EPA 542-F-00-011
June 2000

FEDERAL REMEDIATION TECHNOLOGIES ROUNDTABLE

REMEDIATION CASE STUDIES: FACT SHEET AND ORDER FORM

INTRODUCTION

Increasing the cost-effectiveness of site remediation is a national priority. The selection and use of more cost-effective remedies requires better access to data on the performance and cost of technologies used in the field. To make data more widely available, member agencies of the Federal Remediation Technologies Roundtable (see footnote) are working jointly to publish case studies of full-scale remediation and demonstration projects. Previously, the Roundtable had published 140 case study reports and a collection of corresponding abstracts. Now, the Roundtable has published 78 additional case study reports and corresponding abstracts. These case studies are based on an important Roundtable Guide for documenting site cleanups.

CONTENTS OF CASE STUDY REPORTS

The 218 case study reports prepared by the federal agencies describe both above-ground and in situ technologies. Remediation case studies are available in 13 separate volumes (Volumes 1-4 were published in March 1995, Volumes 5-6 in July 1997, and Volumes 7-13 in September 1998) and on a CD-ROM (published June 2000; the CD-ROM contains the 78 new case studies on a variety of in situ and ex situ technologies as well as the 140 case studies previously published in hard copy):

Volume 1:	*Bioremediation*
Volume 2:	*Groundwater Treatment*
Volume 3:	*Soil Vapor Extraction*
Volume 4:	*Thermal Desorption, Soil Washing, and In Situ Vitrification*
Volume 5:	*Bioremediation and Vitrification*
Volume 6:	*Soil Vapor Extraction and Other In Situ Technologies*
Volume 7:	*Ex Situ Soil Treatment Technologies*
Volume 8:	*In Situ Soil Treatment Technologies*
Volume 9:	*Groundwater Pump and Treat*
Volume 10:	*Groundwater Pump and Treat*
Volume 11:	*Innovative Groundwater Treatment Technologies*
Volume 12:	*On-Site Incineration*
Volume 13:	*Debris and Surface Cleaning Technologies, and Other Miscellaneous Technologies*
CD-ROM:	*FRTR Cost and Performance Case Studies and Related Publications*

Exhibit 1 list the case studies contained in each volume and on the CD-ROM with the technology and type of contaminants treated. Case studies average 20 pages long and document project design, operation, performance, cost, and lessons learned. Graphics include concentration distribution, site stratigraphy, and treatment schematics.

ABSTRACTS OF REMEDIATION CASE STUDIES

Four volumes of case study abstracts have been prepared; Volume 1 covers the 37 reports published in March 1995, Volume 2 the 17 published in July 1997, Volume 3 the 86 published in September 1998, and Volume 4 the 78 published in June 2000. Each 2-page abstract summarizes information about the site and waste treated, waste source, technology, period of operation, technology vendor, technology description, contaminants and media treated, regulatory requirements, summary of performance and cost, points of contact, and the significance of the application.

GUIDE TO DOCUMENTING AND MANAGING COST AND PERFORMANCE INFORMATION FOR REMEDIATION PROJECTS

The Roundtable has prepared this Guide to better capture federal agency cleanup experience. The Guide provides recommended procedures for documenting the matrix characteristics and technology operation, performance, and cost for the following conventional and innovative cleanup technologies:

In Situ Soil Remediation

- Bioventing
- Capping
- In situ heating
- Phytoremediation
- Soil flushing
- Soil vapor extraction
- Vitrification

Ex Situ Soil Remediation

- Composting
- Incineration
- Land treatment
- Slurry-phase bioremediation
- Soil washing
- Stabilization
- Thermal desorption

Groundwater Remediation

- Air sparging
- Bioremediation
- Bioslurping
- Circulating wells (UVB)
- Cosolvents and surfactants
- Dual-phase extraction
- Dynamic underground stripping
- In situ oxidation (Fenton's reagent)
- Natural attenuation (chlorinated compounds)
- Natural attenuation (nonchlorinated hydrocarbons)
- Permeable reactive barriers
- Phytoremediation
- Pump and treat systems
- Steam flushing
- Vertical barrier walls

ORDERING INFORMATION

Ordering instructions are provided at the end of this Fact Sheet and Order Form.

ON-LINE ACCESS

The case studies and case study abstracts are available on the Internet through the Roundtable home page at *http://www.frtr.gov*. The home page provides links to individual Roundtable members' home pages, and includes a search function.

The Federal Remediation Technologies Roundtable consists of senior executives from eight agencies with an interest in site remediation technology. The Roundtable meets twice each year to coordinate the exchange of information on remediation technologies and to consider cooperative efforts. Primary members include the U.S. Departments of Defense, Energy, and Interior, and the U.S. Environmental Protection Agency. Other participants include the Nuclear Regulatory Commission, National Aeronautics and Space Administration, Tennessee Valley Authority, and the U.S. Coast Guard.

