 13 identifies specific treatment trains used in remedial actions. Appendix D provides additional information on the sites that use treatment trains. Innovative treatment technologies may be used with established technologies or with other innovative technologies. The most common treatment train is soil washing followed by aboveground bioremediation (usually slurry-phase treatment). Technologies may be combined to reduce the volume of material that requires further treatment, as in the example given above; to prevent the emission of volatile contaminants during excavation and mixing; or to treat multiple contaminants in a single medium.

Soil Vapor Extraction

SVE is the most frequently selected innovative technology for treating soil. Currently 135 projects are being implemented. At some sites, several areas are being treated with SVE. Only 13 SVE remedial projects have been completed, but an additional 70 are underway. Duration varies from 1 month to 5 years or more. Most projects target chlorinated or nonchlorinated VOCs for treatment; a few target semivolatiles, such as phenols and naphthalene. Most applications are vertical wells with activated carbon used to treat off-gases. Unusual applications include horizontal wells such as at the SMS Instruments site, New York.

Thermal Desorption

This technology has been selected 51 times. Seventeen projects are completed; another 13 are operating. Thermal desorption projects take less time to implement than soil vapor extraction: from 1 to 18 months for the 13 remedial projects completed thus far. Contaminants treated are shown in Figure 14. This technology is used to treat SVOCs, such as polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs), as well as VOCs.

Bioremediation

This technology has been selected a total of 65 times, but in a number of different forms. Figure 15 illustrates the different types of bioremediation being implemented. Land treatment is the most common form of ex situ bioremediation, followed by slurry-phase treatment. Bioventing has been specified for 7 of the 25 in situ soil bioremediation remedies, although bioventing approaches may be selected at additional projects as design proceeds. Contaminants treated by bioremediation are shown in Figure 16. The contaminants treated most often by

Figure 12: Superfund Remedial Actions
Number of Innovative Treatment Technologies Versus Corresponding RODs

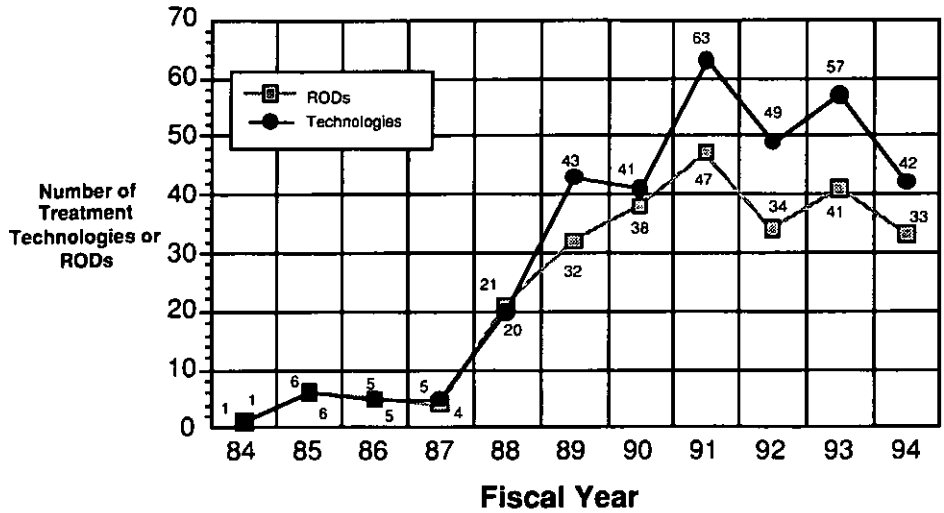

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Figure 13: Superfund Remedial Actions
Treatment Trains with Innovative Treatment Technologies

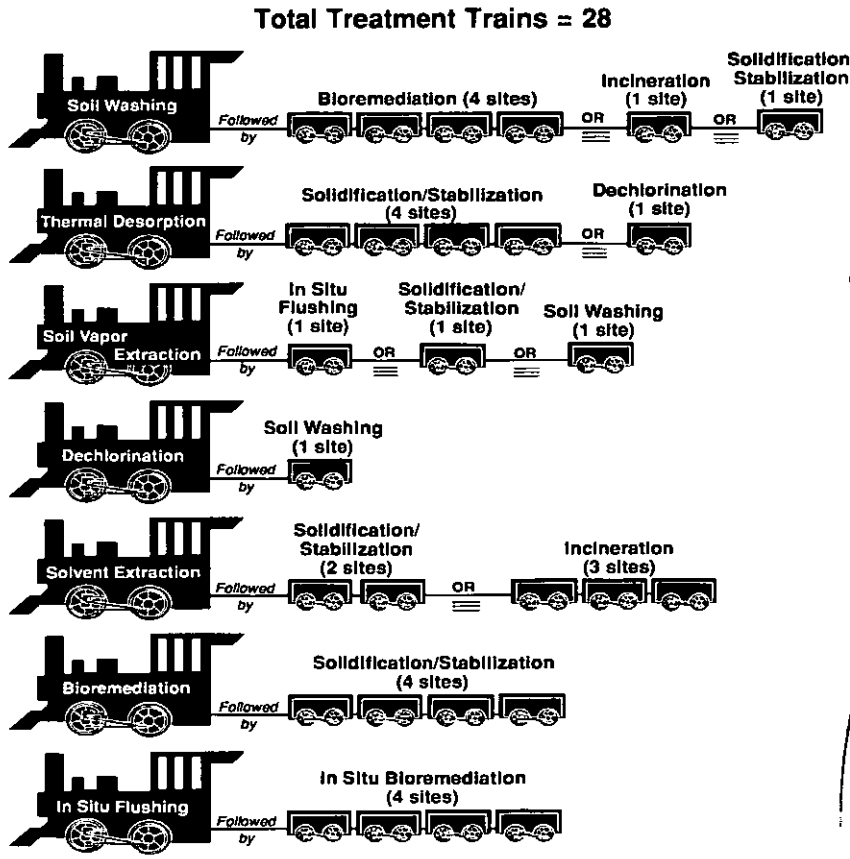

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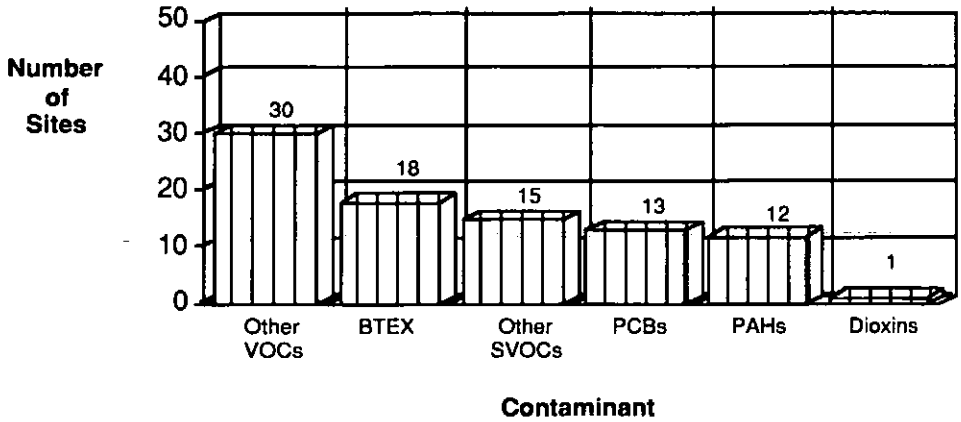
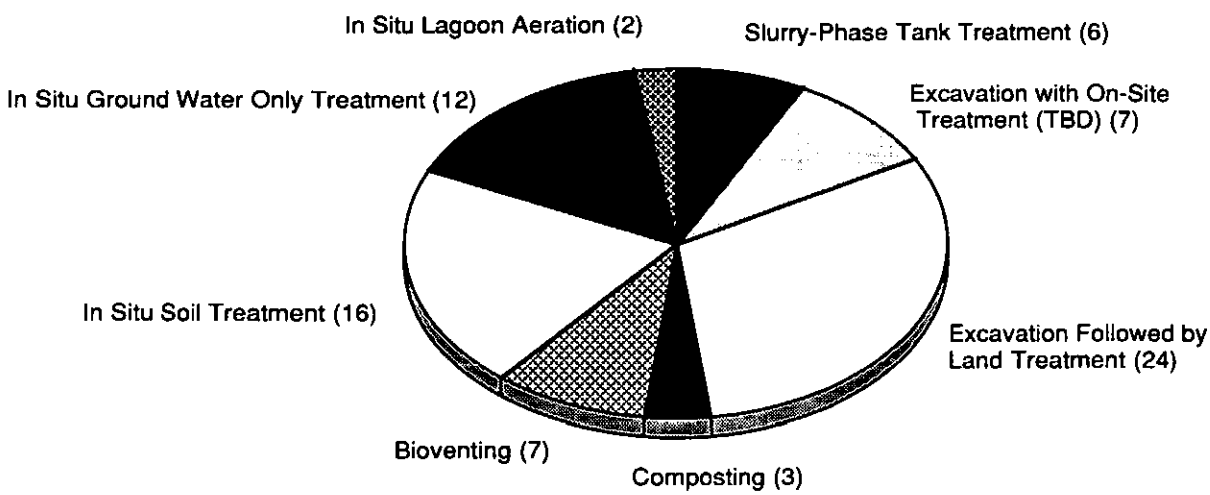
Figure 14: Superfund Remedial Actions Contaminants Treated by Thermal Desorption



Note: *At some sites, treatment is for more than one contaminant. Treatment may be planned, ongoing, or completed.*

Source: *Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995.*

Figure 15: Superfund Remedial Actions Bioremediation Methods

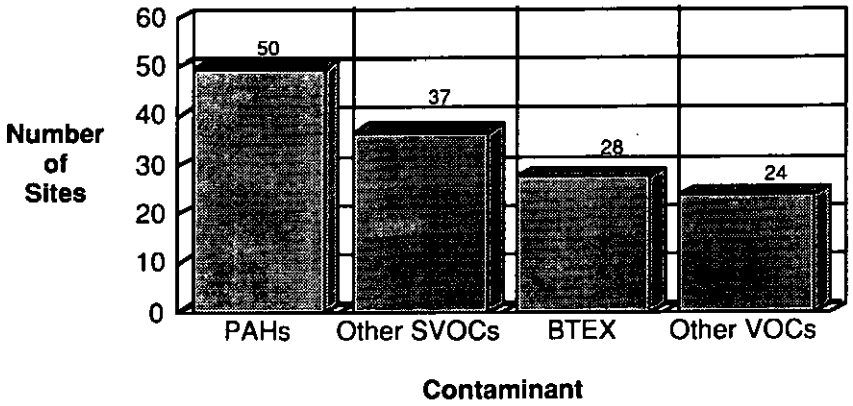


Note: *Some RODs specify multiple remedies.*

TBD: *Specific treatment method to be determined.*

Source: *Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995.*

Figure 16: Superfund Remedial Actions Contaminants Treated by Bioremediation*



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**Includes in situ groundwater innovative treatment technologies.*

Note: *At some sites, treatment is for more than one contaminant. Treatment may be planned, ongoing, or completed.*

Source: *Records of Decision (RODs) for fiscal years 1982 – 1994 and anticipated design and construction activities as of August 1995.*

bioremediation are PAHs. Benzene, toluene, ethylbenzene, and xylene (BTEX) compounds are the VOCs addressed most frequently; chlorinated VOCs are being treated at 5 sites.

