U.S. Information Resources

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24 September, 2010

Office of Solid Waste and Emergency Response (OSWER)

- Develops standards and regulations for hazardous and non-hazardous waste (RCRA)
- Promotes resource conservation and recovery (RCRA)
- Cleans up contaminated property and prepares it for reuse (Brownfields, RCRA, Superfund, UST)

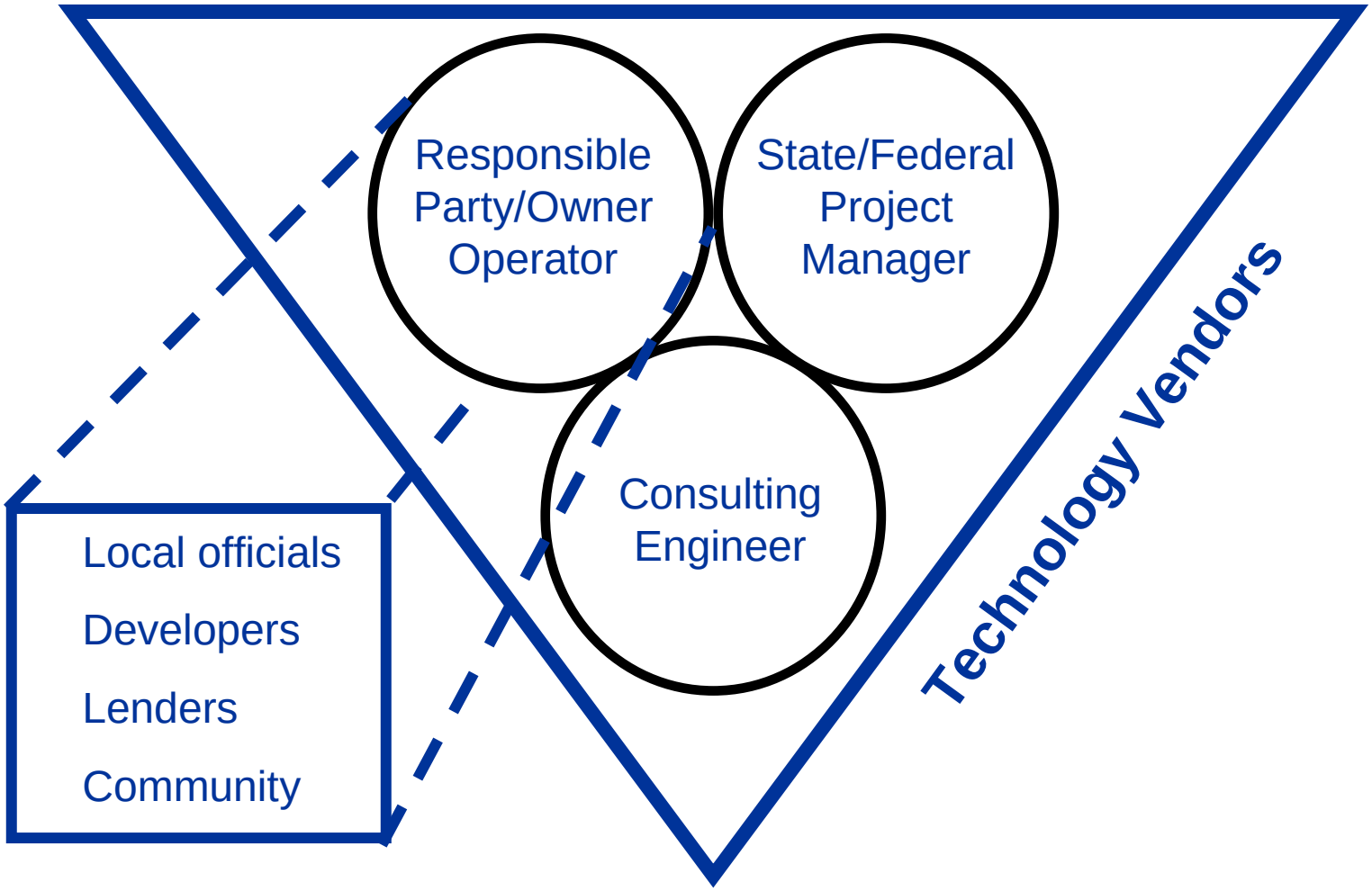
- Helps to prevent, plan for, and respond to emergencies (Oil spills, chemical releases, decontamination)
- Promotes innovative technologies to assess and clean up contaminated soil, sediment, and water at waste sites (Technology Innovation)

Office of Superfund Remediation and Technology Innovation (OSRTI)

Technology Innovation Field Services Division (TIFSD)

- OSRTI - implements and manages Superfund program
- TIFSD Core Mission:
  - Advancing best practices in site cleanup
  - Technology support to EPA Regional project managers, states, local governments, tribes
  - Informational support to cleanup community at large
- Primary activity areas to advance mission:
  - Evaluate and document innovative technologies
  - Transfer knowledge through publications, training, internet, etc.
  - Provide direct technical support at sites in Superfund, Brownfields, RCRA, and UST
  - Manage analytical services for the Superfund program

Target Audience



Levels of Environmental Remediation Information

- Rules (i.e., Laws and Regulation)
- Policy – developed to support rules
- Guidance

Session Goal

- Provide a roadmap to identify information on innovative approaches to site cleanup
- Highlight specific information sources from EPA and other U.S. Agencies
- Present information on specific topics such as treatment technologies, Green Remediation, and other current areas

Overview

- EPA Information Dissemination
- Additional Information on Site Cleanup Best Practices and Technologies From Other U.S. Agencies
- Resources of Specific Interest to ConSoil Attendees
- Summary