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES

Site Name, State	Technology/Contaminants
Remediation Case Studies (Volume 1): Bioremediation	
Brown Wood Preserving Superfund Site, FL	Land Treatment/PAHs
Eielson Air Force Base, AK	Bioventing/BTEX/TPH
French Ltd. Superfund Site, TX	Slurry-Phase Bioremediation/BTEX, PAHs, Chlorinated Solvents
Hill Air Force Base, Site 280, UT	Bioventing/BTEX/TPH
Hill Air Force Base, Site 914, UT	Bioventing preceded by SVE (one report covers both technologies)/BTEX/TPH
Lowry Air Force Base, CO	Bioventing/BTEX/TPH
Lowry Air Force Base, CO	Land Treatment/BTEX/TPH
Scott Lumber Company Superfund Site, MO	Land Treatment/PAHs
Umatilla Army Depot Activity, OR	Composting/TNT/RDX/HMX
Remediation Case Studies (Volume 2): Groundwater Treatment	
Amcor Precast, UT	In Situ Density-Driven Sparging/BTEX/TPH
Amoco Petroleum Pipeline, MI	GW Extraction w/GAC/BTEX/TPH
Commencement Bay, South Tacoma Channel Well 12A Superfund Site, WA	GW Extraction w/GAC/Chlorinated Solvents
Ft. Drum, Fuel Dispensing Area 1595, NY	GW Extraction w/Air Stripping and GAC/BTEX/TPH
Langley Air Force Base, IRP Site 4, VA	GW Extraction w/Air Stripping/BTEX/TPH
Lawrence Livermore National Laboratory Gasoline Spill Site, CA	In Situ Dynamic Underground Stripping/BTEX/TPH
McClellan Air Force Base, Operable Unit B/C, CA	GW Extraction w/Air Stripping/Chlorinated Solvents
McClellan Air Force Base, Operable Unit D, CA	GW Extraction w/Air Stripping/Chlorinated Solvents
Twin Cities Army Ammunition Plant, MN	GW Extraction w/Air Stripping/Chlorinated Solvents
U.S. Department of Energy Kansas City Plant, MO	GW Extraction w/Advanced Oxidation Processes/Chlorinated Solvents
U.S. Department of Energy Savannah River Site, A/M Area, SC	GW Extraction w/Air Stripping/Chlorinated Solvents
U.S. Department of Energy Savannah River Site, A/M Area, SC	In Situ Air Stripping/Chlorinated Solvents
Remediation Case Studies (Volume 3): Soil Vapor Extraction	
Commencement Bay, South Tacoma Channel Well 12A Superfund Site, WA	SVE w/Product Recovery/Chlorinated Solvents
Fairchild Semiconductor Corporation Superfund Site, CA	SVE w/GAC/Chlorinated Solvents
Hastings Groundwater Contamination Superfund Site, Well Number 3 Subsite, NE	SVE w/GAC/Chlorinated Solvents
Hill Air Force Base, Site 914, UT	SVE w/Catalytic Oxidation followed by Bioventing (one report covers both technologies)/BTEX/TPH
Luke Air Force Base, North Fire Training Area, AZ	SVE w/Thermal Oxidizer/BTEX/TPH
McClellan Air Force Base, Operable Unit D, Site S, CA	SVE w/Catalytic Oxidizer and Scrubber/Chlorinated Solvents
Rocky Mountain Arsenal Superfund Site (Motor Pool Area - Operable Unit #18), CO	SVE w/Product Recovery and GAC/Chlorinated Solvents