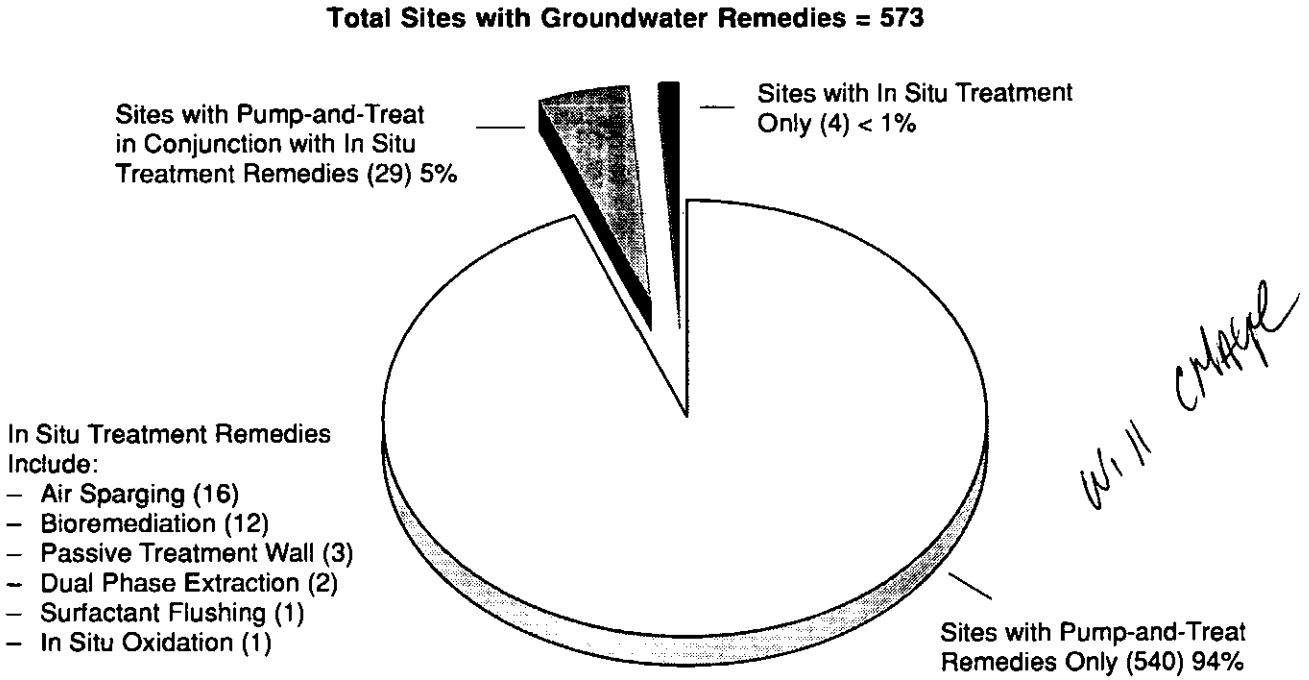
Groundwater Remediation Technologies

Groundwater treatment remedies include pump-and-treat and in situ treatment or a combination of both. Figure 17 shows each type of groundwater treatment remedy selected. Groundwater remedies have been selected for 573 sites. Of these, 540 sites are implementing pump-and-treat systems alone. In the case of another 29 sites, pump-and-treat systems are being combined with in situ treatment. Four sites have selected in situ treatment only to treat groundwater contamination.

EPA has selected in situ treatment of groundwater 35 times at 33 remedial sites. EPA selected in situ treatment of groundwater for nine remedial sites in FY 1994, including the first selection of surfactant flushing for dense NAPLs. Completion of in situ groundwater cleanup at Superfund sites is predicted to require 5 to 20 years. Figure 9 shows the overall status of in situ groundwater projects.

Appendix A gives the number of in situ groundwater treatment technologies selected each year. The summary matrix in Appendix B provides the site names, technologies, and project status.

Figure 17: Superfund Remedial Actions
Groundwater Remedies Through Fiscal Year 1994



Will change

Source: USEPA Office of Emergency and Remedial Response
Records of Decision (RODs) for fiscal years 1982 - 1994 and anticipated design and construction activities as of August 1995

SECTION 2: SUPERFUND REMOVAL ACTIONS

A removal action under Superfund is conducted in response to an immediate threat caused by a release of a hazardous substance or substances. Removal action decisions are documented in an action memorandum. To date, innovative treatment technologies have been used in relatively few removal actions. The innovative technologies addressed in this report have been used 29 times in 26 removal actions (Figure 18). In addition, infrared incineration, no longer considered innovative, was used first at two removal actions. Since removal actions are responses to an immediate threat, and often involve smaller quantities of hazardous wastes than remedial activities, the implementation of the technology may progress faster at a removal site than at a remedial site. Figure 18 indicates that 90 percent of removal projects that involve innovative treatment technologies have been completed.

Many removal actions involve small quantities of waste or immediate threats that require quick action to alleviate the hazard. Often, such activities do not lend themselves to on-site treatment. In addition, SARA does not establish the same preference for innovative treatment for removal it sets forth for remedial actions. However, EPA expects that innovative treatment technologies will be used more often in the future for larger and less time-critical removal actions.

The *ITT Database* provides more detailed information for each application of an innovative technology at a removal site. The summary matrix in Appendix B lists each removal site and innovative technology.

Figure 18: Superfund Removal Actions
Project Status of Innovative Treatment Technologies as of August 1995

Technology	Predesign/ In Design	Design Complete/Being Installed/Operational	Project Completed	Total
Source Control				
Soil Vapor Extraction	0	0	4	4
Thermal Desorption	0	1	1	2
Bioremediation (Ex Situ)	0	1	4	5
Bioremediation (In Situ)	0	0	3	3
Soil Washing	0	0	2	2
In Situ Flushing	0	0	0	0
Dechlorination	0	0	2	2
Solvent Extraction	0	0	2	2
In Situ Vitrification	0	0	1	1
Chemical Treatment	0	0	6	6
TOTAL	**0 (0%)**	**2 (7%)**	**25 (93%)**	**27**
Groundwater Technologies				
Air Sparging	0	0	1	1
Bioremediation (In Situ)	0	1	0	1
TOTAL	**0**	**1 (50%)**	**1 (50%)**	**2**

Note: Data derived from a survey of EPA Superfund Removal Branch Chiefs and On-Scene Coordinators for each Region.

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SECTION 3: ACTIONS UNDER OTHER FEDERAL PROGRAMS

This chapter contains available information on projects conducted under federal programs other than the Superfund program. Many of those projects are conducted at DoD and DOE facilities. The sites were identified through various sources of information, including discussions with DoD and DOE personnel. The RCRA corrective action sites using an innovative technology were identified through the review of 50 SBs, which are decision documents prepared for some actions at corrective action sites. Because innovative technologies have likely been used at RCRA sites, but not documented in SBs, the list in this report should not be considered complete. Figure 19 summarizes the types of innovative treatment technologies and the number of projects, and indicates the status of each. The summary matrix in Appendix B lists the name of each site, the technology selected, and the status of the project. The *ITT Database* provides more information on each application.

Figure 19: Sample of Projects Under Other Federal and RCRA Corrective Action Programs Status of Innovative Treatment Technologies as of August 1995

Technology	Predesign/ In Design	Design Complete/Being Installed/Operational	Project Completed	Total
Other Federal Programs				
Soil Vapor Extraction	2	8	1	11
Bioremediation (Ex Situ)	0	1	4	5
Bioremediation (In Situ) #	0	5	3	8
Soil Washing	0	1	1	2
Dechlorination	0	1	0	1
Air Sparging	0	1	0	1
TOTAL	**2 (7%)**	**17 (61%)**	**9 (32%)**	**28**
RCRA Corrective Action				
Soil Vapor Extraction	3	4	0	7
Thermal Desorption	1	0	0	1
TOTAL	**4 (50%)**	**4 (50%)**	**0 (0%)**	**8**

Note: Data derived from a survey of EPA RCRA Corrective Action, DoD, and DOE points of contact for each site.

 # Includes in situ groundwater treatment.

Appendix A

Treatment Technologies by Fiscal Year

Treatment Technologies by Fiscal Year

Innovative Technologies — Fiscal Year

Source Control Technologies	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Totals
Bioremediation (Ex Situ)	0	0	1	0	1	0	4	7	4	4	8	6	5	40
Bioremediation (In Situ)	0	0	0	0	0	1	2	0	3	3	4	7	5	25
Cyanide Oxidation	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Dechlorination	0	0	0	1	0	0	0	0	1	2	0	0	0	4
In Situ Flushing	0	0	0	1	1	0	1	3	1	3	4	2	3	19
In Situ Vitrification	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Soil Washing	0	0	0	0	0	0	2	2	6	1	1	0	0	12
Solvent Extraction	0	0	0	0	0	0	0	3	0	1	0	1	1	6
Thermal Desorption	0	0	0	1	1	3	4	2	8	10	5	10	7	51
Soil Vapor Extraction	0	0	0	2	2	1	7	22	17	33	18	22	11	135
Phyto-treatment	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Plasma High Temperature Metals Recovery	0	0	0	0	0	0	0	0	0	0	1	0	0	1
CROW	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Totals	**0**	**0**	**1**	**5**	**5**	**5**	**20**	**39**	**40**	**59**	**42**	**48**	**33**	**297**

Groundwater Technologies	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Totals
Air Sparging	0	0	0	0	0	0	0	1	1	3	3	5	3	16
Bioremediation (In Situ)	0	0	0	1	0	0	0	3	0	1	2	2	3	12
Passive Treatment Wall	0	0	0	0	0	0	0	0	0	0	2	0	1	3
Dual Phase Extraction	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Surfactant Flushing	0	0	0	0	0	0	0	0	0	0	0	0	1	1
In Situ Oxidation	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Totals	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**4**	**1**	**4**	**7**	**9**	**9**	**35**

Established Technologies — Fiscal Year

Source Control Technologies	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Totals
Off Site Incineration	0	0	3	4	5	3	12	14	17	26	7	11	5	107
On Site Incineration	0	0	0	4	6	8	17	13	14	4	3	5	4	78
Solidification/Stabilization	1	0	1	3	8	14	21	22	24	36	37	24	13	202
Other	0	0	0	1	0	1	2	2	1	0	4	1	1	13
Totals	**1**	**0**	**4**	**12**	**17**	**26**	**52**	**51**	**56**	**66**	**51**	**41**	**23**	**400**

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NO

Appendix B

Innovative Technology Summary Matrix

Innovative Technology Summary Matrix

Region 1

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Kellogg-Deering Well Field	CT	D/I	Remedial									●									
Linemaster Switch Corporation	CT	D	Remedial									●						●			
Cannon Engineering/Bridgewater	MA	C	Remedial												●						
Groveland Wells	MA	O	Remedial									●									
Hocomonco Pond, ESD	MA	D/I	Remedial														●				
Iron Horse Park	MA	O	Remedial	●																	
Norwood PCBs	MA	D/I	Remedial											●							
Re-Solve	MA	C	Remedial												●						
Silresim	MA	PD	Remedial									●									
Wells G&H, OU 1	MA	D/I	Remedial									●									
McKin	ME	C	Remedial												●						
O'Connor	ME	D	Remedial											●							
Union Chemical Co., OU 1	ME	I	Remedial									●									
Mottolo Pig Farm	NH	O	Remedial									●									
Ottati & Goss	NH	C	Remedial												●						
Pease Air Force Base (Site 8)	NH	I	Remedial									●									
Somersworth Sanitary Landfill Site	NH	PD	Remedial																	●	
South Municipal Water Supply Well	NH	O	Remedial									●									
South Municipal Water Supply Well	NH	I	Remedial													●					
Tibbetts Road	NH	PD	Remedial									●									
Tinkham Garage, OU 1	NH	O	Remedial									●									
Peterson/Puritan Inc., OU 1	RI	D	Remedial									●							●		
Picillo Farm Site	RI	PD	Remedial									●									
Stamina Mills	RI	D	Remedial									●									
IBM Corporation	VT	O	RCRA									●									

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete
Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

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Innovative Technology Summary Matrix

Region 2

Site Name	State	Status	Action	Source Control															Groundwater Remedies			
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
A O Polymer, Soil treatment phase	NJ	O	Remedial										●									
Dayco Corp./L.E. Carpenter Co.	NJ	PD	Remedial		●																	
FAA Technical Center	NJ	I	Remedial										●									
FAA Technical Center	NJ	O	Remedial														●					
Garden State Cleaners	NJ	C	Remedial										●									
Industrial Latex, OU 1	NJ	D/I	Remedial													●						
King of Prussia	NJ	C	Remedial											●								
Lipari Landfill Marsh Sediment	NJ	O	Remedial													●						
Lipari Landfill OU 2	NJ	O	Remedial						●													
Metaltec/Aerosystems, OU 1 -Soil Tmnt	NJ	C	Remedial													●						
Myers Property	NJ	D	Remedial					●						●								
Naval Air Engineering Center, OU 23	NJ	I	Remedial										●									
Reich Farms	NJ	C	Remedial													●						
South Jersey Clothing	NJ	D	Remedial										●									
Swope Oil & Chem Co., OU 2	NJ	D	Remedial										●									
Universal Oil Products	NJ	PD	Remedial													●						
Vineland Chemical	NJ	C	Removal			●																
Vineland Chemical, OU 1 and OU 2	NJ	D	Remedial						●					●								
Waldick Aerospace Devices, OU 1	NJ	C	Remedial													●						
Zschiegner Refining Company	NJ	C	Removal			●																
American Thermostat (Phase 1)	NY	C	Remedial													●						
American Thermostat (Phase 2)	NY	D/I	Remedial													●						
Applied Environmental Services(Ground water)	NY	O	Remedial														●					
Applied Environmental Services, OU 1	NY	O	Remedial		●								●					●				
Byron Barrel & Drum	NY	PD	Remedial						●													
Circuitron Corporation, OU 1	NY	D/I	Remedial										●									
Claremont Polychemical - Soil Remedy	NY	D/I	Remedial													●						
Fulton Terminals, Soil Treatment	NY	I	Remedial													●						