22-24 September 2010
ConSoil 2010
Salzburg Congress, Austria
www.consoil.de

EPA Information Dissemination

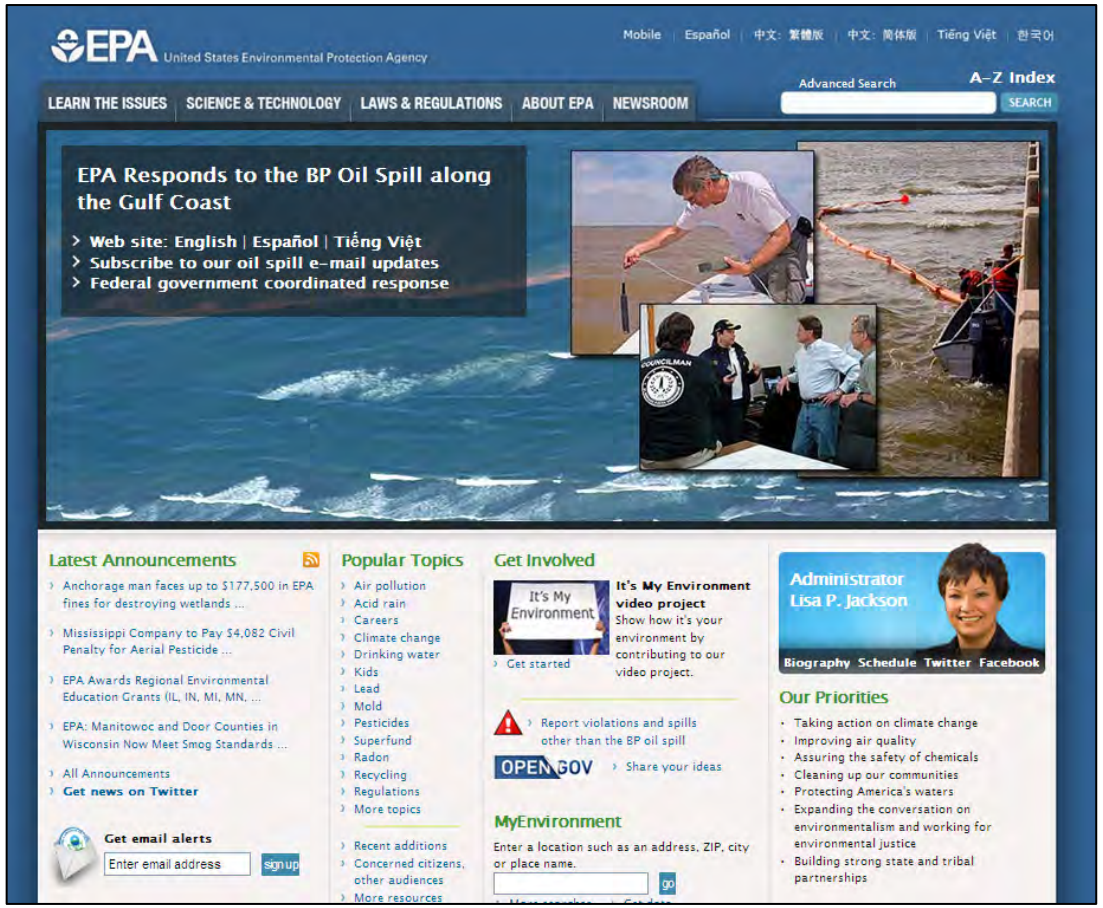
UNITED STATES • ENVIRONMENTAL PROTECTION AGENCY •

EPA Information Dissemination

- Internet Resources
- Electronic Distribution
- Social Networking
- Training
- Hardcopy

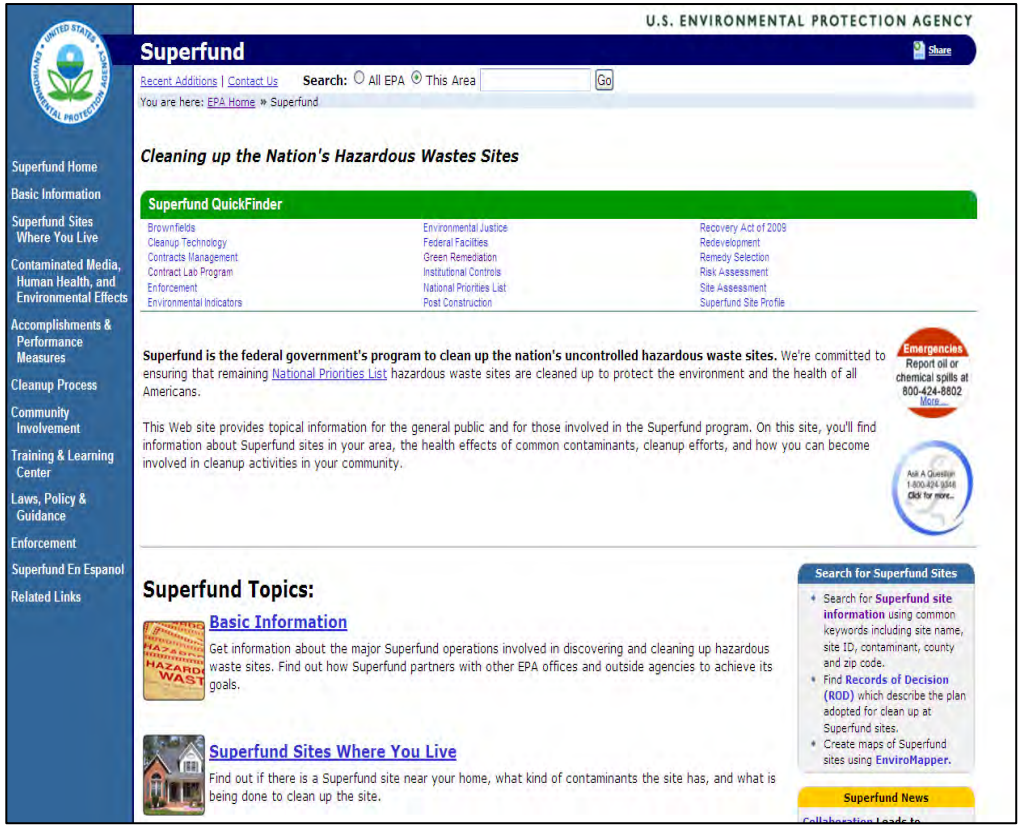
US EPA

- Federal environmental laws, regulations, and guidance
- News, press releases, speeches
- Program-specific sites
  - News
  - Laws
  - Funding
  - Regional sites
- EPA initiatives



www.epa.gov

US EPA Superfund



- Cleanup process
- Accomplishments and performance measures
- Laws, policy and guidance
- Enforcement

www.epa.gov/superfund

Contaminated Site CLean-Up Information (CLU-IN) Website

- Technologies
- Contaminants
- Issues
- Strategies & Initiatives
- Vendors and Developers
- Training & Events
- Additional Resources

www.clu-in.org

CLU-IN Website – Technologies (examples)

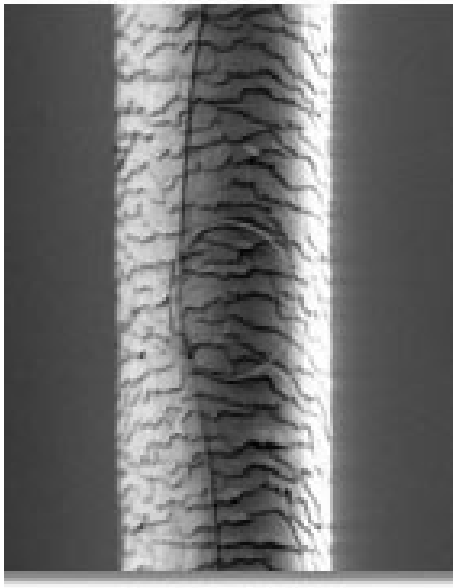
- **Characterization and Monitoring Technologies**
  - Fiber Optic Chemical Sensors
  - Direct-Push Membrane Interface Probe (MIP)
  - X-Ray Fluorescence (XRF) Detector
- **Remediation Technologies**
  - Evapotranspiration covers
  - Permeable Reactive Barriers (PRB)
  - Soil Vapor Extraction (SVE)

- **Available Information**
  - Regulatory Guidance
  - Demonstration Project Profiles
  - Case Studies
  - Analytical and Decision Tools
  - Cost Data
  - Conference and Training Opportunities

www.clu-in.org/technologies

Nanotechnology for Environmental Remediation Technology Focus Area

- Nanomaterials currently used for environmental remediation
- Factors affecting performance
- Potential nanomaterials
- Field demonstrations and case studies
- Research on fate, transport, and toxicity



Mazur Group, Harvard University.