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Sacramento Army Depot Superfund Site, Tank 2 (Operable Unit #3), CA	SVE w/GAC/Chlorinated and Non-Chlorinated Solvents
SMS Instruments Superfund Site, NY	SVE w/Catalytic Incineration and Scrubbing/Chlorinated and Non-Chlorinated Solvents
Verona Well Field Superfund Site (Thomas Solvent Raymond Road - Operable Unit #1), MI	SVE w/Catalytic Oxidation and GAC/Chlorinated and Non-Chlorinated Solvents
Remediation Case Studies (Volume 4): Thermal Desorption, Soil Washing, and In Situ Vitrification	
Anderson Development Company Superfund Site, MI	Thermal Desorption/MBOCA, PAHs
King of Prussia Technical Corporation Superfund Site, NJ	Soil Washing/Heavy Metals
McKin Superfund Site, ME	Thermal Desorption/BTEX/TPH, PAHs
Outboard Marine Corporation Superfund Site, OH	Thermal Desorption/PCBs
Parsons Chemical/ETM Enterprises Superfund Site, MI	In Situ Vitrification/Pesticides, Heavy Metals, Dioxins
Pristine, Inc. Superfund Site, OH	Thermal Desorption/BTEX, PAHs, Pesticides, Dioxins, Chlorinated Solvents
TH Agriculture & Nutrition Company Superfund Site, GA	Thermal Desorption/Pesticides
Wide Beach Development Superfund Site, NY	Thermal Desorption w/Dehalogenation/PCBs
Remediation Case Studies (Volume 5): Bioremediation and Vitrification	
Burlington Northern Superfund Site, MN	Land Treatment/PAHs, Methylene Chloride Extractable Hydrocarbons
Dubose Oil Products Co. Superfund Site, FL	Composting/PAHs, Toluene, TCE
Southeastern Wood Preserving Superfund Site, MS	Slurry-Phase Bioremediation/Naphthalene, Benzo(a)pyrene
Umatilla Army Depot Activity, OR	Windrow Composting/TNT, RDX, HMX
U.S. Department of Energy Savannah River Site, SC	In Situ Bioremediation/TCE, PCE
U.S. Department of Energy Paducah Gaseous Diffusion Plant, KY	Lasagna™ Soil Remediation/TCE
Parsons Chemical/ETM Enterprises Superfund Site, MI	In Situ Vitrification/Pesticides, Metals, Dioxins
U.S. Department of Energy Hanford Site, WA, Oak Ridge (TN) and Others	In Situ Vitrification/Pesticides, Metals, Dioxin/Furan, PCBs
Remediation Case Studies (Volume 6): Soil Vapor Extraction and Other In Situ Technologies	
Basket Creek Surface Impoundment Site, GA	SVE/Toluene, MIBK
Sacramento Army Depot Superfund Site, Burn Pits Operable Unit, CA	SVE/TCE, PCE, DCE
Sand Creek Industrial Superfund Site, Operable Unit 1, CO	SVE/PCE, TCE
U.S. Department of Energy, Portsmouth Gaseous Diffusion Plant, OH	In Situ Enhanced Soil Mixing/TCE, TCA, DCE
U.S. Department of Energy, Savannah River Site, SC	Flameless Thermal Oxidation/TCE, PCE, TCA
U.S. Department of Energy, Savannah River Site, SC, and Hanford Site, WA	Six Phase Soil Heating/TCE, PCE
U.S. Department of Energy, Portsmouth Gaseous Diffusion Plant, OH and Other Sites	Hydraulic and Pneumatic Fracturing/VOCs, DNAPLs
U.S. Department of Energy, SEG Facilities, TN	Frozen Soil Barrier Technology/Not Applicable (not a contaminated site)
U.S. Department of Energy, Multiple Sites	Resonant Sonic Drilling/Not Applicable (not a contaminated site)

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Remediation Case Studies (Volume 7): Ex Situ Soil Treatment Technologies (Bioremediation, Solvent Extraction, Thermal Desorption)	
Bioremediation	
Bonneville Power Administration Ross Complex, Operable Unit A, WA	Land Treatment/PAHs
Fort Greely, UST Soil Pile, AK	Land Treatment/BTEX/TPH
Novartis Site, Ontario, Canada	Land Treatment/Pesticides/Herbicides
Solvent Extraction	
Sparrevohn Long Range Radar Station, AK	Solvent Extraction/PCBs
Thermal Desorption	
FCX Washington Superfund Site, NC	Thermal Desorption/Pesticides/Herbicides
Fort Lewis, Solvent Refined Coal Pilot Plant (SRCPP), WA	Thermal Desorption/PAHs
Naval Air Station Cecil Field, Site 17, OU 2, FL	Thermal Desorption/BTEX/TPH, PAHs
Port Moller Radio Relay Station, AK	Thermal Desorption/BTEX/TPH
Re-Solve, Inc. Superfund Site, MA	Thermal Desorption/PCBs
Waldick Aerospaces Devices Superfund Site, NJ	Thermal Desorption/Chlorinated Solvents, BTEX/TPH, Metals
Remediation Case Studies (Volume 8): In Situ Soil Treatment Technologies (Soil Vapor Extraction, Thermal Processes)	
Soil Vapor Extraction	
Camp LeJeune Military Reservation, Site 82, Area A, NC	SVE/Chlorinated Solvents
Davis-Monthan AFB, Site ST-35, AZ	SVE/BTEX/TPH
Defense Supply Center Richmond, OU 5, VA	SVE/Chlorinated Solvents
Fort Greely, Texas Tower Site, AK	Air Sparging, In Situ Bioremediation, and SVE/BTEX/TPH
Fort Lewis, Landfill 4, WA	SVE and Air Sparging/Chlorinated Solvents, Metals
Fort Richardson, Building 908 South, AK	SVE/BTEX/TPH
Holloman AFB, Sites 2 and 5, NM	SVE /BTEX/TPH
Intersil/Siemens Superfund Site, CA	SVE/Chlorinated Solvents
NAS North Island, Site 9, CA	Photolytic Destruction/Chlorinated Solvents
Seymour Recycling Corporation Superfund Site, IN	SVE/Chlorinated Solvents
Shaw AFB, OU 1, SC	SVE and Groundwater Containment/BTEX/TPH
Tyson's Dump Superfund Site, PA	SVE/Chlorinated Solvents
Thermal Processes	
Brodhead Creek Superfund Site, PA	Contained Recovery of Oily Waste/PAHs, Metals
Missouri Electric Works Superfund Site, MO	In Situ Thermal Desorption/PCBs
Remediation Case Studies (Volume 9): Groundwater Pump and Treat (Chlorinated Solvents)	
Des Moines TCE Superfund Site, OU 1, IA	Pump and Treat with Air Stripping/Chlorinated Solvents
Former Firestone Facility Superfund Site, CA	Pump and Treat with Air Stripping, Carbon Adsorption, and Oil/Water Separation/Chlorinated Solvents
JMT Facility RCRA Site (formerly Black & Decker RCRA Site), NY	Pump and Treat with Air Stripping/Chlorinated Solvents