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete

Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

Innovative Technology Summary Matrix

Region 2 (Continued)

Site Name	State	Status	Action	Source Control													Groundwater Remedies					
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
GCL Tie and Treating	NY	PD	Remedial													●						
General Motors/Central Foundry Div. OU 1 & 2	NY	D	Remedial													●						
Genzale Plating Company, OU 1	NY	O	Remedial										●									
Hooker Chemical/Ruco Polymer Site, OU 1	NY	PD	Remedial						●													
Mattiace Petrochemicals Company, OU 4	NY	PD	Remedial										●									
Pasley Solvents and Chemicals, Inc.	NY	D	Remedial										●				●					
Reynolds Metals Company Study Area Site, (RMC)	NY	D	Remedial													●						
Sarney Farm	NY	D/I	Remedial													●						
Signo Trading/Mt. Vernon	NY	C	Removal					●														
SMS Instruments (Deer Park)	NY	C	Remedial										●									
Solvent Savers	NY	PD	Remedial													●						
Vestal Water Supply 1-1	NY	D/I	Remedial										●									
Wide Beach Development	NY	C	Remedial					●														
GE Wiring Devices	PR	D	Remedial											●								
Janssen Inc.	PR	O	Remedial										●									
Upjohn Manufacturing Co.	PR	C	Remedial										●									

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete

Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

Innovative Technology Summary Matrix

Region 3

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Delaware Sand and Gravel	DE	D	Remedial		●							●									
Brodhead Creek, OU 1	PA	I	Remedial				●														
Brown's Battery Breaking Site, OU 2	PA	PD	Remedial								●									●	
Cryochem, OU 3	PA	PD	Remedial									●									
Lord-Shope Landfill	PA	D/I	Remedial									●									
Raymark	PA	O	Remedial									●									
Revere Chemical Site, OU1	PA	PD	Remedial									●									
Saegertown Industrial Area Site	PA	PD	Remedial									●				●					
Tonolli Corporation	PA	PD	Remedial																	●	
Tyson's Dump	PA	O	Remedial									●									
U.S.A. Letterkenny SE Area, OU1	PA	C	Remedial												●						
Uniform Tubes, Inc.	PA	D	RCRA									●									
Whitmoyer Laboratories, OU 3	PA	D	Remedial	●																	
William Dick Lagoons, OU 3	PA	PD	Remedial												●						
Arrowhead Associates/Scovill, OU 1	VA	D	Remedial									●									
Avtex Fibers	VA	C	Removal			●															
Defense General Supply Center, OU 5	VA	C	Remedial									●									
General Motors Corporation	VA	PD	RCRA									●									
IBM (Manassas)	VA	O	RCRA									●									
Langley AFB, IRP Site 28	VA	I	DoD									●									
Rentokil	VA	D	Remedial												●						
Saunders Supply Co, OU 1	VA	D	Remedial					●							●						
Ordnance Works Disposal Areas	WV	D	Remedial	●																	

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Innovative Technology Summary Matrix

Region 4

Site Name	State	Status	Action	Source Control															Groundwater Remedies			
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Ciba-Geigy (MacIntosh Plant) OU 2	AL	PD	Remedial						●							●						
Ciba-Geigy (MacIntosh Plant) OU 4	AL	PD	Remedial						●							●						
Airco Plating Company, OU 10	FL	I	Remedial										●									
American Creosote Works, OU 2	FL	D	Remedial																			●
American Creosote Works, OU 2	FL	PD	Remedial															●				
Brown Wood Preserving	FL	C	Remedial	●																		
Cabot Carbon/Koppers	FL	D	Remedial	●	●									●								
Dubose Oil Products	FL	C	Remedial	●																		
Hollingsworth Solderless	FL	C	Remedial										●									
Jacksonville NAS, OU 2	FL	C	Remedial													●						
Naval Air Station, Cecil Field Site 17, OU 2	FL	O	Remedial													●						
Naval Air Station, Cecil Field Site 5, OU 2	FL	D/I	Remedial	●																		
Peak Oil/Bay Drums, OU 1	FL	PD	Remedial		●				●													
Whitehouse Waste Oil Pits (amended ROD)	FL	PD	Remedial	●										●								
Basket Creek Surface Impoundment	GA	C	Removal										●									
General Refining	GA	C	Removal												●							
Marzone Inc./Chevron Co. Superfund Site, OU 1	GA	D	Remedial													●						
Mathis Brothers - South Marble Top Road Landfill	GA	I	Remedial	●																		
Robins AFB, Landfill and Sludge Lagoon, OU 1	GA	D	Remedial										●									
Smith's Farm Brooks, OU 1	KY	C	Remedial					●								●						
Southeastern Wood Preserving	MS	C	Removal	●										●								
ABC One Hour Cleaners Site	NC	D	Remedial										●									
Aberdeen Pesticide Dumps, OU 1 and OU 4	NC	D	Remedial													●						
Benfield Industries	NC	D	Remedial	●																		
Cape Fear Wood Preserving	NC	D/I	Remedial	●										●								
Carolina Transformer	NC	D	Remedial												●							
Charles Macon Lagoon, Lagoon #7, OU 1	NC	D/I	Remedial										●									
FCX-Washington Site	NC	O	Removal													●						

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Innovative Technology Summary Matrix

Region 4 (Continued)

Site Name	State	Status	Action	Source Control															Groundwater Remedies			
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
JADCO-Hughes	NC	D/I	Remedial						●				●									
JFD Electronics/Channel Master	NC	D	Remedial			●			●													
Potter's Septic Tank Service Pits	NC	O	Remedial													●						
USMC Camp Lejeune Military Base, OU 2	NC	O	Remedial										●									
CSX McCormick Derailment Site	SC	O	Removal															●				
CSX McCormick Derailment Site	SC	C	Removal										●									
Hinson Chemical	SC	C	Removal										●									
Medley Farm, OU 1	SC	O	Remedial										●									
Para-Chem Southern, Inc.	SC	D	Remedial	●																		
Rochester Property	SC	O	Remedial														●					
Sangamo/Twelve-Mile/Hartwell PCB, OU 1	SC	D/I	Remedial													●						
Savannah River DOE, M Area Settling Basin	SC	O	DOE		●								●				●					
SCRDI Bluff Road	SC	O	Remedial										●									
Wamchem	SC	C	Remedial													●						
Arlington Blending & Packaging Co., OU 1	TN	I	Remedial													●						
Carrier Air Conditioning	TN	O	Remedial										●									

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Innovative Technology Summary Matrix

Region 5

Site Name	State	Status	Action	Source Control														Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Acme Solvent Reclaiming, Inc., OU 3	IL	I	Remedial												●						
Acme Solvent Reclaiming, Inc., OU 6	IL	I	Remedial									●									
Galesburg/Koppers	IL	D	Remedial	●																	
Outboard Marine/Waukegan Harbor, OU 3	IL	C	Remedial												●						
American Chemical Services	IN	PD	Remedial									●			●						
Conrail Rail Yard, OU 2	IN	PD	Remedial									●				●					
Enviro. Conservation and Chemical (amended ROD)	IN	D	Remedial									●									
Fisher Calo Chem	IN	D	Remedial									●									
Indiana Wood Treating	IN	C	Removal	●																	
Main Street Well Field	IN	O	Remedial									●									
MIDCO I	IN	PD	Remedial									●									
MIDCO II	IN	PD	Remedial									●									
Ninth Avenue Dump	IN	C	Remedial						●												
Reilly Tar and Chemical	IN	D/I	Remedial												●						
Seymour Recycling	IN	C	Remedial		●																
Seymour Recycling	IN	O	Remedial									●									
Wayne Reclamation and Recycling	IN	O	Remedial									●				●					
Anderson Development (ROD Amendment)	MI	C	Remedial												●						
Chem Central	MI	D/I	Remedial									●									
Clare Water Supply	MI	D	Remedial												●						
Duell-Gardner Landfill	MI	PD	Remedial												●						
Electro-Voice, OU 1	MI	D	Remedial									●				●					
Kysor Industrial Corp.	MI	D/I	Remedial									●									
Ott/Story/Cordova Chemical	MI	I	Remedial												●						
Parsons Chemical (ETM Enterprise)	MI	C	Removal						●												
PBM Enterprises (Van Dusen Airport Service)	MI	C	Removal			●															
Peerless Plating	MI	D	Remedial									●									
Rasmussen Dump	MI	D/I	Remedial						●												

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Innovative Technology Summary Matrix

Region 5 (Continued)

Site Name	State	Status	Action	Source Control																Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Saginaw Bay Confined Disposal Facility	MI	C	DoD										●									
Springfield Township Dump	MI	D	Remedial									●										
Sturgis Municipal Well Field	MI	D	Remedial									●										
ThermoChem, Inc., OU 1	MI	D	Remedial									●										
Verona Well Field (Thomas Solvent/Raymond Road)	MI	C	Remedial									●										
Verona Well Field, OU 2 (Paint shop area)	MI	O	Remedial									●										
Verona Well Field, OU 2 (Annex area)	MI	O	Remedial									●										
Arrowhead Refinery Co.	MN	O	Remedial											●								
Burlington Northern Railroad Tie Treating Plant	MN	C	Remedial	●																		
Joslyn Manufacturing and Supply Co.	MN	O	Remedial	●																		
Koppers Coke Site, Groundwater OU	MN	D	Remedial														●					
Long Prairie Groundwater Contamination	MN	D	Remedial									●										
Ritari Post and Pole, OU 1	MN	D	Remedial	●																		
South Andover Salvage Yards, OU 2	MN	C	Remedial												●							
Twin Cities Army Ammunition Plant	MN	O	DoD										●									
Allied Chem & Ironton Coke, OU 2	OH	D/I	Remedial	●	●																	
Allied Chem & Ironton Coke, OU 2[a]	OH	D/I	Remedial	●																		
Miami County Incinerator	OH	D	Remedial									●										
Ormet Corporation	OH	PD	Remedial						●													
Pristine (ROD Amendment)	OH	C	Remedial												●							
Pristine (ROD Amendment)	OH	I	Remedial									●										
Skinner Landfill, OU 2	OH	D	Remedial									●										
Van Dale Junkyard Site	OH	PD	Remedial		●																	
Zanesville Well Field	OH	D	Remedial									●	●									
City Disposal Corporation Landfill	WI	O	Remedial									●										
Hagen Farm Site, Ground Water Control OU	WI	PD	Remedial														●					
Hagen Farm Source Control OU	WI	O	Remedial									●										
Moss-American	WI	PD	Remedial	●									●									

[a] Allied Chem & Ironton Coke, OU2 is conducting two types of bioremediation ex situ: land farming and magnetically enhanced land farming

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Innovative Technology Summary Matrix

Region 5 (Continued)

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Muskego Sanitary Landfill, Interim Action, OU 1	WI	I	Remedial										●									
Onalaska Municipal Landfill	WI	O	Remedial		●																	
Wausau Groundwater Contamination	WI	O	Remedial										●									

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Innovative Technology Summary Matrix

Region 6

Site Name	State	Status	Action	Source Control															Groundwater Remedies			
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Arkwood	AR	D	Remedial											●								
MacMillan Ring Free Oil Company	AR	O	Removal	●																		
Popile	AR	D/I	Remedial	●														●				
American Creosote Works, Inc.(Winnfield Plant)	LA	D/I	Remedial		●																	
Old Inger Oil Refinery	LA	I	Remedial	●																		
Pab Oil & Chemical Services	LA	D	Remedial	●																		
Atchison, Topeka, & Santa FeClovis/Santa Fe L	NM	O	Remedial		●																	
Holloman AFB, BX Service Station	NM	I	DoD										●									
Holloman AFB, Main POL Area	NM	O	DoD										●									
Prewitt Abandoned Refinery	NM	D	Remedial	●																		
Prewitt Abandoned Refinery	NM	D/I	Remedial										●				●					
Oklahoma Refining Co.	OK	D	Remedial	●	●																	
Traband Warehouse	OK	C	Removal												●							
Baldwin Waste Oil	TX	C	Removal		●																	
French Limited	TX	C	Remedial		●																	
Kelly AFB, Site 1100	TX	O	DoD		●								●									
Matagorda Island AF Range	TX	C	DoD	●																		
North Cavalcade Street	TX	D/I	Remedial	●																		
Petro-Chemical Systems, Inc., OU 2	TX	D	Remedial										●				●					
Sheridan Disposal Services	TX	PD	Remedial	●																		
South Cavalcade Street	TX	PD	Remedial						●					●								
United Creosoting	TX	D	Remedial												●							

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Innovative Technology Summary Matrix