www.clu-in.org/technologies

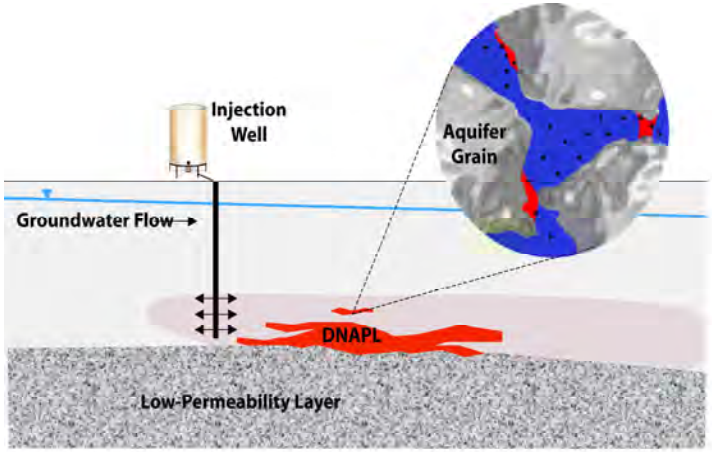
CLU-IN Website – Contaminants

- **Example Contaminants**
  - Dense Nonaqueous Phase Liquids (DNAPLs)
  - Persistent Organic Pollutants (POPs)
  - Trichloroethylene (TCE)
- **Available Information**
  - Policy and Guidance
  - Chemistry and Behavior
  - Environmental Occurrence
  - Toxicology
  - Detection and Site Characterization
  - Treatment Technologies
  - Conferences and Seminars

www.clu-in.org/contaminantfocus

DNAPL Contaminant Focus Area

- Currently available:
  - Halogenated alkanes
  - Halogenated alkenes
  - Halogenated monaromatics
  - Polychlorinated biphenyls (PCBs)
  - Multi-Component Waste (creosotes, coal tars, heavy oils)
- For future development:
  - Ethers
  - Other (aniline, benzyl chloride, etc.)



Tratnyek and Johnson (2006)
NanoToday 1(2): 44-48

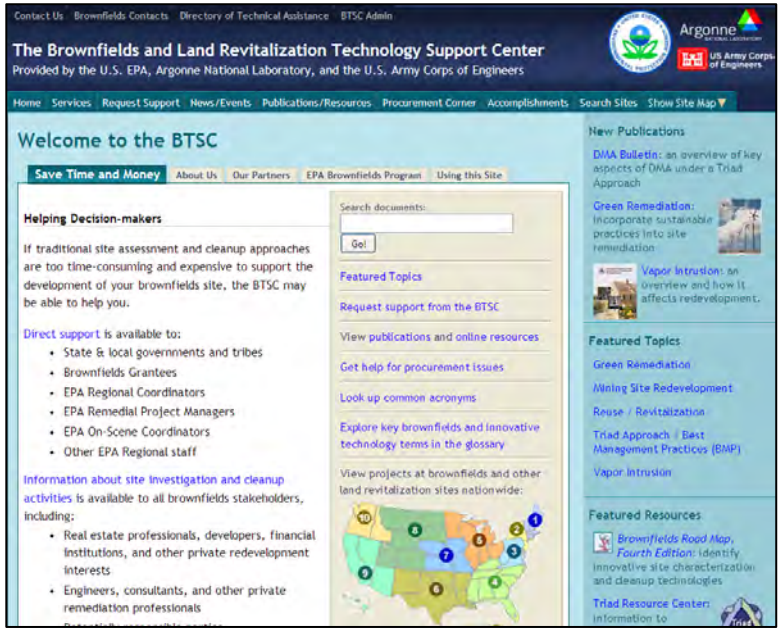
www.cluin.org/contaminantfocus/default.focus/sec/Dense_Nonaqueous_Phase_Liquids_(DNAPLs)/cat/Overview

CLU-IN Website - Issues

- Brownfields
- Triad: A Smarter Solution to Site Cleanup
- Green Remediation
- Ecological Land Reuse
- Mining Sites
- Nanotechnology
- Vapor Intrusion
- Wood Treater Sites

www.clu-in.org/contaminantfocus

Brownfields and Land Revitalization Technology Support Center (BTSC)

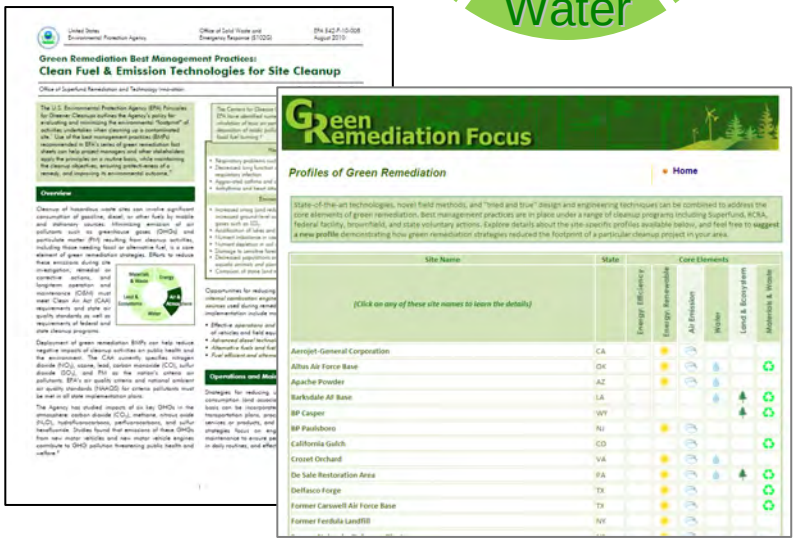


- Strategy and Project Planning Support
- Document Reviews
- Technology Scoping for Site Assessment and Cleanup
- Information on Innovative and Real-Time Investigation Technologies
- Information on Remedial Technologies

www.brownfieldstsc.org

Green Remediation and Remedial System Evaluations (RSE)

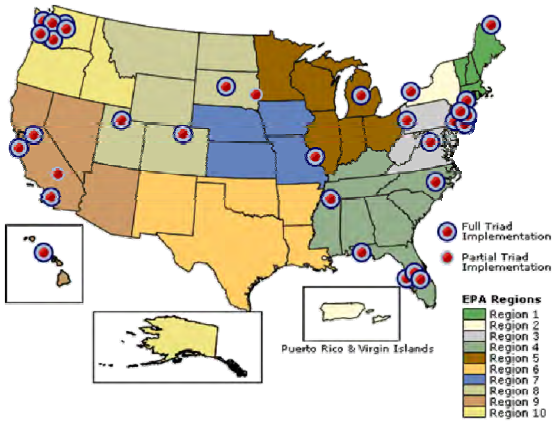
- Policies and Strategies
- Best Management Practices (BMP)
- Incorporation of BMPs
- Green Remediation Profiles
- Conferences and Seminars



www.clu-in.org/greenremediation

Triad Approach

- Regulatory Information
- Considerations for the use of Triad
- Triad Technical Components
- Triad Profiles
- Triad Community of Practice (CoP)



www.triadcentral.org

CLU-IN Website – Vendors and Developers

- Market Analysis
- Business Planning and Funding
- Research & Development
- Demonstration & Testing
- Permitting & Regulatory Assistance
- Commercialization & Contracts
- Vendor Information

www.clu-in.org/vendor

CLU-IN Website – Training and Events

- Upcoming Internet Seminars
  - Phone line
  - Streaming audio
- Archived Internet Seminars
  - View online
  - Download MSPowerPoint with audio
  - Download audio in MP3 format
  - Subscribe to archive podcast feed
- Upcoming Courses and Conferences

www.clu-in.org/training

CLU-IN Website – Training and Events (continued)

