Cribando Información Sobre Tecnologías Para la Recuperación de Suelos Contaminados

16 de diciembre, 2002

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Agenda: Cribando Información

- Fuentes de Información
  - Portales y páginas en Internet
  - Proyectos documentados a fondo Proveedores en el mercado
  - Tecnologías de Caracterización
- Cursos y seminarios

Welcome to the Federal Remediation Technologies Roundtable - Netscape

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Welcome to the Federal Remediation Technologies Roundtable

- Mission & Member Agencies
- Partnerships & Consortiums

- Meetings & Workgroups
- Publications Library

- Cost & Performance
  Look here for more than 270 case studies on remedial technologies

- Technology Infobase
- Optimization & Evaluation

- Technology Demonstrations
- Technology Development

- Remediation Screening Matrix
- Sampling & Analysis Matrix

- Technology Synonym List
- What's New!

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Table 3-2: Treatment Technologies Screening Matrix

Rating Codes
■ - Better; ○ - Average;
△ - Worse; ◆ - See definition
Y - Yes; N - No.
F - Full; P - Pilot.
S - Solid; L - Liquid;
V - Vapor.
NA - Not Applicable
I - Inadequate.
O&M - Operation & Maintenance; Cap - Capital; B - Both

	Development Status	Treatment Train (excludes off-gas treatment)	Residuals Produced	O&M or Capital Intensive	Availability	System Reliability/ Maintainability	Cleanup Time	Overall Cost	Nonhalogenated VOCs	Halogenated VOCs	Nonhalogenated SVOCs	Halogenated SVOCs	Fuels	Inorganics	Radionuclides	Explosives
Ground Water, Surface Water, and Leachate																
3.9 In Situ Biological Treatment																
4.33 Co-metabolic Treatment	P	N	N	O&M	△	◆	◆	◆	■	◆	■	◆	◆	△	△	○
4.34 Enhanced Biodegradation · Nitrate Enhancement · Oxygen Enhancement with Air Sparging · Oxygen Enhancement with Hydrogen Peroxide	F	N	N	O&M	■	◆	◆	◆	■	◆	■	◆	■	△	△	○
4.35 Natural Attenuation	F	N	N	O&M	■	◆	◆	◆	◆	◆	◆	◆	◆	△	△	△
4.36 Phytoremediation · Enhanced Rhizosphere Biodegradation · Hydraulic Control · Phyto-Degradation · Phyto-Volatilization	P	N	N	N	○	■	△	■	○	○	○	○	○	■	△	■
3.10 In Situ Physical/Chemical Treatment																
4.37 Aeration	F	Y	V	N	■	○	■	■	■	■	○	○	■	△	△	△
4.38 Air Sparging	F	Y	V	N	■	■	■	■	■	■	△	△	■	△	△	△
4.39 Bioslurping	F	Y	L V	N	■	○	○	■	○	○	■	■	■	△	△	○
4.40 Directional Wells (enhancement)	F	N	NA	Cap.	△	○	■	I	○	○	○	○	○	○	△	○
4.41 Dual Phase Extraction	F	Y	L V	O&M	■	○	○	○	■	■	△	△	■	△	△	△
4.42 Fluid/Vapor Extraction	F	Y	L V	O&M	■	○	○	○	■	■	○	○	■	△	△	△
4.43 Hot Water or Steam	P	Y	L	Cap.	■	△	■	○	○	○	■	■	■	△	△	△

4.38 Air Sparging

(In Situ Ground Water Remediation Technology)

Previous Section | Top Page | Screen Matrix | Table of Contents | Synonym List | Next Section

Description | Synonyms | Applicability | Limitations
Data Needs | Performance | Cost | References
Site Information | Points of Contact | Vendor Information | Health & Safety

Technology	Description
Ground Water, Surface Water, and Leachate	
3.10 In Situ Physical/Chemical Treatment	
4.38 Air Sparging	Air is injected into saturated matrices to remove contaminants through volatilization.

Description:

Figure 4-38:
Typical Air Sparging System

Air sparging is an in situ technology in which air is injected through a contaminated aquifer. Injected air traverses horizontally and vertically in channels through the soil column, creating an underground stripper that removes contaminants by volatilization. This injected air helps to flush (bubble) the contaminants up into the unsaturated zone where a vapor extraction system is usually implemented in conjunction with air sparging to remove the generated vapor phase contamination.This technology is designed to operate at high flow rates to maintain increased contact between ground water and soil and strip more ground water by sparging.

Oxygen added to contaminated ground water and vadose zone soils can also enhance biodegradation of contaminants below and above the water table.

Air sparging has a medium to long duration which may last, generally, up to a few years