Region 7

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Chemplex, OU 2	IA	D	Remedial										●									
McGraw Edison	IA	D	Remedial										●									
People's Natural Gas	IA	D/I	Remedial		●																	
Vogel Paint & Wax	IA	O	Remedial	●																		
Coleman Operable Unit, 29th and Mead	KS	PD	Remedial										●									
Pester Refinery Co.	KS	D	Remedial		●																	
Pester Refinery Co.	KS	PD	Remedial						●													
Strother Field Industrial Park	KS	PD	Remedial										●									
Crown Plating	MO	C	Removal					●														
Lee Chemical	MO	O	Remedial						●													
Scott Lumber	MO	C	Removal	●																		
Valley Park TCE Site,Wainwright OU	MO	PD	Remedial										●			●	●					
Hastings GW Contamination (Colorado Ave)	NE	D/I	Remedial										●									
Hastings GW Contamination (Far-Mar Co.)	NE	D/I	Remedial										●									
Hastings GW Contamination (Well No. 3)	NE	C	Remedial										●									
Lindsay Manufacturing	NE	O	Remedial										●									
Sherwood Medical	NE	PD	Remedial													●						
Waverly Groundwater Contamination	NE	O	Remedial										●									

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Innovative Technology Summary Matrix

Region 8

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Broderick Wood Products, OU 2	CO	D/I	Remedial		●																
Broderick Wood Products, OU 2	CO	O	Remedial	●																	
Chemical Sales Company, OU 1	CO	D	Remedial									●				●					
Fort Carson	CO	O	DoD		●							●									
Lockheed/Martin (Denver Aerospace)	CO	D	Remedial									●			●						
Martin Marietta Corp., W C Astronautics Facility	CO	PD	RCRA												●						
Martin Marietta Corp., W C Astronautics Facility	CO	D	RCRA									●									
Rocky Flats, OU 2, Interim Remedial Action Plan	CO	I	Remedial									●									
Rocky Mountain Arsenal, OU 18, Interim Response	CO	C	Remedial									●									
Sand Creek Industrial OU 1	CO	C	Remedial									●									
Sand Creek Industrial, OU 4	CO	PD	Remedial									●						●			
Sand Creek Industrial, OU 5	CO	C	Remedial												●						
Burlington Northern (Somers Plant)	MT	O	Remedial	●													●				
Former Glasgow AFB	MT	O	DoD	●																	
Idaho Pole Company	MT	D	Remedial		●				●												
Idaho Pole Company	MT	I	Remedial	●																	
Libby Ground Water Contamination	MT	O	Remedial	●													●				
Montana Pole and Treating Plant	MT	D	Remedial	●	●				●												
Montana Pole and Treating Plant (Ground water)	MT	D	Remedial														●				
Old Works/ East Anaconda Development Area Site	MT	D	Remedial								●										
Hill Air Force Base, OU 4	UT	PD	Remedial									●									
Utah Power and Light/American Barrel	UT	PD	Remedial									●									
Wasatch Chemical	UT	O	Remedial							●											
Wasatch Chemical	UT	C	Remedial	●																	
Mystery Bridge Road/Highway 20, OU 2	WY	C	Removal									●				●					

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Innovative Technology Summary Matrix

Region 9

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Aua Fuel Farm, Aua Village, American Samoa		O	DoD		●																	
Davis Monthan AFB	AZ	D	DoD										●									
Davis Monthan AFB	AZ	C	DoD		●																	
Davis Monthan AFB, Site 35	AZ	C	DoD		●																	
Davis Monthan AFB, Site 35	AZ	O	DoD										●									
Gila River Indian Reservation	AZ	C	Removal		●	●																
Hassayampa Landfill	AZ	D	Remedial										●									
Indian Bend Wash, North Area (Area 12)	AZ	PD	Remedial										●									
Indian Bend Wash, North Area (Area 6)	AZ	PD	Remedial										●									
Indian Bend Wash, North Area (Area 7)	AZ	O	Remedial										●									
Indian Bend Wash, North Area (Area 8)	AZ	D/I	Remedial										●									
Indian Bend Wash, South Area, RD 1 of OU 7	AZ	D/I	Remedial										●									
Luke AFB	AZ	C	DoD										●									
Luke Air Force Base, OU2	AZ	O	Remedial	●																		
Motorola 52nd Street	AZ	D	Remedial										●									
Phoenix-Goodyear Airport Area (North Facility)	AZ	O	Remedial										●									
Phoenix-Goodyear Airport Area (South Facility)	AZ	O	Remedial										●									
Stanford Pesticide #1	AZ	C	Removal			●																
Williams AFB, OU 2	AZ	PD	Remedial		●																	
Williams AFB, OU 2	AZ	I	Remedial										●									
Fairchild Semiconductor (San Jose)	CA	C	Remedial										●									
Fort Ord Marina, Fritzche AAF Fire Drill Area	CA	C	DoD	●																		
Fort Ord, OU 4	CA	I	Remedial	●																		
Hexcel	CA	PD	Remedial		●								●				●					
IBM (San Jose)	CA	O	Remedial										●									
Intel, Mountain View (355 Middlefield Rd)	CA	I	Remedial										●									
Intersil/Siemens (Siemins)	CA	O	Remedial										●									
Intersil/Siemins (Intersil)	CA	C	Remedial										●									
J.H. Baxter	CA	D	Remedial	●																		

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Innovative Technology Summary Matrix

Region 9 (continued)

Site Name	State	Status	Action	Source Control																Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Jasco Chemical Co.	CA	D	Remedial	●																		
Koppers Company, Inc. (Oroville Plant)	CA	PD	Remedial											●								
Koppers Company, Inc. (Oroville Plant)	CA	D/I	Remedial		●																	
Lawrence Livermore National Laboratory	CA	D/I	Remedial										●									
Lorentz Barrel and Drum, OU 1	CA	D	Remedial										●									
Marine Corps., Mountain Warfare Center	CA	C	DoD	●																		
McClellan AFB, OU D	CA	O	DoD										●									
MEW- Fairchild Semiconductor (369 N. Whisman)	CA	O	Remedial										●									
MEW- Fairchild Semiconductor (401 National Ave.)	CA	I	Remedial										●									
MEW-Fairchild Semiconductor (515 N. Whisman)	CA	I	Remedial										●									
MEW-General Instrument Corp.	CA	D/I	Remedial										●									
MEW-Siemins/Sobrato	CA	I	Remedial										●									
Monolithic Memories/AMD - Arques, OU 1	CA	O	Remedial										●									
National Semiconductor Corp., OU 1 - Subunit 2	CA	O	Remedial										●									
Norton Air Force Base, CBA OU	CA	D/I	Remedial										●									
Pacific Coast Pipeline	CA	O	Remedial										●									
Purity Oil Sales, OU 2	CA	PD	Remedial										●									
Raytheon, MV (305 Ellis Street/415 Middlefield Rd.)	CA	I	Remedial										●									
Roseville Drums	CA	C	Removal		●																	
Sacramento Army Depot, Burn Pits OU	CA	C	Remedial										●									
Sacramento Army Depot, Tank 2 OU	CA	C	Remedial										●									
Seal Beach Navy Weapons Station IR Site 14	CA	O	DoD		●																	
Seal Beach Navy Weapons Station IR Site 14	CA	D	DoD										●									
Signetics (AMD 901) (TRW), Signetics OU - 811	CA	O	Remedial										●									
Solvent Service	CA	O	RCRA										●									
Southern California Edison, Visalia Pole Yard (gwou)	CA	PD	Remedial														●					
Southern California Edison, Visalia Pole Yard (scou)	CA	PD	Remedial		●																	
Spectra Physics, OU 1	CA	O	Remedial										●									

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete

Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

Innovative Technology Summary Matrix

Region 9 (continued)

Site Name	State	Status	Action	Source Control															Groundwater Remedies		
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual-Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Van Waters and Rogers	CA	O	Remedial										●									
Watkins-Johnson	CA	O	Remedial										●									
U. S. Public Works Center, Guam	GU	O	DoD					●														
Poly-Carb	NV	C	Removal	●										●								
Naval Communication Station, Scotland		C	DoD		●																	

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete

Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

Innovative Technology Summary Matrix

Region 10

Site Name	State	Status	Action	Source Control															Groundwater Remedies			
				Bioremediation (Ex situ)	Bioremediation (In situ)	Chemical Treatment	CROW	Dechlorination	In Situ Flushing	In Situ Vitrification	Phyto-treatment	Plasma High Temperature Metals Recovery	Soil Vapor Extraction	Soil Washing	Solvent Extraction	Thermal Desorption	Air Sparging	Bioremediation (In situ)	Dual Phase Extraction	In Situ Oxidation	Passive Treatment Wall	Surfactant Flushing
Eielson Air Force Base OU 1 (refueling loop)	AK	O	Remedial		●																	
Eielson Air Force Base, OU 1 (power plant)	AK	O	Remedial		●																	
Eielson Air Force Base, OU 2 (fuel area)	AK	I	Remedial		●																	
Fort Wainwright	AK	C	DoD	●																		
Idaho National Engineering Lab, Pit 9 (OU 7 - 10)	ID	D	Remedial											●								
Evanite Fiber Corporation	OR	O	RCRA									●										
Umatilla Army Depot (Lagoons), OU 3	OR	D/I	Remedial						●													
Umatilla Army Depot Activity, Soil OU	OR	O	Remedial	●																		
United Chrome Products	OR	O	Remedial						●													
Bangor Naval Submarine Base, OU 6 Site D & OU 2	WA	D	Remedial	●																		
Bonneville Power Administration, OU A	WA	O	Remedial	●																		
Commencement Bay, South Tacoma Field OU	WA	PD	Remedial									●				●						
Commencement Bay/S. Tacoma Channel/Well 12A	WA	O	Remedial									●										
Drexler - RAMCOR	WA	C	Removal												●							
Fairchild AFB, Priority 1 OUs (OU 2) FT-1	WA	O	Remedial		●											●						
Fort Lewis Military Reservation Solvent Refined	WA	PD	Remedial												●							
Fort Lewis Military Reservation, Landfill 4	WA	D	Remedial									●				●						
Harbor Island	WA	PD	Remedial												●							
Lockheed Shipyard Facility/Harbor Island, OU 3	WA	D	Remedial												●							
Naval Submarine Base, Bangor Site A, OU 1	WA	O	Remedial						●													

Status: PD = Predesign; D = Design; D/I = Designed but not installed; I = Installed or being installed; O = Operational; C = Complete
Action: Remedial = Superfund Remedial Action; Removal = Superfund Removal Action; DoD = Actions under Department of Defense; DOE = Actions under Department of Energy; RCRA = RCRA Corrective Action

Appendix C

Established Technology Summary Matrix

Established Technology Summary Matrix

Region 1

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Beacon Heights Landfill	CT	1990		●				
Baird & McGuire	MA	1986	●					
Baird & McGuire	MA	1989	●					
Cannon Engineering/Plymouth	MA	1988		●				
Charles George Land Reclamation	MA	1988			●			
New Bedford	MA	1990	●		●			
PSC Resources	MA	1992			●			
Rose Disposal Pit	MA	1988	●					
Salem Acres	MA	1993			●			
Silresim Chemical	MA	1991			●			
Sullivan's Ledge	MA	1989			●			
Sullivan's Ledge	MA	1991			●			
W.R. Grace (Acton Plant)	MA	1989		●	●			
Wells G&H	MA	1989	●					
O'Connor	ME	1989		●	●			
Pinette's Salvage Yard	ME	1989		●				
Pinette's Salvage Yard	ME	1993		●				
Union Chemical	ME	1991		●	●			
Kearsarge Metallurgical	NH	1990		●				
Ottati & Goss	NH	1987	●					
Davis Liquid Waste	RI	1987	●		●			
Davisville Naval Construction Battalion Center	RI	1993		●				

Technology Type

Established Technology Summary Matrix

Region 2

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
American Cyanamid	NJ	1993			●			
Asbestos Dump	NJ	1991			●			
Bog Creek Farm	NJ	1985	●					
Bog Creek Farm	NJ	1989	●					
Bridgeport Rental & Oil	NJ	1985	●					
Brook Industries Park (OU 1)	NJ	1994	●					
Chemical Control	NJ	1987			●			
Cosden Chemical Coatings	NJ	1992			●			
Curcio Scrap Metal	NJ	1991		●				
De Rewal Chemical	NJ	1989	●		●			
Ellis Property	NJ	1992		●				
Ewan Property	NJ	1988		●				
FAA Technical Center	NJ	1990		●				
Fried Industries	NJ	1994			●			
Lipari Landfill	NJ	1988	●					
Myers Property	NJ	1987			●			
Nascolite Corp.	NJ	1991			●			
NL Industries, Inc. (OU 1)	NJ	1994			●			
NL Industries, Inc.	NJ	1991			●			
Reich Farms	NJ	1988		●				
Roebling Steel	NJ	1990			●			
Roebling Steel	NJ	1991			●			
Sayreville Landfill	NJ	1990		●				
Swope Oil & Chemical	NJ	1985		●				
Swope Oil	NJ	1991		●				
Waldick Aerospace Devices, Inc.	NJ	1991		●	●			