- Identifying & Evaluating Ecosystem Services at Contaminated Sites Prior to Remediation
- US and EU Perspectives on Green and Sustainable Remediation
- Using Ecological-Based Tools and Approaches to Assess Bioavailability
- MTBE and TBA Cleanup-New Research Perspectives
- Implementation of Triad for Petroleum Brownfield's Cleanup and Reuse

www.cluin.org/live/archive

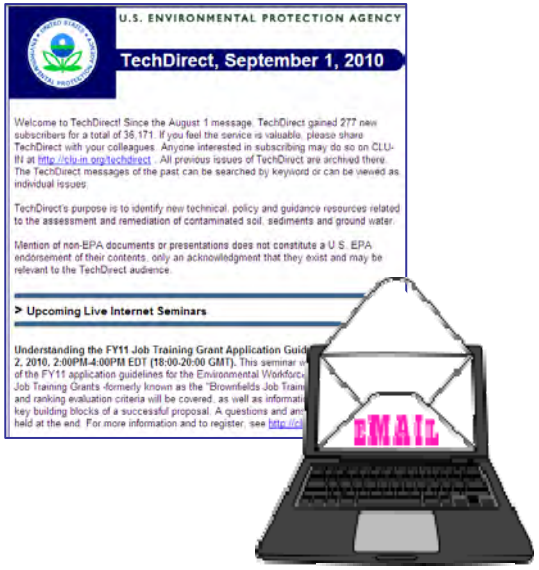
Trainex Website

- Hazardous waste management and remediation training
  - Classroom
  - Internet Seminar
  - CD-ROM Based
  - Streaming Video
  - Independent on-line
  - Video by mail
  - Web-based training
- Example upcoming training
  - Advanced Triad Training for Practitioners
    - Kansas City, KS, USA
    - October 26-28

www.trainex.org

Other EPA Resources

- Tech Direct
  - New technical, policy, and guidance resources
  - Upcoming live Internet seminars
  - New documents and web resources
  - Conferences and symposia
- Technology News and Trends
- Technology Innovation News Survey



www.cluin.org/newsletters

Other EPA Resources (continued)

- Electronic Distribution – RSS feed
- Podcasts
  - Green Chemistry Challenge
  - Risk Management Research
- Social Networking
  - Facebook
  - Greenversations (http://blog.epa.gov/blog)
  - Twitter (www.twitter.com/epagov)
  - YouTube (www.youtube.com/user/USEPAgov)

Office of Research and Development

- National Research Programs
- Reports and Technology Evaluations
- Models, Methods, and Databases
  - Toxicity Reference Database
  - Test Method Collections Website
  - ECOTOX Database

www.epa.gov/ord

EPA Libraries

- Online Library System (OLS)
  - www.epa.gov/libraries/aboutols.htm
- National Environmental Publications Internet Site (NEPIS)
  - www.epa.gov/nscep

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Additional Information on Site Cleanup Best Practices and Technologies From Other U.S. Agencies

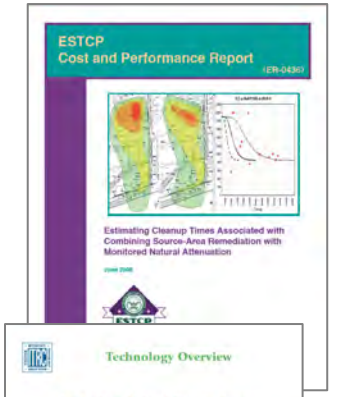
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Federal Remediation Technologies Roundtable (FRTR)

- Technology-related efforts of mutual interest
- Future directions site remediation programs
- State and private industry technology development programs
- Partnerships to pursue mutual interests

www.frtr.gov

FRTR (continued)



- Case Studies
  - Remediation Case Study Searchable Database
    - 414 full-scale and large-scale demonstration projects
  - Remediation Optimization Case Studies
    - 130 case studies of specific optimization efforts
  - Remediation Technology Assessment Reports
    - 92 reports analysis of remedial technologies
  - Site Characterization and Monitoring Technologies
    - 144 experiences and lessons learned in field demonstrations and full-scale uses of innovative technologies

www.frtr.gov/costperf.htm

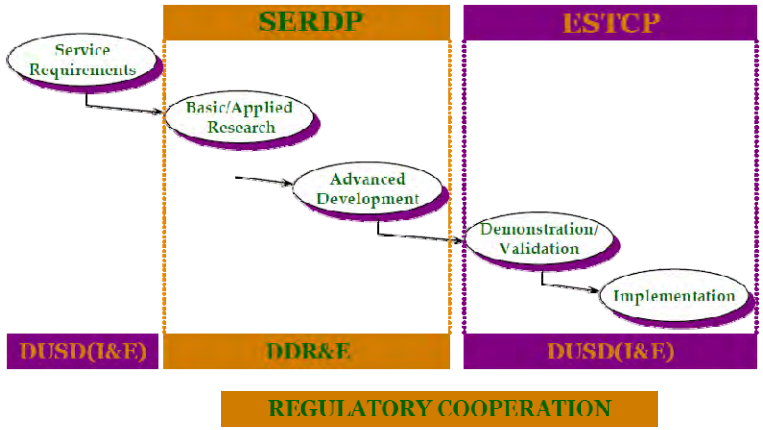
FRTR (continued)

- Matrices
  - The Remediation Technologies Screening Matrix
  - Decision Support Tools (DST)

www.frtr.gov

US Department of Defense (DoD)

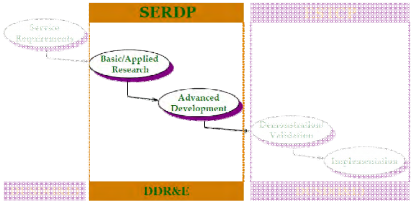
- Strategic Environmental Research and Development Program (SERDP)
- Environmental Security Technology Certification Program (ESTCP)
- Environmental Restoration Tools and Trainings
  - Groundwater plume treatment
  - Monitoring and characterization
  - Contaminated sediments



www.serdp-estcp.org

DoD (continued)

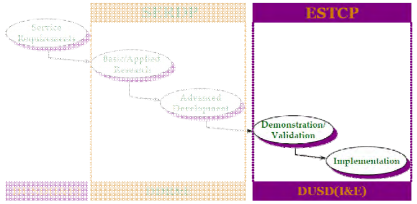
- SERDP
  - Environmental science and technology program
  - Partnership with EPA & Department of Energy (DOE)
  - Recent publications
    - *Evaluation of Performance and Longevity at DoD Permeable Reactive Barrier Sites* (Project ID: ER-1140)
    - *In Place Soil Treatments for Prevention of Explosives Contamination* (Project ID: ER 200434)



www.serdp-estcp.org

DoD (continued)