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Keefe Environmental Services Superfund Site, NH	Pump and Treat with Air Stripping and Coagulation/Flocculation/Chlorinated Solvents
Lawrence Livermore National Laboratory (LLNL) Site 300 - General Services Area (GSA) Operable Unit, CA	Pump and Treat with Air Stripping and Carbon Adsorption; SVE/Chlorinated Solvents
Mystery Bridge at Hwy 20 Superfund Site, Dow/DSI Facility - Volatile Halogenated Organic (VHO) Plume, WY	Pump and Treat with Air Stripping; SVE/Chlorinated Solvents
Offutt AFB, Site LF-12, NE	Pump and Treat with Air Stripping/Chlorinated Solvents
Old Mill Superfund Site, OH	Pump and Treat with Air Stripping and Carbon Adsorption/Chlorinated Solvents
SCRDI Dixiana Superfund Site, SC	Pump and Treat with Air Stripping /Chlorinated Solvents
Shaw AFB, Site OT-16B, SC	Hydraulic Containment Through Active Pumping/Chlorinated Solvents
Shaw AFB, Sites SD-29 and ST-30, SC	Free Product Recovery with Air Stripping/Chlorinated Solvents, BTEX/TPH
Solid State Circuits Superfund Site, MO	Pump and Treat with Air Stripping/Chlorinated Solvents
Sol Lynn/Industrial Transformers Superfund Site, TX	Pump and Treat with Air Stripping, Carbon Adsorption, and Filtration/Chlorinated Solvents
Solvent Recovery Services of New England, Inc. Superfund Site, CT	Pump and Treat with Carbon Adsorption, Chemical Treatment, Filtration, and UV/Oxidation; Vertical Barrier Wall/Chlorinated Solvents, Metals
Remediation Case Studies (Volume 10): Groundwater Pump and Treat (Nonchlorinated Contaminants)	
Baird and McGuire Superfund Site, MA	Pump and Treat with Aeration, Air Stripping, Chemical Treatment, Clarification, and Filtration/BTEX/TPH, PAHs, Pesticides/Herbicides, Metals
Bofors Nobel Superfund Site, OU 1, MI	Pump and Treat with Air Stripping, Carbon Adsorption, Chemical Treatment, Filtration, and UV/Oxidation/Chlorinated Solvents, SVOCs
City Industries Superfund Site, FL	Pump and Treat with Air Stripping/Chlorinated Solvents, BTEX/TPH
King of Prussia Technical Corporation Superfund Site, NJ	Pump and Treat with Air Stripping, Carbon Adsorption, and Electrochemical Treatment/Chlorinated Solvents, BTEX/TPH, Metals
LaSalle Electrical Superfund Site, IL	Pump and Treat with Air Stripping, Carbon Adsorption, and Oil/Water Separation/Chlorinated Solvents, PCBs
Mid-South Wood Products Superfund Site, AR	Pump and Treat with Carbon Adsorption, Filtration, and Oil/Water Separation/PAHs, Metals
Odessa Chromium I Superfund Site, OU 2, TX	Pump and Treat with Chemical Treatment, Flocculation, Multimedia Filtration, pH Adjustment, and Precipitation/Metals
Odessa Chromium IIS Superfund Site, OU 2, TX	Pump and Treat with Chemical Treatment, Flocculation, Multimedia and Cartridge Filtration, pH Adjustment, and Precipitation/Metals
Pope AFB, Site FT-01, NC	Free Product Recovery/BTEX/TPH
Pope AFB, Site SS-07, Blue Ramp Spill Site, NC	Free Product Recovery/BTEX/TPH
Sylvester/Gilson Road Superfund Site, NH	Pump and Treat with Air Stripping, Biological Treatment, Chemical Treatment, Clarification, Flocculation, and Mixed-media Pressure Filtration; Cap; SVE; Vertical Barrier Wall/Chlorinated Solvents, Metals
United Chrome Superfund Site, OR	Pump and Treat with Reduction and Precipitation/Metals