Established Technology Summary Matrix

Region 2 (Continued)

Site Name	State	FY	Technology Type: On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Waldick Aerospace	NJ	1987			●			
White Chemical Corp.	NJ	1991			●			
Williams Property	NJ	1987		●				
Brewster Well Field	NY	1988		●				
Circuitron	NY	1991		●				
Claremont Polychemical	NY	1989		●				
Facet Enterprises	NY	1992			●			
FMC-Dublin Road	NY	1993			●			
Hooker Chemical-Ruco Polymer	NY	1990		●				
Love Canal	NY	1988	●		●			
Marathon Battery	NY	1986			●			
Marathon Battery	NY	1988			●			
Marathon Battery	NY	1989			●			
Mattiace Petrochemicals	NY	1990		●				
Mattiace Petrochemicals	NY	1991		●				
Preferred Plating	NY	1992			●			
Sarney Farm	NY	1990	●					
Sealand Restoration	NY	1990		●				
York Oil	NY	1988			●			

Established Technology Summary Matrix

Region 3

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Delaware Sand & Gravel	DE	1988	●					
Dover Gas Light Superfund Site	DE	1994		●				
Halby Chemical	DE	1991			●			
Wildcat Landfill	DE	1988		●				
Mid-Atlantic Wood Preservers	MD	1991			●			
Southern Maryland Wood Treating	MD	1988	●					
Alladin Plating	PA	1988			●			
Bendix Flight System	PA	1988				●		
Berks Sand Pit	PA	1988		●				
Brodhead Creek	PA	1991		●				
Bruin Lagoon	PA	1982			●			
Bruin Lagoon	PA	1986			●			
C & D Recycling	PA	1992			●			
Craig Farm	PA	1989			●			
Douglassville Disposal	PA	1988		●				
Douglassville Disposal	PA	1989	●		●			
Drake Chemical/Phase II	PA	1986		●				
Drake Chemical/Phase III	PA	1988	●					
Eastern Diversified Metals	PA	1991	●	●	●			
Hebelka Auto Salvage Yard	PA	1989			●			
Hebelka Auto Salvage Yard	PA	1991			●			
Hunterstown Road	PA	1993		●	●			
M.W. Manufacturing	PA	1989		●				
M.W. Manufacturing	PA	1990	●		●			
Paoli Rail Yard	PA	1992			●			
Saegertown Industrial	PA	1993	●					
Tonolli	PA	1992			●			
U.S.A. Letterkenny SE	PA	1991			●			
Westline	PA	1986		●				

Established Technology Summary Matrix

Region 3 (Continued)

Site Name	State	FY	Technology Type: On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Whitmoyer Laboratories (OU 2)	PA	1991	●		●			
Whitmoyer Laboratories (OU 3)	PA	1991			●			
Whitmoyer Laboratories	PA	1989		●				
Abex	VA	1992			●			
C&R Battery	VA	1990			●			
Dixie Cavern County Landfill	VA	1991		●				
First Piedmont Quarry 719	VA	1991			●			
Greenwood Chemical	VA	1990		●	●			
Rentokil Virginia Wood Preserving	VA	1993		●	●			
Rhinehart Tire Fire Dump	VA	1992			●			
Saunders Supply	VA	1991			●			
Fike Chemical	WV	1988		●	●			
Fike Chemical	WV	1992		●	●		●	
Ordnance Works Disposal	WV	1988	●					
Ordnance Works Disposal	WV	1989			●			
West Virginia Ordnance	WV	1987						●

Established Technology Summary Matrix

Region 4

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Alabama Army Ammunition Plant (OU 1)	AL	1992	●					
Alabama Army Ammunition Plant (OU 2)	AL	1994	●					
Ciba Geigy Corp.	AL	1991	●					
Ciba-Geigy (McIntosh Plant)	AL	1992			●			
Interstate Lead Co.	AL	1991			●			
Mowbray Engineering	AL	1986	●					
62nd Street Dump	FL	1990			●			
Agrico Chemical	FL	1992			●			
Anodyne	FL	1993			●			
Brown Wood Preserving	FL	1988			●			
Cabot/Koppers	FL	1990			●			
Coleman-Evans Wood Preserving (Amendment)	FL	1990			●			
Davie Landfill	FL	1985			●			
Florida Steel Corp.	FL	1994			●			
Florida Steel	FL	1992			●			
Gold Coast	FL	1987			●			
Jacksonville Naval Air Station (OU 2)	FL	1994			●			
Kassouf-Kimerling Battery	FL	1989			●			
Kassourf-Kimerling Battery Disposal	FL	1990			●			
NAS Cecil Field Site 11 (OU 6)	FL	1994		●				
Peak Oil/Bay Drum (OU 1)	FL	1993			●			
Peak Oil/Bay Drum (OU 3)	FL	1993			●			
Pepper's Steel & Alloy	FL	1986			●			
Reeves Southeastern Galvanizing (OU 1)	FL	1993			●			
Sapp Battery Salvage	FL	1986			●			
Schuylkill Metal	FL	1990			●			
Tower Chemical	FL	1987	●					

Established Technology Summary Matrix

Region 4 (Continued)

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Whitehouse Waste Oil Pits (Amendment)	FL	1992			●			
Yellow Wate Road	FL	1990			●			
Zellwood Groundwater Contamination (Amendment)	FL	1990			●			
Zellwood Groundwater	FL	1988	●					
Cedartown Industries	GA	1993			●			
General Refining	GA	1985			●			
Hercules 009 Landfill	GA	1993			●			
Marine Corps Logistics Base	GA	1992			●			
Mathis Brothers Landfill (South Marble Top Road)	GA	1993	●					
USAF Robins Air Force Base	GA	1991			●			
Howe Valley Landfill	KY	1990				●		
Maxey Flats Nuclear Disposal	KY	1991			●			
Smith's Farm Brooks	KY	1989	●		●			
Flowood	MS	1988			●			
Newsom Brothers Old Reichold	MS	1989		●				
Aberdeen Pesticide Dumps (Amendment)	NC	1991		●	●			
Aberdeen Pesticide Dumps/Fairway	NC	1989	●					
Bypass 601 Groundwater Contamination (Amendment)	NC	1993			●			
Bypass 601 Groundwater Contamination	NC	1993			●			
Cape Fear Wood Preserving	NC	1989			●			
Carolina Transformer	NC	1991			●			
Celanese	NC	1989	●		●			
Chemtronics	NC	1988			●			
JFD Electronics/Channel Masters	NC	1992			●			
Koppers (Morrisville Plant)	NC	1993		●				
Sodyeco	NC	1987		●				
Geiger/(C&M Oil) (Amendment)	SC	1993			●			

Established Technology Summary Matrix

Region 4 (Continued)

Site Name	State	FY	Technology Type: On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Geiger/C&M Oil	SC	1987	●		●			
Golden Strip Septic Tank	SC	1991			●			
Independent Nail	SC	1987			●			
Kalama Specialty	SC	1993			●	●		
Palmetto Wood Preserving	SC	1987			●			
Savannah River (USDOE) (OU 1)	SC	1992			●			
American Creosote Works	TN	1989	●					
Amnicola Dump	TN	1989			●			
Arlington Blending and Packaging Co.	TN	1991			●			
Oak Ridge (OU 3)	TN	1991			●			
Wrigley Charcoal	TN	1991		●	●			

Established Technology Summary Matrix

Region 5

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Acme Solvent Reclaiming	IL	1985	●					
Acme Solvent Reclaiming	IL	1991		●	●			
Belvidere Municipal Landfill #1	IL	1988		●				
Byron/Johnson Salvage Yard	IL	1985		●				
Cross Brothers Pail	IL	1989		●				
LaSalle Electrical Utilities	IL	1986	●					
LaSalle Electrical Utilities	IL	1988	●					
Outboard Marine/Waukegan Harbor	IL	1989		●				
Sangamo/Crab Orchard National Wildlife Refuge	IL	1990	●		●			
Savanna Army Depot	IL	1992	●		●			
Velsicol Chemical	IL	1988			●			
American Chemical Services	IN	1992		●				
Fisher Calo	IN	1990	●					
Fort Wayne Reduction	IN	1988	●					
Main Street Wellfield	IN	1991		●				
MIDCO I	IN	1989			●			
MIDCO II	IN	1989			●			
Ninth Avenue Dump	IN	1989	●					
Reilly Tar & Chemical (Indianapolis Plant)	IN	1993			●			
Wayne Waste Oil	IN	1990			●			
Wedzeb	IN	1989		●				
Auto Ion Chemicals	MI	1989			●			
Berlin & Farro Liquid Incineration	MI	1984		●				
Bofors Nobel	MI	1990	●					
Carter Industries	MI	1991		●	●			
Cliff/Dow Dump	MI	1989		●				
Electrovoice	MI	1992			●			

Established Technology Summary Matrix

Region 5 (Continued)

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Forest Waste Products	MI	1986			●			
Forest Waste Products	MI	1988	●					
H. Brown Company	MI	1992			●			
Liquid Disposal	MI	1987			●			
Metamora Landfill	MI	1986		●				
Peerless Plating	MI	1992			●			
Rose Township Dump	MI	1987	●					
Spiegelberg Landfill	MI	1986		●				
Springfield Township Dump	MI	1990	●		●			
Tar Lake	MI	1992			●			
Thermo Chem	MI	1991		●				
Arrowhead Refinery	MN	1986	●					
MacGillis and Gibbs/Bell Lumber and Pole (OU 3)	MN	1994	●		●			
MacGillis and Gibbs/Bell Lumber and Pole	MN	1993	●					
New Brighton/Arden Hills	MN	1989	●					
Ritari Post and Pole (OU 1)	MN	1994	●					
University of Minnesota	MN	1990	●					
Waite Park Wells (OUs 1,2,&3)	MN	1994			●			
Allied Chem & Ironton Coke	OH	1991	●					
Alsco Anaconda	OH	1989		●				
Big D Campground	OH	1989	●					
Fields Brook	OH	1986	●					
Laskin/Poplar Oil	OH	1984		●				
Laskin/Poplar Oil	OH	1987	●					
Laskin/Poplar Oil	OH	1989	●					
Ormet Corp.	OH	1994			●			
Pristine (Amendment)	OH	1990	●					

Established Technology Summary Matrix

Region 5 (Continued)

Site Name	State	FY	Technology Type: On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Pristine	OH	1988	●					
Summit National Liquid Disposal Service (Amendment)	OH	1991		●				
Summit National Liquid Disposal	OH	1988	●					
Mid-State Disposal Landfill	WI	1988			●			
N.W. Mauthe Site	WI	1994			●			
Northern Engraving	WI	1987			●			
Oconomowoc Electroplating	WI	1990			●			
Spickler Landfill	WI	1992			●			

Established Technology Summary Matrix

Region 6

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Arkwood	AR	1990		●				
Gurley Pit	AR	1987			●			
Industrial Waste Control	AR	1988			●			
Jacksonville Municipal Landfill	AR	1990		●	●			
Mid-South Wood	AR	1987			●			
Old Midland Products	AR	1988	●					
Rogers Road Municipal Landfill	AR	1990		●	●			
South 8th Street Landfill (OU 1)	AR	1994			●			
Vertac	AR	1990	●					
Vertac	AR	1993	●	●				
American Cresote Works (Winnfield Plant)	LA	1993	●					
Bayou Bonfouca	LA	1987	●					
Cleve Reber	LA	1987	●		●			
Gulf Coast Vacuum Services (OU 1)	LA	1992	●		●			
Pab Oil & Chemical Services	LA	1993			●			
Cal West Metals	NM	1992			●			
Cimarron Mining Corp.	NM	1991			●			
Double Eagle Refinery	OK	1992			●		●	
Fourth Street Abandoned Refinery	OK	1992			●		●	
Hardage/Criner (Amendment)	OK	1990		●				
Oklahoma Refining	OK	1992			●		●	
Sand Springs Petrochemical Complex	OK	1987		●	●			
Bailey Waste Disposal	TX	1988			●			
Bioecology Systems	TX	1984			●			
Brio Refining	TX	1988	●		●			
French Limited	TX	1988			●			

Established Technology Summary Matrix

Region 6 (Continued)