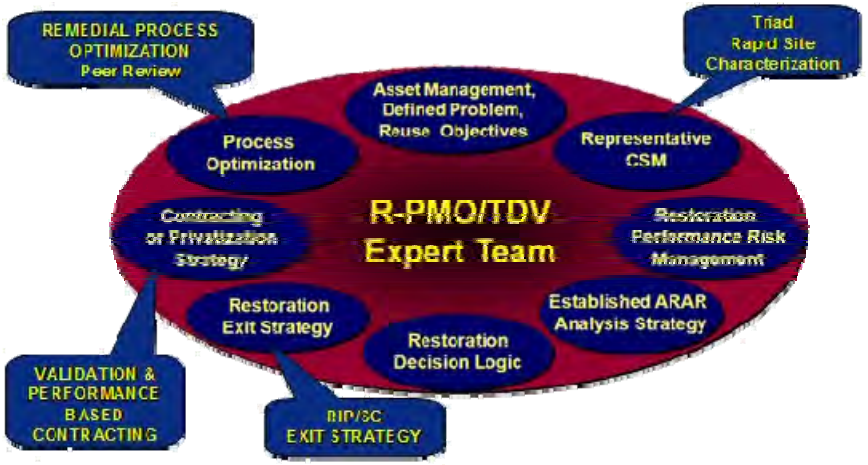
- ESTCP
  - Environmental technology demonstration and validation program
  - Recent publications:
    - *State-of-the-Practice Overview: Critical Evaluation of State-of-the-Art In Situ Thermal Treatment Technologies for DNAPL Source Zone Treatment* (Project ID: ER-200314)
    - *Emulsified Zero-Valent Nano-Scale Iron Treatment of Chlorinated Solvent DNAPL Source Areas* (Project ID: ER 200431)



www.serdp-estcp.org

US Air Force Center for Engineering and the Environment (AFCEE)

- Environmental Restoration Program Optimization (ERP-O)
- Long-Term Monitoring Optimization (LTMO)
- Groundwater Modeling
- AFCEE Sustainable Remediation Tool (SRT)



www.afcee.af.mil/resources/sustainability/index.asp

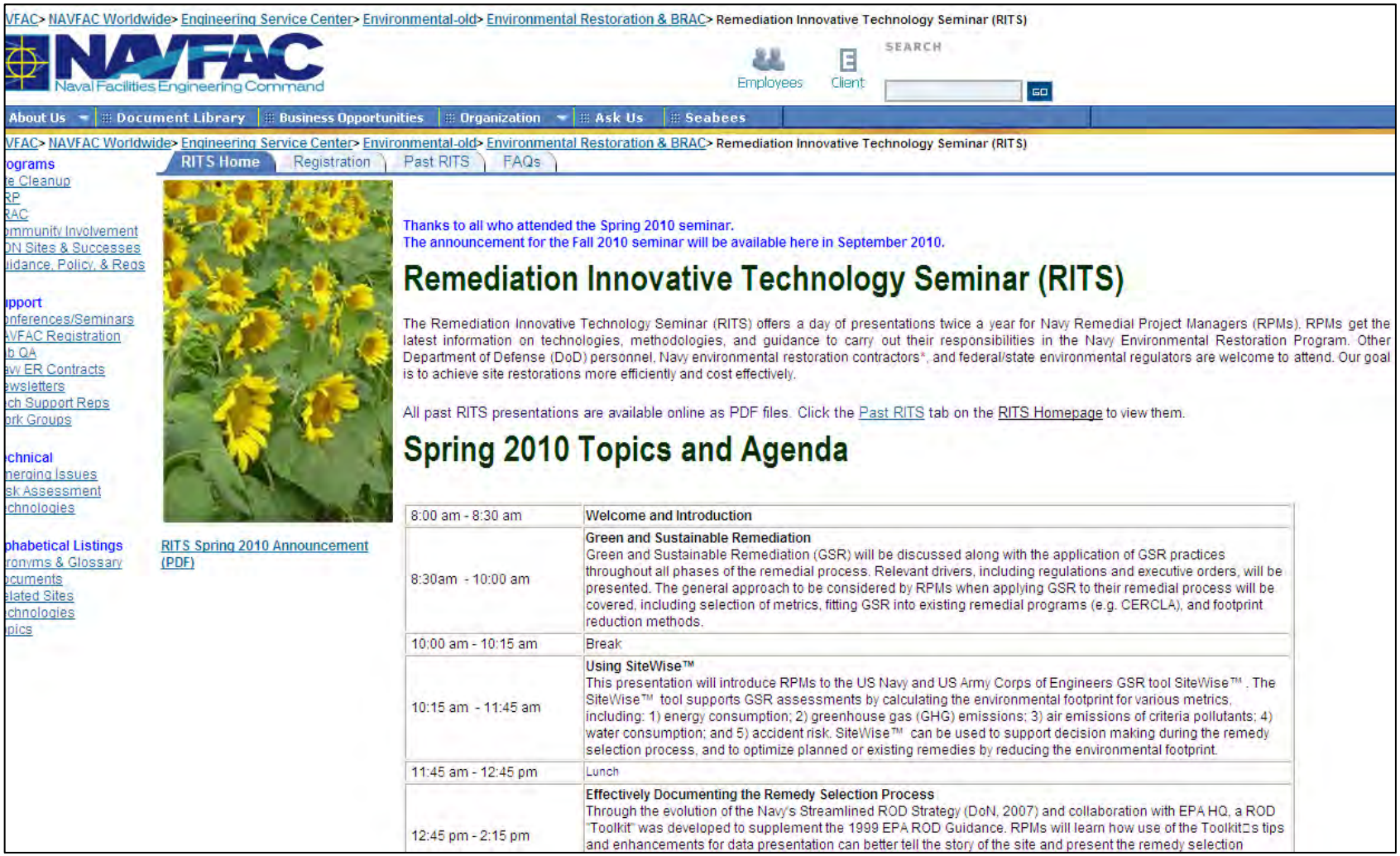
Interstate Technologies Regulatory Council (ITRC)

- Consists of 50 states, the District of Columbia, multiple federal partners, industry participants, and other stakeholders
- Develops guidance documents for consistent regulatory knowledge and approaches for reviewing and approving specific technologies:

- Accelerated Site Characterization
- Alternative Landfill Technologies
- Bioremediation of DNAPLs
- Brownfields
- Constructed Wetlands
- Dense Nonaqueous Phase Liquids
- Diffusion/Passive Samplers
- Ecological Land Reuse
- Enhanced Attenuation: Chlorinated Organics
- Enhanced In Situ Biodenitrification
- In Situ Bioremediation
- In Situ Chemical Oxidation
- LNAPLs
- Mass Flux
- Metals in Soils
- Mitigation Wetlands
- MTBE and Other Fuel Oxygenates
- Perchlorate
- Permeable Reactive Barriers
- Phytotechnologies
- Plasma Technologies
- Policy
- Radionuclides
- Remediation Process Optimization
- Risk Assessment Resources
- Sampling, Characterization and Monitoring
- Small Arms Firing Range
- Thermal Desorption
- Unexploded Ordnance
- Vapor Intrusion

www.itrcweb.org

US Navy



VFAC> NAVFAC Worldwide> Engineering Service Center> Environmental-old> Environmental Restoration & BRAC> Remediation Innovative Technology Seminar (RITS)

NAVFAC Naval Facilities Engineering Command

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VFAC> NAVFAC Worldwide> Engineering Service Center> Environmental-old> Environmental Restoration & BRAC> Remediation Innovative Technology Seminar (RITS)

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RITS Home | Registration | Past RITS | FAQs

RITS Spring 2010 Announcement (PDF)

Thanks to all who attended the Spring 2010 seminar.
The announcement for the Fall 2010 seminar will be available here in September 2010.