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
U.S. Aviex Superfund Site, MI	Pump and Treat with Air Stripping/Chlorinated Solvents, Diethyl Ether
Western Processing Superfund Site, WA	Pump and Treat with Air Stripping and Filtration; Vertical Barrier Wall/Chlorinated Solvents, PAHs, Metals
Remediation Case Studies (Volume 11): Innovative Groundwater Treatment Technologies	
Balfour Road Site, CA; Fourth Plain Service Station Site, WA; Steve's Standard and Golden Belt 66 Site, KS	Enhanced Bioremediation of Groundwater/BTEX/TPH
Coastal Systems Station, AOC 1, FL	Chemical Reaction and Flocculation, and Dissolved Air Flotation/BTEX/TPH, Metals
Former Intersil, Inc. Site, CA	Pump and Treat with Air Stripping; Permeable Reactive Barrier/Chlorinated Solvents
French Ltd. Superfund Site, TX	Pump and Treat with Activated Sludge for Extracted Groundwater; In Situ Bioremediation /Chlorinated Solvents
Gold Coast Superfund Site, FL	Pump and Treat with Air Sparging/Chlorinated Solvents
Libby Groundwater Superfund Site, MT	Pump and Treat; In Situ Bioremediation/PAHs
Moffett Federal Airfield, CA	Permeable Reactive Barrier/Chlorinated Solvents
Pinellas Northeast Site, FL	In Situ Air and Steam Stripping -Dual Auger Rotary Steam Stripping/Chlorinated Solvents
Pinellas Northeast Site, FL	In Situ Anaerobic Bioremediation/Chlorinated Solvents
Pinellas Northeast Site, FL	Membrane Filtration - PerVap™/Chlorinated Solvents
Site A (actual name confidential), NY	Pump and Treat with Air Stripping; In Situ Bioremediation; Air Sparging; SVE/BTEX/TPH
U.S. Coast Guard Support Center, NC	Permeable Reactive Barrier/Chlorinated Solvents, Metals
Remediation Case Studies (Volume 12): On-Site Incineration	
Baird and McGuire, MA	Rotary Kiln Incinerator/PAHs, Pesticides/Herbicides, Metals, Dioxin, PCBs
Bayou Bonfouca, LA	Rotary Kiln Incinerator/PAHs
Bridgeport Refinery and Oil Services, NJ	Rotary Kiln Incinerator/BTEX/TPH, Metals, Dioxin, PCBs
Celanese Corporation Shelby Fiber Operations, NC	Rotary Kiln Incinerator/Chlorinated Solvents, PAHs, Metals
Coal Creek, WA	Rotary Kiln Incinerator/Metals, Dioxin, PCBs
FMC Corporation - Yakima, WA	Rotary Kiln Incinerator/Pesticides/Herbicides, Metals
Former Nebraska Ordnance Plant - OU 1, NE	Rotary Kiln Incinerator/Explosives/Propellants, TNT, RDX, HMX
MOTCO, TX	Rotary Kiln Incinerator/Chlorinated Solvents, Metals, Dioxin, PCBs
Old Midland Products, AR	Rotary Kiln Incinerator/PAHs
Petro Processors, LA	Horizontal Liquid Injection Incinerator/Chlorinated Solvents, BTEX/TPH, PAHs, Metals
Rocky Mountain Arsenal, CO	Submerged Quench Incinerator/Pesticides/Herbicides, Metals
Rose Disposal Pit, MA	Rotary Kiln Incinerator/Chlorinated Solvents, Dioxin, PCBs
Rose Township Dump, MI	Infrared Incinerator/BTEX/TPH, Dioxin, PCBs
Sikes Disposal Pits, TX	Rotary Kiln Incinerator/Chlorinated Solvents, PAHs
Times Beach, MO	Rotary Kiln Incinerator/Dioxin, PCBs