Site Name	*State*	*FY*	*Technology Type*					
			On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
MOTCO	TX	1985	●					
Pesses Chemical	TX	1989			●			
Petrochemical (Turtle-Bayou)	TX	1991		●				
S. Calvacade St.	TX	1988		●				
Sheridan Disposal Services	TX	1989			●			
Sikes Disposal Pit	TX	1986	●					
Texarkana Wood Preserving	TX	1990	●					
Triangle Chemical	TX	1985		●		●		
United Creosoting	TX	1989		●				

Established Technology Summary Matrix

Region 7

Site Name	State	FY	Technology Type: On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Fairfield Coal Gasification Plant	IA	1990		●				
IE Dupont de Nemours & Co. Inc.	IA	1991			●			
Mid-America Tanning	IA	1991			●			
Midwest Manufacturing/North Farm	IA	1988			●			
Peoples Natural Gas	IA	1991		●				
Shaw Avenue Dump	IA	1991			●			
Vogel Paint & Wax	IA	1989			●			
Arkansas City Dump	KS	1988					●	
Ellisville Area (Amendment)	MO	1991		●				
Ellisville Area/Bliss	MO	1986		●				
Ellisville Area	MO	1991		●				
Kem-Pest Laboratories	MO	1991		●				
Minker/Stout/Romaine Creek (R&S)	MO	1988		●				
Missouri Electric Works	MO	1990	●					
Shenandoah Stables	MO	1990		●	●			
Syntex	MO	1988		●				
Times Beach	MO	1988	●					
Weldon Spring Quarry/Plant/Pits (USDOE)	MO	1993			●			
Hastings Groundwater Contamination (East Industrial)	NE	1990	●		●			

Established Technology Summary Matrix

Region 8

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
Broderick Wood Products	CO	1988	●					
Broderick Wood Products	CO	1991		●				
Broderick Wood Products	CO	1992			●			
Denver Radium (OU 8)	CO	1992			●			
Martin Marietta (Denver Aerospace)	CO	1990		●	●			
Rocky Flats (USDOE) (OU 4)	CO	1992			●			
Rocky Mountain Arsenal (OU 17)	CO	1990			●			
Rocky Mountain Arsenal (OU 28)	CO	1993			●			
Rocky Mountain Arsenal (OU 29)	CO	1993		●				
Sand Creek Industrial	CO	1990		●				
Woodbury Chemical	CO	1985		●				
Woodbury Chemical	CO	1989		●				
Anaconda Co. Smelter	MT	1991			●			
Montana Pole and Treating	MT	1993		●				
Silver Bow CreekButte Area	MT	1992			●			
Hill AFB	UT	1991		●				
Ogden Defense Depot (OU 3)	UT	1992		●				
Ogden Defense Depot	UT	1990		●				
Portland Cement (Kiln Dust #2 & #3)	UT	1992			●			
Tooele Army Depot-North Area (OUs 5,6,7,10)	UT	1994		●				
Utah Power & Light/American Barrel	UT	1993		●	●			

Technology Type

Established Technology Summary Matrix

Region 9

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Apache Powder Site	AZ	1994		●	●			
Advanced Micro Devices Inc.	CA	1991		●				
FMC (Fresno Plant)	CA	1991			●			
Intel,Mountain View	CA	1989				●		
J.H. Baxter	CA	1990			●			
Koppers (Oroville Plant)	CA	1989			●			
McColl	CA	1993			●			
Purity Oil Sales	CA	1989			●			
Raytheon, Mountain View	CA	1989				●		
Rhone-Poulenc/Zoecon	CA	1992			●			
Sacramento Army Depot	CA	1993			●			
Selma Pressure Treating	CA	1988			●			
Valley Wood Preserving	CA	1991			●			
Westinghouse Electric (Sunnyvale Plant)	CA	1992		●				

Established Technology Summary Matrix

Region 10

Site Name	State	FY	On-Site Incineration	Off-Site Incineration	Solidification/Stabilization	Mechanical Soil Aeration	Neutralization	Open Detonation
			Technology Type					
Bunker Hill Mining and Metallurgical Complex	ID	1992			●			
Pacific Hide & Fur Recycling (Amendment)	ID	1992		●	●			
Pacific Hide & Fur Recycling	ID	1988			●			
U.S. DOE Idaho National Engineering Lab (OU 23)	ID	1992		●	●			
Gould	OR	1988			●			
Teledyne Wah Chang Albany (TWCA)	OR	1990			●			
Umatilla Army Depot (Lagoons) (OU 4)	OR	1994			●			
Umatilla Army Depot (Lagoons)	OR	1994			●			
Umatilla Army Depot (OU 1)	OR	1993			●			
American Crossarm & Conduit	WA	1993			●			
Commencement Bay (South Tacoma Field OU)	WA	1994		●	●			
Commencement Bay - Nearshore/Tideflats	WA	1991		●				
Commencement Bay/Nearshore/Tideflats (OU 3)	WA	1988			●			
FMC Yakima Pit	WA	1990	●					
Frontier Hard Chrome	WA	1988			●			
Hanford 1100-Area (DOE)	WA	1993		●				
Harbor Island-Lead	WA	1993		●				
Northwest Transformer - Mission Pole	WA	1991		●				
Umatilla Army Depot (Lagoons) OU 7	WA	1994						●
Western Processing Phase I	WA	1984		●				
Western Processing/Phase II	WA	1985			●			

Appendix D

Treatment Trains With Innovative Treatment Technologies

Dechlorination Followed by

Soil Washing	Myers Property	NJ

Ex Situ Bioremediation Followed by

Solidification/Stabilization	J. H. Baxter	CA
Solidification/Stabilization	Cape Fear Wood Preserving	NC
Solidification/Stabilization	Oklahoma Refining Co.	OK
Solidification/Stabilization	PAB Oil	LA

In Situ Flushing Followed by

In Situ Bioremediation	Peak Oil/Bay Drums, OU	FL
In Situ Bioremediation	Pester Burn Pond	KS
In Situ Bioremediation	Idaho Pole Company	MT
In Situ Bioremediation	Montana Pole Company	MT

Soil Vapor Extraction Followed by

In Situ Flushing	JADCO - Hughes	NC
Solidification/Stabilization	Genzale Plating Company, OU 1	NY
Soil Washing	Zanesville Well Field	OH

Soil Washing Followed by

Bioremediation	Cabot Carbon/Koppers	FL
Bioremediation	Whitehouse Waste Oil Pits	FL
Bioremediation	Cape Fear Wood Preserving	NC
Bioremediation	Moss-American	WI
Incineration	Arkwood	AR
Solidification/Stabilization	Vineland Chemical OU 1 and OU 2	NJ

Solvent Extraction Followed by

Incineration	Norwood PCBs	MA
Incineration	United Cresoting	TX
Solidification/Stabilization	O'Connor	ME
Solidification/Stabilization	Carolina Transformer	NC
Chemical Leaching and Incineration	Idaho National Engineering Laboratory, Pit 9	ID

Thermal Desorption Followed by

Dechlorination	Smith's Farm Brooks, OU 1	KY
Solidification/Stabilization	Waldick Aerospace Devices	NJ
Solidification/Stabilization	USA Letterkenny (SE Area, OU 1)	PA
Solidification/Stabilization	Acme Solvent Reclaiming, Inc., OU 2	IL
Solidification/Stabilization	Martin Marietta (Denver Aerospace)	CO

Appendix E

Summary of Status Report Updates, Changes, and Deletions

Summary of Status Report Updates, Changes, and Deletions

Each edition of this report has contained new information on the applications of innovative technologies at Superfund sites and has updated the status of existing innovative projects. The information from records of decision (ROD) that was deleted or changed in each edition (from the first edition of the report, published in January 1991, through this seventh edition) is listed below to allow tracking of specific projects from edition to edition.

Additions, *Changes*, and Deletions, From the First Edition of the Report (January 1991) to the Second Edition (September 1991)

Region	Site Name, State (ROD Date)	Technology (Listed in 1st Edition)	2nd Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
3	Leetown Pesticides, WV (03/31/86)	Bioremediation		Yes		No further action. Risk was re-evaluated and it was determined that risk was not sufficient for remedial action.	Andy Palestini 215-597-1286 Philip Rotstein 215-597-9023
3	Harvey-Knott Drum, DE (09/30/85)	In situ soil flushing		Yes		During remedial design, sampling indicated VOCs were no longer present in the soils. Heavy metals remained at the surface. An ESD was issued in December 1992. Remedy will consist of capping the site.	Kate Lose 215-597-0910
2	SMS Instruments (Deer Park), NY (09/29/89)	Thermal desorption		Yes (changed to soil vapor extraction in third edition)		ROD was misinterpreted during ROD analysis.	Miko Fayon 212-264-4706
1	Re-Solve, MA (09/24/87)	Chemical treatment			Dechlorination	Reclassified technology.	Lorenzo Thantu 617-223-5500
2	GE Wiring Services, PR (09/30/88)	Chemical extraction			Soil washing	Reclassified technology.	Caroline Kwan 212-264-0151
6	Sol Lynn/Industrial Transformers, TX (03/25/88)	Chemical treatment			Dechlorination	Reclassified technology.	John Meyer 214-655-6735
10	Northwest Transformer, WA (09/15/89)	In situ vitrification		Yes		Technology dropped because commercial availability was delayed.	Christine Psyk 206-553-6519

Note: The second edition of the report also added information about 45 innovative treatment technologies selected for remedial actions in RODs signed during fiscal year (FY) 1990 and 18 innovative treatment technologies used in removal actions.

Additions, Changes, and Deletions, From the Second Edition of the Report (September 1991) to the Third Edition (April 1992)

Region	Site Name, State (ROD Date)	Technology (Listed in 2nd Edition)	3rd Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
2	Marathon Battery, NY (09/30/88)	Thermal desorption		Yes		During design, soil gas concentration at hot spots was below state standards. Groundwater monitoring will continue.	Pam Tames 212-264-1036
2	Goose Farm, NJ (09/27/85)	In situ soil flushing		Yes		Incorrectly classified. A pump-and -treat system with reinjection of treated water is being used.	Laura Lombardo 212-264-6989
2	GE Wiring Services, PR (09/30/88)	Soil washing			Thermal desorption	Possible pre-wash of debris with surfactants	Caroline Kwan 212-264-0151
4	Coleman-Evans Wood Preserving, FL (09/26/90)	Soil washing		Yes		Problems due to the presence of furans; incineration is likely.	Tony Best 404-347-2643
5	Sangamo/Crab Orchard National Wildlife Refuge, IL (08/01/90)	In situ vitrification		Yes	Incineration	ROD specified the remedy as in situ vitrification or incineration; incineration was chosen.	Nan Gowda 312-353-9236
5	Anderson Development, MI (09/28/90)	In situ vitrification			Thermal desorption	Because of concern on the part of the community, the remedy was changed. A ROD amendment was signed on 9/30/91, and an ESD was signed on 10/2/92.	Jim Hahnenberg 312-353-4213
5	U.S. Aviex, MI (09/07/88)	In situ flushing		Yes		Cleanup levels were reached by natural attenuation.	Robert Whippo 312-886-4759
6	Atchison/Santa Fe/Clovis, NM (09/23/88)	Bioremediation (ex situ)		Yes			Ky Nichols 214-655-6783
6	Crystal Chemical, TX (09/27/90)	In situ vitrification		Yes		Remedy was reconsidered after commercial availability of the technology was delayed. Vitrification was considered for hot spots only. Revised remedy will consist of capping and off-site disposal and consolidation of soils.	Lisa Price 214-655-6735

Note: The third edition of the report also added information about 70 innovative treatment technologies selected for remedial actions under FY 1991 RODs.

Additions, Changes, and Deletions, From the Second Edition of the Report (September 1991) to the Third Edition (April 1992) (continued)

Region	Site Name, State (ROD Date)	Technology (Listed in 2nd Edition)	3rd Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
9	Solvent Service, CA (09/27/90)	Bioremediation (in situ)		Yes		ROD was misinterpreted during ROD analysis.	Kevin Graves 510-286-0435 Steve Morse (CA) 570-286-0304
9	Poly Carb, NV (Removal)	Bioremediation (ex situ)			Bioremediation (in situ)	Reclassified technology.	Bob Mandel 415-744-2290

Note: The third edition of the report also added information about 70 innovative treatment technologies selected for remedial actions under FY 1991 RODs.