Remediation Innovative Technology Seminar (RITS)

The Remediation Innovative Technology Seminar (RITS) offers a day of presentations twice a year for Navy Remedial Project Managers (RPMs). RPMs get the latest information on technologies, methodologies, and guidance to carry out their responsibilities in the Navy Environmental Restoration Program. Other Department of Defense (DoD) personnel, Navy environmental restoration contractors*, and federal/state environmental regulators are welcome to attend. Our goal is to achieve site restorations more efficiently and cost effectively.

All past RITS presentations are available online as PDF files. Click the Past RITS tab on the RITS Homepage to view them.

Spring 2010 Topics and Agenda

8:00 am - 8:30 am	**Welcome and Introduction**
8:30am - 10:00 am	**Green and Sustainable Remediation** Green and Sustainable Remediation (GSR) will be discussed along with the application of GSR practices throughout all phases of the remedial process. Relevant drivers, including regulations and executive orders, will be presented. The general approach to be considered by RPMs when applying GSR to their remedial process will be covered, including selection of metrics, fitting GSR into existing remedial programs (e.g. CERCLA), and footprint reduction methods.
10:00 am - 10:15 am	Break
10:15 am - 11:45 am	**Using SiteWise™** This presentation will introduce RPMs to the US Navy and US Army Corps of Engineers GSR tool SiteWise™ . The SiteWise™ tool supports GSR assessments by calculating the environmental footprint for various metrics, including: 1) energy consumption; 2) greenhouse gas (GHG) emissions; 3) air emissions of criteria pollutants; 4) water consumption; and 5) accident risk. SiteWise™ can be used to support decision making during the remedy selection process, and to optimize planned or existing remedies by reducing the environmental footprint.
11:45 am - 12:45 pm	Lunch
12:45 pm - 2:15 pm	**Effectively Documenting the Remedy Selection Process** Through the evolution of the Navy's Streamlined ROD Strategy (DoN, 2007) and collaboration with EPA HQ, a ROD "Toolkit" was developed to supplement the 1999 EPA ROD Guidance. RPMs will learn how use of the Toolkit□s tips and enhancements for data presentation can better tell the story of the site and present the remedy selection

US Army Corps of Engineers

www.environmental.usace.army.mil/rse_checklist.htm

Other Agencies

- National Aeronautics and Space Administration (NASA)
  - http://nasaksc.rti.org/index.cfm
- US Department of the Interior (DOI)
  - www.doi.gov/oepc
- US Department of Energy (DOE)
  - National Renewable Energy Laboratory
  - www.nrel.gov
- United States Geological Survey (USGS)
  - http://water.usgs.gov
  - http://water.usgs.gov/international

Resources of Specific Interest to ConSoil Attendees

CLU-IN ConSoil Website

- Pre-ConSoil 2010 Internet Seminar *US and EU Perspectives on Green and Sustainable Remediation*
- EPA Session Presentations
  - Green Remediation: Reducing the Environmental Footprint of Cleanups
  - Remedy Optimization through Independent Design Reviews (IDRs)
  - Remedy Optimization through Remediation System Evaluations (RSEs)
  - Investigation Process Optimization (IPO)
- Special Sessions: Sustainable Remediation
  - International developments
  - Case studies: Does it make a difference?
- Post-ConSoil 2010 Internet Seminar
- Archive of prior ConSoil Conferences