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Vertac Chemical Corporation, AR	Rotary Kiln Incinerator/Pesticides/Herbicides, Dioxin, PCBs
Remediation Case Studies (Volume 13): Debris and Surface Cleaning Technologies, and Other Miscellaneous Technologies	
Alabama Army Ammunition Plant, AL	Transportable Hot-Gas Decontamination/Explosives
Chicago Pile 5 (CP-5) Research Reactor, Argonne National Laboratory, IL	Centrifugal Shot Blast/Radioactivity
Chicago Pile 5 (CP-5) Research Reactor, Argonne National Laboratory, IL	Rotary Peening with Captive Shot/Radioactivity
Chicago Pile 5 (CP-5) Research Reactor, Argonne National Laboratory, IL	Roto Peen Scaler with VAC-PAC[R] System/Radioactivity
Envirocare of Utah, UT	Polyethylene Macroencapsulation/Radioactivity
Lawrence Livermore National Laboratory (LLNL) Site 300 - Pit 6 Landfill OU, CA	Cap/Chlorinated Solvents, Radioactivity
New Case Studies: June 2000	
In Situ Soil Treatment	
Dover Air Force Base, Building 719, Delaware	Bioventing/Chlorinated Solvents
Multiple Air Force Test Sites, Multiple Locations	Bioventing/BTEX and/or TPH
White Sands Missile Range, SWMU 143, New Mexico	Chemical Reduction/Oxidation/Metals
Active Power Substation, Confidential Location	Electrokinetics/Metals
Naval Air Weapons Station Point Mugu, Site 5, California	Electrokinetics/Metals
Sandia National Laboratories, Unlined Chromic Acid Pit, New Mexico	Electrokinetics/Metals
Former Mare Island Naval Shipyard, California	In Situ Thermal Treatment; In Situ Thermal Desorption/PCBs
Fort Richardson Poleline Road Disposal Area, OU B, Alaska	In Situ Thermal Treatment; Six Phase Heating/Chlorinated Solvents
Argonne National Laboratory - East, Illinois	Phytoremediation/Metals
Ensign-Bickford Company - OB/OD Area, Connecticut	Phytoremediation/Metals
Twin Cities Army Ammunition Plant, Minnesota	Phytoremediation/Metals
Patrick Air Force Base, Active Base Exchange Service Station, Florida	Soil Vapor Extraction/BTEX and/or TPH
Patrick Air Force Base, Active Base Exchange Service Station, Florida	Soil Vapor Extraction/BTEX and/or TPH
Vandenberg Air Force Base, Base Exchange Service Station, California	Soil Vapor Extraction/BTEX and/or TPH
Idaho National Engineering and Environmental Laboratory, Idaho	Soil venting/Chlorinated Solvents
Incineration	
Former Weldon Springs Ordnance Works, OU 1, Missouri	Incineration (on-site)/Explosives/Propellants
Thermal Desorption	
Arlington Blending and Packaging Superfund Site, Tennessee	Thermal Desorption/Pesticides/Herbicides/Metals
Letterkenny Army Depot Superfund Site, K Areas, OU1, Pennsylvania	Thermal Desorption/Chlorinated Solvents/Metals
Longhorn Army Ammunition Plant, Burning Ground No. 3, Texas	Thermal Desorption/Chlorinated Solvents

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Rocky Flats Environmental Technology Site, Trenches T-3 and T-4, Colorado	Thermal Desorption/Chlorinated Solvents/Radionuclides
Other Ex Situ Soil Treatment	
Joliet Army Ammunition Plant, Illinois	Bioremediation (ex situ) Slurry Phase/Explosives/Propellants
Fort Polk Range 5, Louisiana	Chemical Reduction/Oxidation/Metals
Los Alamos National Laboratory, New Mexico	Physical Separation; Segmented Gate System/Radionuclides
Pantex Plant, Firing Site 5, Texas	Physical Separation; Segmented Gate System/Radionuclides
Sandia National Laboratories, ER Site 228A, New Mexico	Physical Separation; Segmented Gate System/Radionuclides
Sandia National Laboratories, ER Site 16, New Mexico	Physical Separation; Segmented Gate System/Radionuclides
Tonapah Test Range, Clean Slate 2, Nevada	Physical Separation; Segmented Gate System/Radionuclides
RMI Titanium Company Extrusion Plant, Ohio	Solvent Extraction/Metals/Radionuclides
Oak Ridge National Laboratory, Tennessee	Vitrification/Radionuclides/Heavy metals
Pump and Treat	
Fort Lewis Logistics Center, Washington	Pump and Treat/Chlorinated Solvents
In Situ Groundwater Treatment	
Abandoned Manufacturing Facility - Emeryville, California	Bioremediation (in situ) Groundwater/Chlorinated Solvents/Metals
Avco Lycoming Superfund Site, Pennsylvania	Bioremediation (in situ) Groundwater/Chlorinated Solvents/Metals
Dover Air Force Base, Area 6, Delaware	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Edwards Air Force Base, California	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Hanford Site, Washington	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Moffett Field Superfund Site, California	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Naval Weapons Station Seal Beach, California	Bioremediation (in situ) Groundwater/BTEX and/or TPH
Watertown Site, Massachusetts	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Savannah River Site, South Carolina	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Texas Gulf Coast Site, Texas	Bioremediation (in situ) Groundwater/Chlorinated Solvents
Hanford Site, 100-H and 100-D Areas, Washington	Chemical Reduction/Oxidation/Metals
Portsmouth Gaseous Diffusion Plant, X-701B Facility, Ohio	Chemical Reduction/Oxidation/Chlorinated Solvents
Milan Army Ammunition Plant, Tennessee	Constructed Wetlands/Explosives/Propellants
328 Site, California	Dual-Phase Extraction/Chlorinated Solvents
Defense Supply Center, Acid Neutralization Pit, Virginia	Dual-Phase Extraction/Chlorinated Solvents
Tinkham's Garage Superfund Site, New Hampshire	Dual-Phase Extraction/Chlorinated Solvents
Oak Ridge National Laboratory, Tennessee	Frozen Soil Barrier/Radionuclides
Portsmouth Gaseous Diffusion Plant, X-701B Facility, Ohio	In Situ Oxidation/Chlorinated Solvents
Naval Air Station Pensacola, OU 10, Florida	In Situ Oxidation; Fenton's Reagent/Chlorinated Solvents
Naval Submarine Base Kings Bay, Georgia	In Situ Oxidation; Fenton's Reagent/Chlorinated Solvents
Confidential Manufacturing Facility, Illinois	In Situ Thermal Treatment; Six Phase Heating/Chlorinated Solvents