Additions, Changes, and Deletions, From the Third Edition of the Report (April 1992) to the Fourth Edition (October 1992)

Region	Site Name, State (ROD Date)	Technology(Listed in 3rd Edition)	4th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
2	Lipari Landfill Marsh Sediment, NJ (07/11/88)	None	Thermal desorption			Missed during original ROD analysis.	Tom Graff 816-426-2296
2	GE Wiring Services, PR (09/30/88)	Thermal desorption			Soil washing		Caroline Kwan 212-264-0151
5	University of Minnesota, MN (06/11/90)	Thermal desorption		Yes	Incineration (in the fifth edition)	An ESD was issued in August 1991 to change remedy to thermal desorption *or* incineration. Incineration was chosen because it was the less expensive of the two.	Darrel Owens 312-886-7089
6	Sol Lynn/Industrial Dechlorination Transformers, TX (03/25/88)	Dechlorination		Yes		Discontinued because of difficulties in implementation.	John Meyer 214-655-6735
6	Koppers/Texarkana, TX (09/23/88)	Soil washing	In situ flushing			Remedy added by ROD amendment.	Ursula Lennox 214-655-6735
9	Poly Carb, NV (Removal)	Bioremediation (in situ)			Bioremediation (ex situ)	Reclassified technology.	Bob Mandel 415-744-2290
9	Teledyne Semiconductors, CA (03/22/91)	Soil vapor extraction		Yes		Mistakenly deleted from report.	Sean Hogan 415-744-2233
10	Gould Battery, OR (03/31/88)	Soil washing	Soil washing			Missed during original ROD analysis.	Chip Humphries 503-326-2678

Note: The fourth edition of the report also added information about 10 innovative treatment technologies selected for remedial action under FY 1992 RODs and 21 innovative treatment technologies implemented at non-Superfund sites.

Additions, Changes, and Deletions, From the Fourth Edition of the Report (October 1992) to the Fifth Edition (September 1993)

Region	Site Name, State (ROD Date)	Technology Listed in 4th Edition	5th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
1	Re-Solve, MA (09/24/87)	Dechlorination		Yes		Pilot study showed that dechlorination increased the volume and that the waste still required incineration. An ESD to incinerate residuals off site is in peer review.	Joe Lemay 617-573-9622
1	Pinette's Salvage Yard, ME (05/30/89)	Solvent extraction		Yes		Will incinerate off site.	Ross Gilleland 617-573-5766
2	Naval Air Warfare Center, OU 1, NJ (02/04/91)	In situ flushing		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-264-6667
2	Naval Air Warfare Center, OU 2, NJ (02/04/91)	In situ flushing		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-264-6667
2	Naval Air Warfare Center, OU 4, NJ (02/04/91)	In situ flushing		Yes		Remedy involves pump-and-treat system, with on-site discharge. Soil is not being targeted.	Jeff Gratz 212-264-6667
2	Caldwell Trucking, NJ (09/25/86)	Thermal desorption		Yes		Thermal desorption is not necessary because highly contaminated soil will be incinerated off site. Remainder of soil will be stabilized. ESD issued.	Ed Finnerty 212-264-3555
3	Tobyhanna Army Depot, PA (Non-Superfund project)	Bioremediation (in situ)		Yes		Will conduct ex situ passive volatilization.	Drew Lausch 215-597-3161 Ross Mantione (Tobyhanna) 717-894-6494

Note: The fifth edition of the report also added information about 49 innovative treatment technologies selected for remedial actions under FY 1992 RODs and 15 innovative treatment technologies used in removal actions.

Additions, Changes, and Deletions, From the Fourth Edition of the Report (October 1992) to the Fifth Edition (September 1993) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 4th Edition	5th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
4	Smith's Farm Brooks, KY (09/30/91)	Dechlorination	Thermal desorption			Will alter chemistry to achieve dechlorination during thermal desorption.	Tony DeAngelo 404-347-7791
4	American Creosote Works, FL (09/28/89)	Soil washing		Yes		Bench-scale study of soil washing showed that the concentrations of carcinogenic PAHs were not reduced adequately. Dioxins also were discovered at much higher concentrations.	Mark Fite 404-347-2643
4	American Creosote Works, FL (09/28/89)	Bioremediation (ex situ)		Yes		Bench-scale study of bioremediation (ex situ) showed that the concentrations of carcinogenic PAHs were not reduced adequately. Dioxins also were discovered at much higher concentrations.	Mark Fite 404-347-2643
4	Hollingsworth Solderless, FL (04/10/86)	None	Soil vapor extraction			Listed as soil aeration in the third edition.	John Zimmerman 404-347-2643
5	Cliffs/Dow Dump, MI (09/27/89)	Bioremediation (in situ)		Yes		Bioremediation (in situ) was a misinterpretation of the ROD. All soil will be excavated and treated by bioremediation (ex situ).	Ken Glatz 312-886-1434
6	Tenth Street Dump/Junkyard, OK (09/27/90)	Dechlorination		Yes		Remedy has been suspended because of difficulties in implementation and escalating cost; Actual cost was double the cost projected in ROD. ROD amendment to cap in place, is being issued.	Mike Overbay 214-655-8512

Note: The fifth edition of the report also added information about 49 innovative treatment technologies selected for remedial actions under FY 1992 RODs and 15 innovative treatment technologies used in removal actions.

Additions, Changes, and Deletions, From the Fourth Edition of the Report (October 1992) to the Fifth Edition (September 1993) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 4th Edition	5th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
7	Fairfield Coal & Gas, IA (09/21/90)	Bioremediation (in situ)		Yes		Pilot study showed in situ bioremediation was too costly. It appears that the present pump-and-treat system will achieve cleanup levels.	Bruce Morrison 913-551-7755
8	Sand Creek Industrial OU 5, CO (09/28/90)	Soil washing			Thermal desorption	Soil washing did not meet performance standards and was expensive. ROD amendment was issued in early September 1993.	Erna Acheson 303-294-1971
9	Koppers Company (Oroville), CA (04/04/90)	Bioremediation (ex situ)		Yes		Misinterpretation of ROD during ROD analysis.	Fred Schlauffler 415-744-2365
9	Signetics (AMD 901) TRW OU, CA (09/11/91)	None	Soil vapor extraction			Remedy added.	Joe Healy 415-744-2331 Kevin Graves (CA) 510-286-0435
9	Teledyne Semiconductors, CA (09/30/91)	None	Soil vapor extraction			Dropped by mistake from fourth edition.	Sean Hogan 415-744-2233
10	IDEL Warm Waste Pond, ID (12/05/91)	Acid extraction		Yes		Treatability study of acid extraction did not achieve good extraction rates. Did not reduce the volume of waste. Will excavate, consolidate, and cap.	Linda Meyer 206-553-6636 Nolan Jenson (DOE) 208-526-0436
10	IDEL Warm Waste Pond, ID (12/05/93)	Soil washing		Yes		Treatability study of soil washing did not achieve acceptable results. Did not reduce the volume of waste. Will excavate, consolidate, and cap.	Linda Meyer 206-553-6636 Nolan Jenson (DOE) 208-526-0436

Note: The fifth edition of the report also added information about 49 innovative treatment technologies selected for remedial actions under FY 1992 RODs and 15 innovative treatment technologies used in removal actions.

Additions, Changes, and Deletions, From the Fifth Edition of the Report (September 1993) to the Sixth Edition (September 1994)

Region	Site Name, State (ROD Date)	Technology Listed in 5th Edition	6th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
1	Union Chemical Co., OU 1, ME (12/27/90)	Thermal desorption			Soil vapor extraction	It was determined that SVE would be the more cost-effective of the two. ESD was signed April 1994.	Terry Connelly 617-573-9638 Christopher Rushton (ME DEP) 207-287-2651
1	Tibbetts Road, NH (09/29/92)	In situ soil flushing		Yes		Misinterpretation of ROD during ROD analysis. Soil was not targeted for treatment.	Darryl Luce 617-573-5767 Mike Robinette (NH) 603-271-2014
2	Ewan Property, OU2, NJ (09/29/89)	Soil washing and solvent extraction		Yes		Reevaluation of site found significantly less contaminated soil than originally had been estimated. Soil will be disposed of off site. ESD was signed July 1994.	Kim O'Connell 212-264-8127 (temporary)
2	Naval Air Engineering Center, OU 7, Interim Action, NJ (03/16/92)	In situ flushing		Yes		Misinterpretation of the ROD during ROD analysis.	Jeff Gratz 212-264-6667 Robert Wing 212-264-8670
2	Solvent Savers, NY (09/30/90)	Soil vapor extraction		Yes		Soil vapor extraction is a secondary remedy that may be used instead of thermal desorption, the primary remedy, if treatability studies show it to be effective.	Lisa Wong 212-264-9348
3	U.S. Titanium, VA (11/21/89)	In situ flushing			Neutralization with lime (ex situ)	Treatability studies indicated that the technology was not feasible. ESD is under preparation.	Vance Evans 215-597-8485 Jeff Howard (VA) 804-762-4203

Note: The sixth edition of the report also added information about 53 innovative treatment technologies selected for remedial actions in FY 1993 RODs.

Additions, Changes, and Deletions, From the Fifth Edition of the Report (September 1993) to the Sixth Edition (September 1994) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 5th Edition	6th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
3	L.A. Clarke & Sons, OU 1 (Soils), VA (03/31/88)	Bioremediation (in situ)		Yes		Facility is no longer in operation, and excavation can be done. Remedies being considered include thermal desorption.	Andy Palestini 215-597-1286
3	L.A. Clarke & Sons, OU 1 (Soils), VA (03/31/88)	In situ flushing		Yes		Facility is no longer in operation, and remedies being considered include thermal desorption.	Andy Palestini 215-597-1286
3	L.A. Clarke & Sons, Lagoon Sludge OU, VA (03/31/88)	Bioremediation (ex situ)			Reuse off site as fuel	Technology changed because of uncertainty about the ability of bioremediation to reach treatment goals. ESD was signed on 3/94.	Andy Palestini 215-597-1286
3	Henderson Road, PA (06/30/88)	Soil vapor extraction		Yes		Conducted air injection only to facilitate pump-and-treat system. Vapors were not extracted. Further investigation revealed that the vadose zone was not an area of concern.	Joe McDowell 215-597-8240
4	Cabot Carbon/Koppers (Groundwater), FL (09/27/90)	Bioremediation (in situ groundwater)		Yes		Groundwater is not being treated; only soil is being treated.	Patsy Goldberg 404-347-6265
4	Benfield Industries, NC (07/31/92)	Soil washing and bioremediation (slurry phase)			Land treatment	Land treatment was determined to be a more cost-effective technology.	Jon Bornholm 404-347-7791
4	Charles Macon Lagoon, Lagoon #10, NC (09/31/91)	Bioremediation (ex situ)		Yes		Treatability study indicated that the technology could not treat the contaminants of concern because of materials problems. Will excavate and dispose of wastes off site. ROD amendment was signed in 3/94.	Geizelle Bennett 404-347-7791 David Lown (NC) 919-733-2801

Note: The sixth edition of the report also added information about 53 innovative treatment technologies selected for remedial actions in FY 1993 RODs.

Additions, Changes, and Deletions, From the Fifth Edition of the Report (September 1993) to the Sixth Edition (September 1994) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 5th Edition	6th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
4	Palmetto Wood Preserving, SC (09/30/87)	Chemical treatment		Yes		Waste will be disposed of more cost-effectively off site.	Al Cherry (404) 342-7791
4	Arlington Blending & Packaging Co., OU1, TN (06/28/91)	Dechlorination		Yes		Another disposal method is likely to be used.	Derek Matory 404-347-7791
5	South Andover Salvage Yard, OU 2, MN (12/24/91)	Bioremediation (ex xitu)		Yes	Thermal treatment	Technology changed to off-site thermal treatment (either thermal desorption or incineration) because of reduced volume of contamination found during RD investigations. ROD amendment was signed 5/31/94.	Bruce Sypniewski 312-886-6189
5	Allied Chem & Ironton Coke, OU 2, OH (12/28/90)	Bioremediation (in situ)	Bioremediation (ex situ) (land farming)			Adding technology to treat more highly contaminated soil.	Tom Alcamo 312-886-7278
5	Allied Chem & Ironton Coke, OU 2, OH (12/28/90)	Bioremediation (in situ)	Bioremediation (ex situ) (magnetically enhanced land farming)			Adding technology to treat more highly contaminated soil.	Tom Alcamo 312-886-7278
5	United Scrap Lead/SIA, OH (09/30/88)	Soil washing		Yes		Determined to be too expensive. Other alternatives being evaluated. ROD amendment planned.	Anita Boseman 312-886-6941 Timothy Hull (OH) 513-285-6357
5	MacGillis and Gibbs Co./Bell Lumber and Pole Co., MN (12/31/92)	Soil washing and Bioremediation (ex situ) of fines		Yes	Incineration on site	Incineration was contingency remedy in ROD. State had concerns about effective means of soil washing, and cost of incineration has decreased. ESD will be signed in fall 1994.	Daryl Owens 312-886-7089

Note: The sixth edition of the report also added information about 53 innovative treatment technologies selected for remedial actions in FY 1993 RODs.