www.clu-in.org/consoil

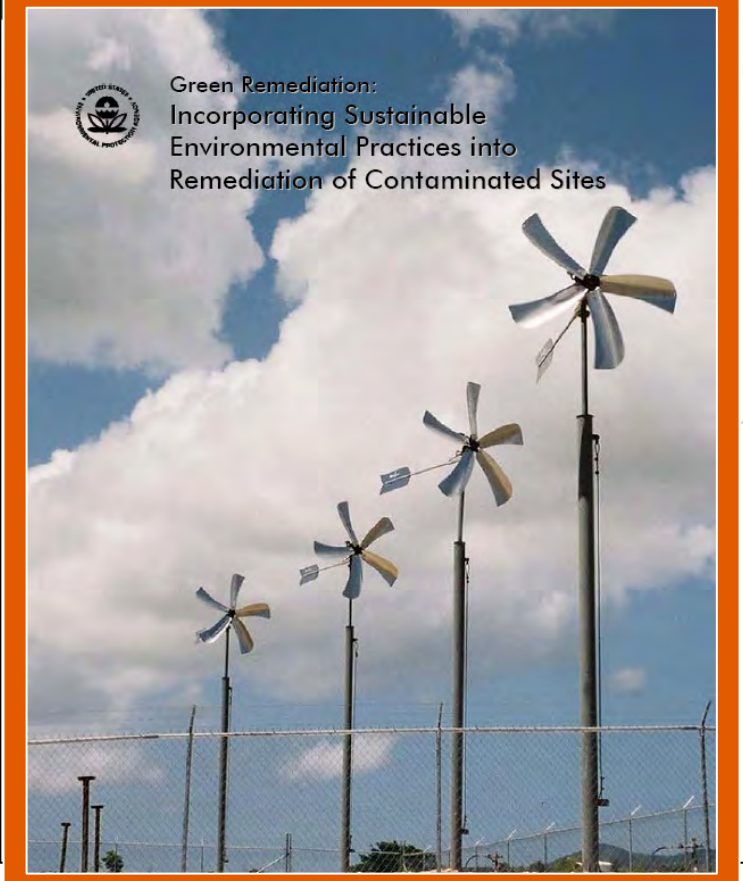
CLU-IN Website

CLU-IN Green Remediation Focus

www.clu-in.org/greenremediation

- Newly redesigned website provides more effective access to resources

New Document



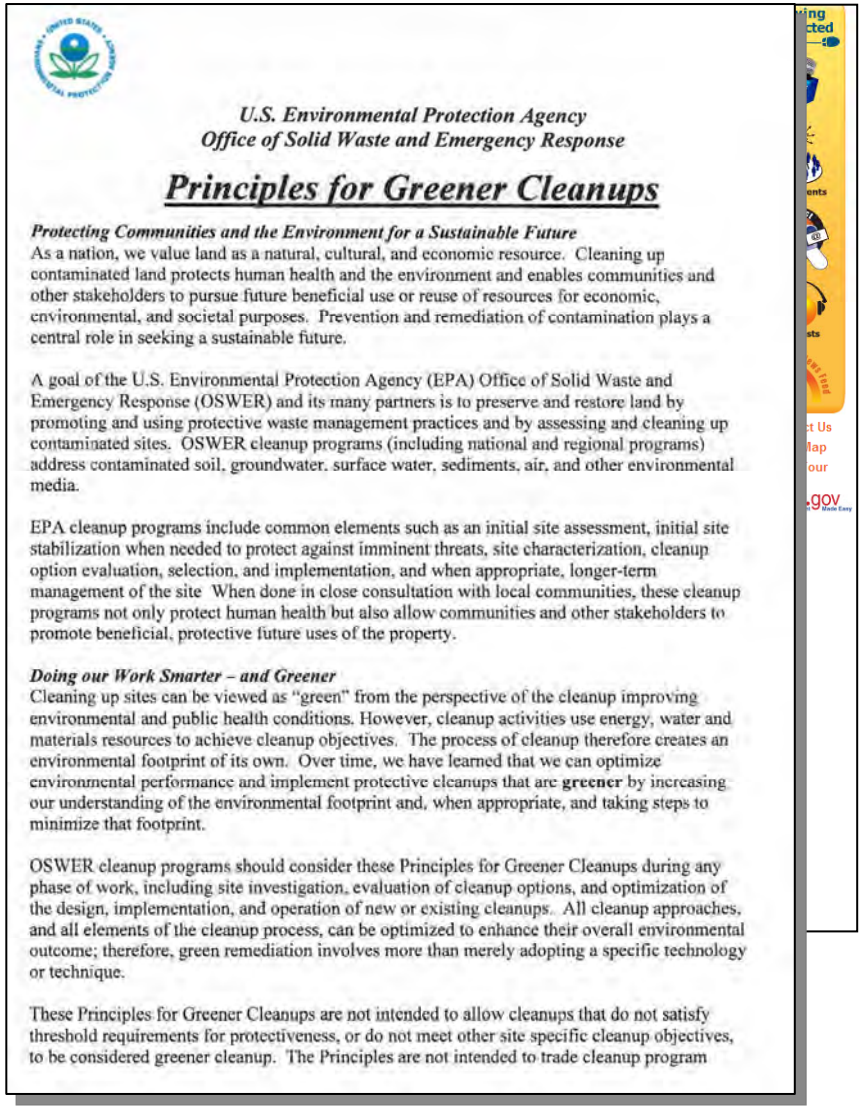
Available for downloading

CLU-IN Website

CLU-IN Green Remediation Focus

www.clu-in.org/greenremediation

- Newly redesigned website provides more effective access to resources
- Policies and strategies information



U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response

Principles for Greener Cleanups

Protecting Communities and the Environment for a Sustainable Future

As a nation, we value land as a natural, cultural, and economic resource. Cleaning up contaminated land protects human health and the environment and enables communities and other stakeholders to pursue future beneficial use or reuse of resources for economic, environmental, and societal purposes. Prevention and remediation of contamination plays a central role in seeking a sustainable future.

A goal of the U.S. Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) and its many partners is to preserve and restore land by promoting and using protective waste management practices and by assessing and cleaning up contaminated sites. OSWER cleanup programs (including national and regional programs) address contaminated soil, groundwater, surface water, sediments, air, and other environmental media.

EPA cleanup programs include common elements such as an initial site assessment, initial site stabilization when needed to protect against imminent threats, site characterization, cleanup option evaluation, selection, and implementation, and when appropriate, longer-term management of the site When done in close consultation with local communities, these cleanup programs not only protect human health but also allow communities and other stakeholders to promote beneficial, protective future uses of the property.

Doing our Work Smarter – and Greener

Cleaning up sites can be viewed as "green" from the perspective of the cleanup improving environmental and public health conditions. However, cleanup activities use energy, water and materials resources to achieve cleanup objectives. The process of cleanup therefore creates an environmental footprint of its own. Over time, we have learned that we can optimize environmental performance and implement protective cleanups that are **greener** by increasing our understanding of the environmental footprint and, when appropriate, and taking steps to minimize that footprint.

OSWER cleanup programs should consider these Principles for Greener Cleanups during any phase of work, including site investigation, evaluation of cleanup options, and optimization of the design, implementation, and operation of new or existing cleanups. All cleanup approaches, and all elements of the cleanup process, can be optimized to enhance their overall environmental outcome; therefore, green remediation involves more than merely adopting a specific technology or technique.

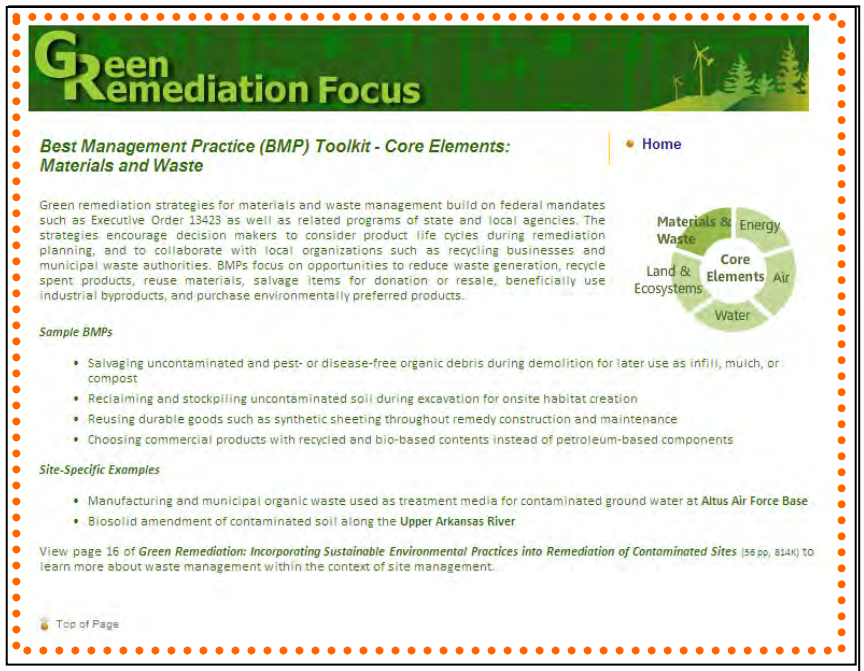
These Principles for Greener Cleanups are not intended to allow cleanups that do not satisfy threshold requirements for protectiveness, or do not meet other site specific cleanup objectives, to be considered greener cleanup. The Principles are not intended to trade cleanup program