EXHIBIT 1. SUMMARY OF REMEDIATION CASE STUDIES (continued)

Site Name, State	Technology/Contaminants
Visalia Superfund Site, California	In Situ Thermal Treatment; Dynamic Underground Stripping/Creosote
Fort Devens, AOCs 43G and 43J, Massachusetts	Monitored Natural Attenuation/BTEX and/or TPH
Keesler Air Force Base Service Station, AOC-A (ST-06), Mississippi	Monitored Natural Attenuation/BTEX and/or TPH/Metals
Kelly Air Force Base, Former Building 2093 Gas Station, Texas	Monitored Natural Attenuation/BTEX and/or TPH
Fry Canyon, Utah	Permeable Reactive Barrier/Metals/Radionuclides
Moffett Field Superfund Site, California	Permeable Reactive Barrier/Chlorinated Solvents
Tacony Warehouse, Pennsylvania	Permeable Reactive Barrier; Pump and Treat/Chlorinated Solvents
Debris/Solid Media Treatment	
Lawrence Livermore National Laboratory, California	Chemical Reduction/Oxidation; Direct Chemical Oxidation/Chlorinated Solvents/Explosives/Propellants
Savannah River Site, South Carolina	Chemical Reduction/Oxidation/Radionuclides
Argonne National Laboratory - East, Illinois	Physical Separation/Radionuclides
Argonne National Laboratory - East, Illinois	Physical Separation/Radionuclides
Fernald Site, Ohio	Physical Separation/Radionuclides
Hanford Site, Washington	Physical Separation/Radionuclides
Hanford Site, Washington	Physical Separation/Radionuclides
Hanford Site, Washington	Physical Separation/Radionuclides
Argonne National Laboratory - West, Waste Area Group 9, OU 9-04, Idaho	Solidification/Stabilization/Metals
Clemson University, South Carolina	Solidification/Stabilization/Metals
Hanford Site, Washington	Solidification/Stabilization/Metals/Radionuclides
Idaho National Engineering and Environmental Laboratory, Idaho	Solidification/Stabilization/Radionuclides
Idaho National Engineering and Environmental Laboratory, Pit 2, Idaho	Solidification/Stabilization/Metals
Idaho National Engineering and Environmental Laboratory, Idaho	Solidification/Stabilization/Metals
Los Alamos National Laboratory, Technical Area 33, New Mexico	Solidification/Stabilization/Metals
Los Alamos National Laboratory, New Mexico	Solidification/Stabilization/Metals/Radionuclides
Pacific Northwest National Laboratory, Washington	Solidification/Stabilization/Metals
Portsmouth Gaseous Diffusion Plant, Ohio	Solidification/Stabilization/Metals/Radionuclides
Idaho National Engineering and Environmental Laboratory, Idaho	Vitrification/Metals/Radionuclides
STAR Center, Idaho	Vitrification/Metals/Radionuclides

Key:
DNAPLs = Dense Non-Aqueous Phase Liquids
SVOCs = Semi-Volatile Organic Compounds
GAC = Granular Activated Carbon
SVE = Soil Vapor Extraction
BTEX = Benzene, Toluene, Ethylbenzene, and Xylene
TPH = Total Petroleum Hydrocarbons
PAHs = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
TCA = 1,1,1-Trichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
DCE = Dichloroethene
TNT = 2,4,6-Trinitrotoluene
RDX = Hexahydro-1,3,5-trinitro-1,3,5 triazine
HMX = Octahydro-1,3,5,7-tetranitro 1,3,5,7-tetrazocine
MBOCA = 4,4-methylene bis(2-chloroaniline)
MIBK = Methyl isobutyl ketone

Remediation Case Studies and Abstract Volumes
Ordering Instructions and Form

The following documents are available free-of-charge from the U.S. EPA/National Service Center for Environmental Publications (NSCEP), while supplies last. To order, mail this completed form to: U.S. EPA/National Service Center for Environmental Publications, P.O. Box 42419, Cincinnati, OH 45242, or FAX to (513) 489-8695. Also, telephone orders may be placed at (800) 490-9198 or (513) 489-8190.