Additions, Changes, and Deletions, From the Fifth Edition of the Report (September 1993) to the Sixth Edition (September 1994) (continued)

Resgion	Site Name, State (ROD Date)	Technology Listed in 5th Edition	6th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
6	Fruitland Drum, NM (09/08/90)	Dechlorination			Incineration (off site)	Dechlorination is not being pursued because of cost considerations.	Gregory Fife 214-655-6773
6	Holloman AFB, Main POL Area, NM	Bioremediation (in situ) (groundwater)		Yes		Groundwater remediation is not planned for this area.	Ron Stirling (USACE) 402-221-7664
6	Holloman AFB, Main POL Area, NM	Air sparging		Yes		Groundwater remediation is not planned for this area.	Ron Stirling (USACE) 402-221-7664
6	South Valley, NM (09/30/88)	Soil vapor extraction		Yes		Determined there was insignificant concentration to warrant remediation. No further action.	Bert Gorrod 214-655-6779
6	Tinker AFB (Soldier Creek Bldg. 3001), OK (08/16/90)	Soil vapor extraction		Yes		Determined that SVE was not viable. No alternative has been selected.	Susan Webster 214-655-6784 Major Richard Ashworth (USAF) 405-734-3058
8	Rocky Mountain Arsenal, M-1 Basins (OU 16), CO (02/26/90)	In situ vitrification		Yes		Remedy has been canceled because of problems with the contractor. New ROD is being negotiated.	Connally Mears 303-293-1528
8	Portland Cement Co. (Kiln Dust No. 2 and No. 3) OU2, UT (03/31/92)	Chemical treatment		Yes		Technology is not considered innovative.	Mike McCeney 303-293-1526
9	Mesa Area Ground Water Contamination, AZ (09/27/91)	Soil vapor extraction		Yes		Site has been removed from National Priorities List (NPL), referred to the state	Maurice Chait 602-962-2187 Richard Oln 602-207-4176

Note: The sixth edition of the report also added information about 53 innovative treatment technologies selected for remedial actions in FY 1993 RODs.

Additions, Changes, and Deletions, From the Fifth Edition of the Report (September 1993) to the Sixth Edition (September 1994) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 5th Edition	6th Edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
9	Castle Air Force Base, OU 1, CA (09/30/91)	Bioremediation (in situ groundwater)		Yes	Pump and treat with air stripping	Bench-scale test indicated that the technology did not work. No ESD or ROD amendment is being issued.	David Roberts 415-744-1487 Brad Hicks (USAF) 209-726-4841
9	Teledyne Semiconductors, CA (03/22/91)	Soil vapor extraction		Yes		ROD was misinterpreted. SVE was intended only for Spectra Physics, the adjacent site.	Sean Hogan 415-744-2233 Carla Dube 510-286-1041
9	FMC (Fresno), CA (06/28/91)	Soil washing		Yes		Soil washing did not work because the soil contained too many fines. Thermal desorption and solidification and stabilization are being considered as possible remedies.	Tom Dunkelman 415-744-2287 Mike Pfister (CA) 209-297-3934
9	Signetics (Advanced Micro Devices 901), CA (09/11/91)	Soil vapor extraction		Yes		Site is subject to a combined ROD for Signetics, AMD 901/902 and TRW Microwave site. SVE is not being done at the TRW OU. ROD was misinterpreted.	Darrin Swartz-Larson 415-744-2233 Kevin Graves (CA) 510-286-0435
9	Sacramento Army Depot, Oxidation Lagoons OU, CA (09/30/92)	Soil washing		Yes		Technology canceled because of cost; solidification is being considered as an alternative.	Marlin Mezquita 415-744-2393 George Siller (USACE) 916-557-7418 Dan Oburn (Sacramento Army Depot) 916-388-4344
10	McChord AFB Washrack Treatment Area, AK (09/28/92)	Bioremediation (ex situ)		Yes		Additional studies showed that treatment is not needed.	Marie Jennings 206-553-1173

Note: The sixth edition of the report also added information about 53 innovative treatment technologies selected for remedial actions in FY 1993 RODs.

Additions, Changes, and Deletions, From the Sixth Edition of the Report (September 1994) to the Seventh Edition (September 1995)

Region	Site Name, State (ROD Date)	Technology Listed in 6th edition	7th edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
1	Linemaster Switch Corporation, CT (07/21/93)	Soil vapor extraction			Dual phase extraction	Groundwater also is being treated with this technology	Elise Jakabhazy 617-573-5760
2	American Thermostat, NY (06/27/90)	Thermal desorption	Thermal Desorption (phase 2)			Project is being conducted in two phases. Phase 1 has been completed and is listed as a separate project.	Christo Tsiamis 212-637-4257
2	GCL Tie and Treating, NY (Removal Action)	Composting			Thermal desorption (being implemented as a remedial action with the ROD signed 09/30/94)	Site is not amenable to composting because of the presence of long-chain PAHs and the time constraints of the removal process. A treatability study achieved over 90% reduction but little degradation of long chain carcinogenic hydrocarbons occurred.	Joe Cosentino 908-906-6983
2	General Motors Central Foundry Division (OU 1 and OU 2), NY (12/17/90) & (03/31/92)	Bioremediation (slurry phase)			Thermal desorption	Both OUs were combined under the thermal desorption remedy. ROD amended to combine both OUs under a thermal desorption remedy.	Lisa Jackson 212-637-4274
2	Pasley Solvents and Chemicals, Inc., NY (02/24/92)	Soil flushing and soil vapor extraction	Air sparging		Soil vapor extraction and air sparging	SVE, in combination with air sparging, will eliminate the need for soil flushing. ROD amendment was signed 05/22/95.	Sherrel Henry 212-637-4273

Note: The seventh edition of the report also adds information about 42 innovative treatment technologies selected for remedial actions in FY 1994 RODs and 8 innovative treatment technologies selected for 7 RCRA corrective actions.

Additions, Changes, and Deletions, From the Sixth Edition of the Report (September 1994) to the Seventh Edition (September 1995) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 6th edition	7th edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
3	Bendix, PA (09/30/88)	Soil vapor extraction		Yes		It was determined that SVE was not a viable remedy; soil was too tightly compacted. No alternative has been selected.	Jim Harper 215-597-6906
3	Brown's Battery Breaking Site, OU 2, PA (07/02/92)	Fuming gasification			Plasma high-temperature metals recovery	The name of the technology was changed to reflect more accurately the treatment process.	Richard Watman 215-597-8996
4	Helena Chemical, SC (09/08/93)	Bioremediation (ex situ) and dechlorination		Yes		Technology could not meet cleanup goal; will incinerate off site.	Bernie Hayes 404-347-7791 ext-2048
5	Carter Industries, MI (09/18/91)	Thermal desorption		Yes		Thermal desorption was too costly (~$300/yd^3). It is less expensive to dispose of the wastes at TSCA landfill (~$186/ton).	Jon Peterson 312-353-1264
5	Cliffs/Dow Dump, MI (09/27/89)	Bioremediation (ex situ)		Yes		Remedy could not reduce concentrations of benzo(a)pyrene to acceptable level. Contaminated soil was excavated and placed in a permitted landfill.	Ken Glatz 312-886-1434
5	Electro-Voice, OU 1, MI (06/23/92)	Soil vapor extraction	Air sparging			Technology actually is a combination of SVE and air sparging called the Subsurface Volatilization and Ventilation System™.	Eugenia Chow 312-353-3156

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Additions, Changes, and Deletions, From the Sixth Edition of the Report (September 1994) to the Seventh Edition (September 1995) (continued)

Region	Site Name, State (ROD Date)	Technology Listed in 6th edition	7th edition			Comments	Contacts/Phone
			Added	Deleted	Changed to		
5	Ionia City Landfill, MI (09/29/89)	Vitrification (in situ)		Yes		Remedy was canceled. Conditions at the site had changed since 1989. Project was implemented as a time critical removal action.	Michael Gifford 312-886-7257
5	Seymour Recycling, IN (09/30/87)	Bioremediation (in situ groundwater)		Yes		Bioremediation of groundwater was not actively pursued. Contamination degraded through natural attenuation.	Jeff Gore 312-886-6552
5	Verona Well Field OU 2, MI (06/28/91)	Soil vapor extraction	Soil vapor extraction			Conducting soil vapor extraction at two separate sites under this ROD: Annex area and Paint shop area. Projects are listed as separate entries in the ASR seventh edition.	Janice Bartlett 312-886-5438
5	Wayne Reclamation and Recycling, IN (03/30/90)	Soil vapor extraction	Air sparging			Air sparging was added under the existing ROD to treat groundwater.	Duane Heaton 312-886-6399
6	Koppers/Texarkana, TX (09/23/88)	Soil washing		Yes		Volume of soil was not as large as originally had been projected. The small volume did not warrant bringing a soil washing unit on site. Will excavate and dispose of soil off site.	Ursula Lennox 214-665-6743

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6	Koppers/Texarkana, TX (09/23/88)	In situ flushing		Yes		In situ flushing was never intended as a treatment at the site. Misinterpretation of the ROD during ROD analysis.	Ursula Lennox 214-665-6743
8	Chemical Sales Company (OU 1), CO (06/27/91)	Soil vapor extraction	Air sparging			Air sparging was added under the existing ROD to treat groundwater.	Armando Saenz 303-293-1532
8	Mouat Industries, MT (Removal Action)	Chemical treatment		Yes		Reducing chromium VI to chromium III not considered innovative.	Ron Bertran 406-449-5720
9	Phoenix-Goodyear Airport Area (North and South Facilities), AZ (09/26/89)	Soil vapor extraction	Soil vapor extraction			Site is divided into 2 areas: North area & South area. Each area is listed as an individual project in the seventh edition ASR.	Craig Cooper 415-744-2370 Rusty Harris-Bishop 415-744-2365 Nancy Moore (AZ) 602-207-4180
9	Fairchild Semiconductor, CA (6/30/89)	2 listings for soil vapor extraction	3 more SVE projects			Soil vapor extraction systems are being implemented at 5 different areas at the site.	Elizabeth Adams 415-744-2235
9	Indian Bend Wash, AZ (09/27/93)	Soil vapor extraction	4 distinct areas using soil vapor extraction			SVE is being conducted at four distinct areas; areas 6, 7, 8, and 12, at the site. Each site is considered as an individual project.	Emily Roth 415-744-2247
9	Intersil, CA (9/27/90)	Soil vapor extraction				Site renamed to Intersil/Siemens (Intersil)	Belinda Wei 415-744-2280

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9	Solvent Service, CA (09/27/93)	Soil vapor extraction			Soil vapor extraction under RCRA corrective action	Project was changed from a Superfund remedial action to a RCRA corrective action.	Tony Mancini 510-286-0825
10	Fairchild AFB Priority 1 OUS (OU 1) Craig Rd Landfill, WA (02/13/93)	Soil vapor extraction		Yes		Remedy was not implemented because of the following concerns: • Generation of combustible gases • Heterogeneous stratigraphy • Reluctance to put holes into the landfill, which could lead to leaching of contaminants Will cap the landfill and conduct pump-and-treat operations.	Cami Grandinetti 206-553-8696
10	Gould, Inc., OR (03/31/88)	Soil washing		Yes		Remedy was shown to be ineffective due to varying site conditions and problems with the technology.	Chip Humphries 503-326-2678
10	Naval Submarine Base, Bangor Site A, OU 1, WA (12/06/91)	Soil washing			Soil flushing (ex situ)	Will excavate and place soil in a lined pit. Soil will be sprayed with water and leachate and will be collected and treated.	Harry Craig 503-326-3250 Craig Thompson (WA) 360-407-7234 Chris Drury (Navy) 360-396-0062

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Additions, Changes, and Deletions, From the Sixth Edition of the Report (September 1994) to the Seventh Edition (September 1995) (continued)

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10	Union Pacific Railroad Sludge Pit, ID (09/10/91)	Soil flushing		Yes		Remedy was not implemented. Excavation of sludge did not indicate that contaminants were present. Amended ROD was signed 9/94. Will excavate and treat off site, in addition to a pump-and-treat operation.	Ann Williamson 206-553-2739 Clyde Cody (ID) 208-334-0556
10	Fort Lewis Military Res. Landfill 4 and Solvent Refined Coal Plant, WA (09/24/93)	Soil washing			Thermal Desorption	ROD specified soil washing or thermal desorption as the remedy. Thermal desorption was selected based on the results of a treatability study.	Bob Kievit 206-753-9014
10	Eielson Air Force Base, AK 9/29/92	Bioventing and soil vapor extraction		Soil vapor extraction		Soil vapor extraction written into ROD as a contingency.	Mary Jane Nearman 206-553-6642 Rielle Markey (AK) 907-451-2117

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