CLU-IN Website

CLU-IN Green Remediation Focus

www.clu-in.org/greenremediation

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit

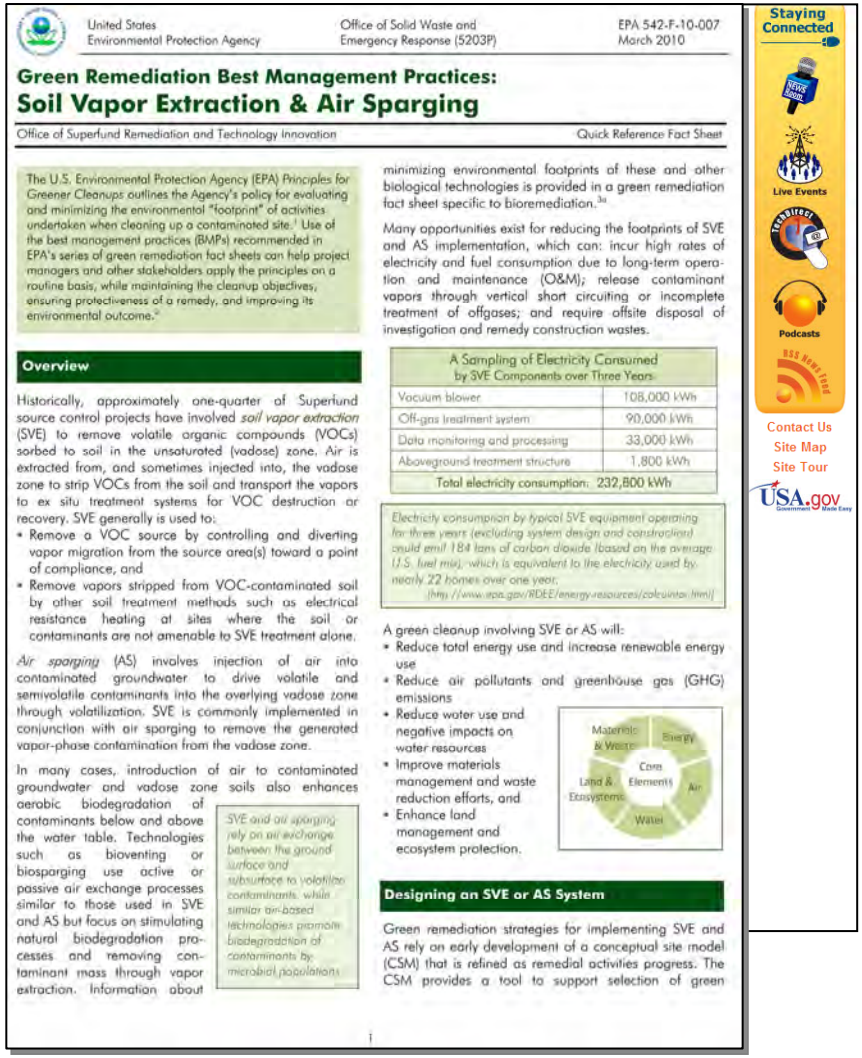


CLU-IN Website

CLU-IN Green Remediation Focus

www.clu-in.org/greenremediation

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit
- BMP fact sheets



United States Environmental Protection Agency | Office of Solid Waste and Emergency Response (5203P) | EPA 542-F-10-007 March 2010

Green Remediation Best Management Practices:
Soil Vapor Extraction & Air Sparging

Office of Superfund Remediation and Technology Innovation | Quick Reference Fact Sheet

The U.S. Environmental Protection Agency (EPA) *Principles for Greener Cleanups* outlines the Agency's policy for evaluating and minimizing the environmental "footprint" of activities undertaken when cleaning up a contaminated site.[1] Use of the best management practices (BMPs) recommended in EPA's series of green remediation fact sheets can help project managers and other stakeholders apply the principles on a routine basis, while maintaining the cleanup objectives, ensuring protectiveness of a remedy, and improving its environmental outcome.[2]

Overview

Historically, approximately one-quarter of Superfund source control projects have involved *soil vapor extraction* (SVE) to remove volatile organic compounds (VOCs) sorbed to soil in the unsaturated (vadose) zone. Air is extracted from, and sometimes injected into, the vadose zone to strip VOCs from the soil and transport the vapors to ex situ treatment systems for VOC destruction or recovery. SVE generally is used to:

- Remove a VOC source by controlling and diverting vapor migration from the source area(s) toward a point of compliance, and
- Remove vapors stripped from VOC-contaminated soil by other soil treatment methods such as electrical resistance heating at sites where the soil or contaminants are not amenable to SVE treatment alone.

Air sparging (AS) involves injection of air into contaminated groundwater to drive volatile and semivolatile contaminants into the overlying vadose zone through volatilization. SVE is commonly implemented in conjunction with air sparging to remove the generated vapor-phase contamination from the vadose zone.

In many cases, introduction of air to contaminated groundwater and vadose zone soils also enhances aerobic biodegradation of contaminants below and above the water table. Technologies such as bioventing or biosparging use active or passive air exchange processes similar to those used in SVE and AS but focus on stimulating natural biodegradation processes and removing contaminant mass through vapor extraction. Information about minimizing environmental footprints of these and other biological technologies is provided in a green remediation fact sheet specific to bioremediation.[3a]

SVE and air sparging rely on air exchange between the ground surface and subsurface to volatilize contaminants, while similar air-based technologies promote biodegradation of contaminants by microbial populations.

Many opportunities exist for reducing the footprints of SVE and AS implementation, which can: incur high rates of electricity and fuel consumption due to long-term operation and maintenance (O&M); release contaminant vapors through vertical short circuiting or incomplete treatment of offgases; and require offsite disposal of investigation and remedy construction wastes.

A Sampling of Electricity Consumed by SVE Components over Three Years

Vacuum blower	108,000 kWh
Off-gas treatment system	90,000 kWh
Data monitoring and processing	33,000 kWh
Aboveground treatment structure	1,800 kWh
Total electricity consumption:	232,800 kWh

Electricity consumption by typical SVE equipment operating for three years (excluding system design and construction) could emit 184 tons of carbon dioxide (based on the average U.S. fuel mix), which is equivalent to the electricity used by nearly 22 homes over one year.
(http://www.epa.gov/RDEE/energy-resources/calculator.html)

A green cleanup involving SVE or AS will:

- Reduce total energy use and increase renewable energy use
- Reduce air pollutants and greenhouse gas (GHG) emissions
- Reduce water use and negative impacts on water resources
- Improve materials management and waste reduction efforts, and
- Enhance land management and ecosystem protection.

Designing an SVE or AS System

Green remediation strategies for implementing SVE and AS rely on early development of a conceptual site model (CSM) that is refined as remedial activities progress. The CSM provides a tool to support selection of green

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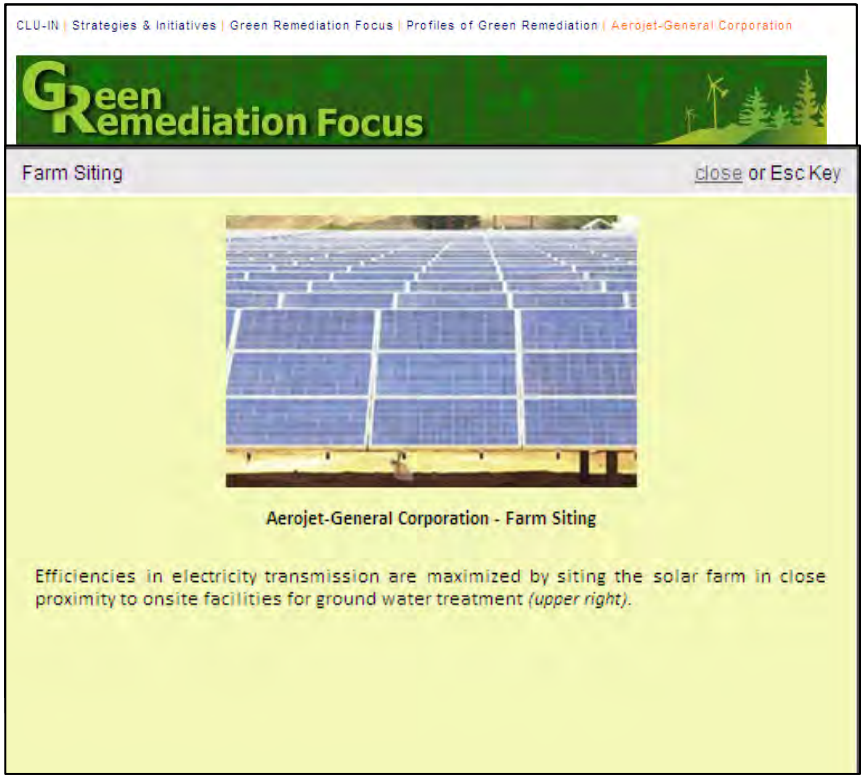
www.clu-in.org/greenremediation

- Newly redesigned website provides more effective access to resources
- Policies and strategies information
- Best Management Practices toolkit
- BMP fact sheets
- Green remediation profiles



Summary

- Many resources are available from EPA and other U.S. resources
- Information sources are varied (podcast to hardcopy)
- No longer a problem of too little information

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Questions?

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Thank You

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