Title	Number	Please Send
New Publications		
Abstracts of Remediation Case Studies, Volume 4	EPA-542-R-00-006; June 2000	☐
CD-ROM, FRTR Cost and Performance Case Studies and Related Information	EPA-542-C-00-001; June 2000	☐
Previous Publications		
Abstracts of Remediation Case Studies, Volume 1	EPA-542-R-95-001; March 1995	☐
Remediation Case Studies, Volume 1: Bioremediation	EPA-542-R-95-002; March 1995	☐
Remediation Case Studies, Volume 2: Groundwater Treatment	EPA-542-R-95-003; March 1995	☐
Remediation Case Studies, Volume 3: Soil Vapor Extraction	EPA-542-R-95-004; March 1995	☐
Remediation Case Studies, Volume 4: Thermal Desorption, Soil Washing, and In Situ Vitrification	EPA-542-R-95-005; March 1995	☐
Abstracts of Remediation Case Studies, Volume 2	EPA-542-R-97-010; July 1997	☐
Remediation Case Studies, Volume 5: Bioremediation and Vitrification	EPA-542-R-97-008; July 1997	☐
Remediation Case Studies, Volume 6: Soil Vapor Extraction and Other In Situ Technologies	EPA-542-R-97-009; July 1997	☐
Abstracts of Remediation Case Studies, Volume 3	EPA-542-R-98-010; September 1998	☐
Remediation Case Studies, Volume 7: Ex Situ Soil Treatment Technologies (Bioremediation, Solvent Extraction, Thermal Desorption)	EPA-542-R-98-011; September 1998	☐
Remediation Case Studies, Volume 8: In Situ Soil Treatment Technologies (Soil Vapor Extraction, Thermal Processes)	EPA-542-R-98-012; September 1998	☐
Remediation Case Studies, Volume 9: Groundwater Pump and Treat (Chlorinated Solvents)	EPA-542-R-98-013; September 1998	☐
Remediation Case Studies, Volume 10: Groundwater Pump and Treat (Nonchlorinated Contaminants)	EPA-542-R-98-014; September 1998	☐
Remediation Case Studies, Volume 11: Innovative Groundwater Treatment Technologies	EPA-542-R-98-015; September 1998	☐
Remediation Case Studies, Volume 12: On-Site Incineration	EPA-542-R-98-016; September 1998	☐
Remediation Case Studies, Volume 13: Debris and Surface Cleaning Technologies, and Other Miscellaneous Technologies	EPA-542-R-98-017; September 1998	☐
Guide to Documenting and Managing Cost and Performance Information for Remediation Projects, Revised Version	EPA-542-B-98-007; October 1998	☐

Name: _____ Date: _____

Organization: _____

Address: _____

City/State/Zip: _____ Telephone: _____

E-mail Address: _____

Individual remediation case studies and abstracts also are available on the Internet at ***http://www.frtr.gov***.

Federal Remediation Technologies Roundtable
General Publications
Ordering Instructions and Form

The following documents are available free-of-charge from the U.S. EPA/National Service Center for Environmental Publications (NSCEP). To order, mail this completed form to: U.S. EPA/National Service Center for Environmental Publications, P.O. Box 42419, Cincinnati, OH 45242, or FAX to (513) 489-8695. Also, telephone orders may be placed at (800) 490-9198 or (513) 489-8190.

Title	Number	Please Send
Site Remediation Technology InfoBase: A Guide to Federal Programs, Information Resources, and Publications on Contaminated Site Cleanup Technologies	EPA-542-B-00-005; June 2000	☐
Guide to Documenting and Managing Cost and Performance Information for Remediation Projects, Revised Version	EPA-542-B-98-007; October 1998	☐
Field Sampling and Analysis Technologies Matrix And Reference Guide, First Edition	EPA-542-B-98-002; March 1998	☐
Field Sampling and Analysis Technologies Matrix - Poster	EPA-542-B-98-002A; March 1998	☐
Remediation Technologies Screening Matrix And Reference Guide, Third Edition	Viewable at *http://www.frtr.gov*; November 1997	☐
Remediation Technologies Screening Matrix - Poster*	November 1998	☐

Name: _____ Date: _____

Organization: _____

Address: _____

City/State/Zip: _____ Telephone: _____

E-mail Address: _____

Documents also are available on the Internet at ***http://www.frtr.gov***.

* To order a copy of the Remediation Technologies Screening Matrix Poster: send your name, organization, and address to the technology transfer hotline at t2hotline@aec.apgea.army.mil.

EPA

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

Official Business
Penalty for Private Use
$300

EPA 542-F-00-011

Federal Remediation Technologies Roundtable
<www.frtr.gov>

Remediation Case Studies:

Fact Sheet and Order Form