http://clu-in.org
El Portal de Información sobre tecnologías de tratamiento

CLU-IN

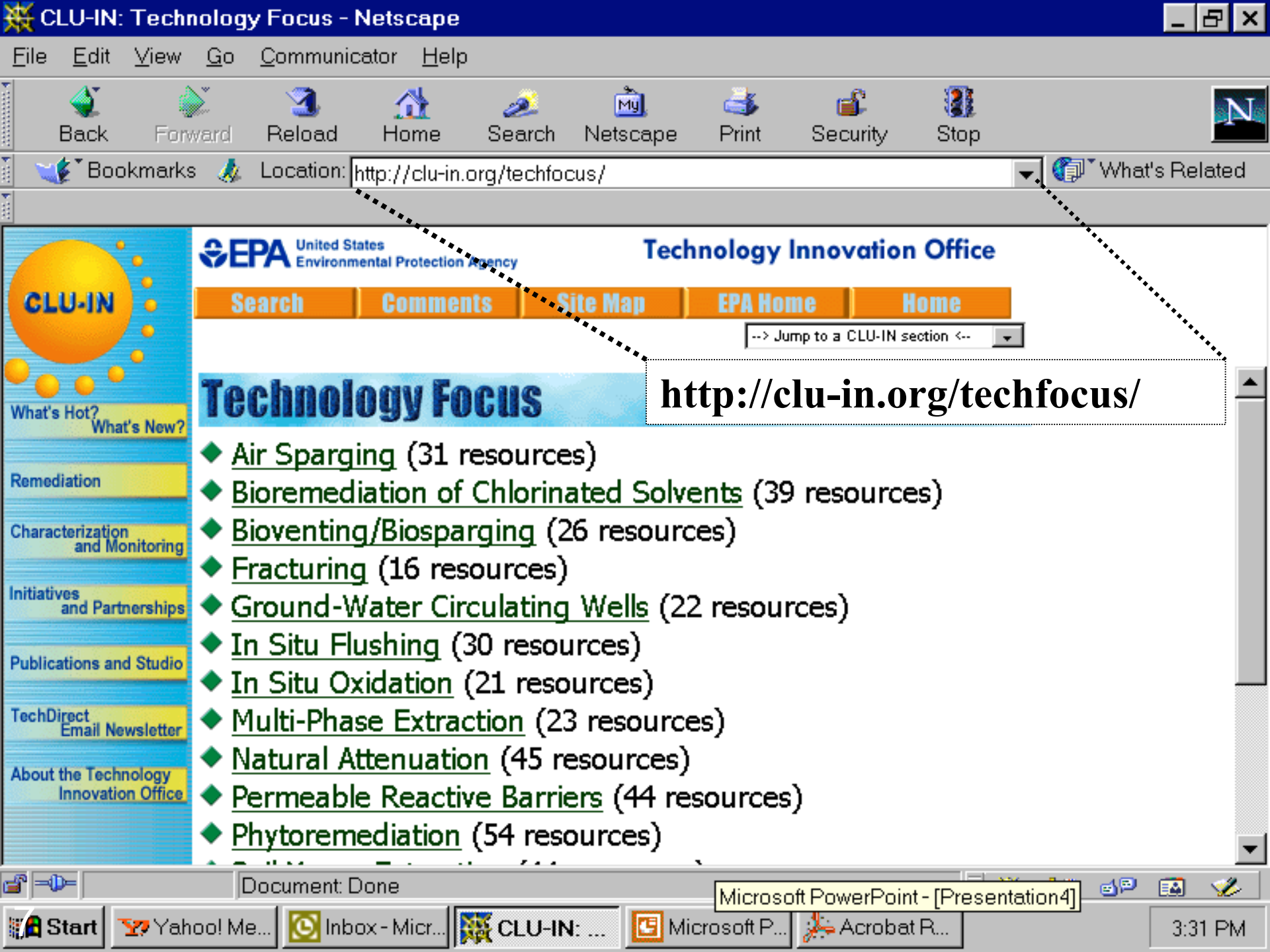
EPA United States Environmental Protection Agency

Technology Innovation Office

- Publications & Software
- Remediation
- Site Characterization
- Partnerships & Consortia
- International Updates
- Vendor Support
- TechDirect

Y2K

- Tecnologías de tratamiento
- Tecnologías de caracterización y monitoreo
- Asociaciones, Mesas Redondas y Consorcios Tecnológicos
- Actualizaciones de Actividades Internacionales de Saneamiento
- Apoyo de los Vendedores
- Publicaciones para Ser Descargadas
- Actualizaciones gratuitas por correo electrónico por medio de TechDirect
- Política Regulatoria en Información y Tecnología
- Enlaces a Otros Recursos en Internet y en línea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Air Sparging (31 resources)
Bioremediation of Chlorinated Solvents (39 resources)
Bioventing/Biosparging (26 resources)
Fracturing (16 resources)
Ground-Water Circulating Wells (22 resources)
In Situ Flushing (30 resources)
In Situ Oxidation (21 resources)
Multi-Phase Extraction (23 resources)
Natural Attenuation (45 resources)
Permeable Reactive Barriers (44 resources)
Phytoremediation (54 resources)
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Citizen's Guides (1 resources)
Technology Description (5 resources)
Applications (11 resources)
Engineering/ Regulatory Guidance (7 resources)
Training (3 resources)
References (4 resources)
Suggest a New Resource for Inclusion
Citizen's Guides
A Citizen's Guide to Soil Vapor Extraction and Air Sparging (English
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FRTR: Proyectos Documentados

- Documentación del costo y funcionamiento de tecnologías de remediación
- Incluye proyectos de remediación finales así como proyectos piloto
- 313 proyectos de las agencias EPA, DoD, DoE
- Versión en Internet con capacidad de búsqueda por tecnología, contaminante, o medio (www.frtr.gov)

http://www.frtr.gov

Documentación de Proyectos (costo y funcionamiento)

Tecnologías de remediación de suelos

In situ

- Aeración de suelos
- Lavado de suelos
- Extracción de vapores
- Vitrificación
- Bioabsorción
- Fitocorrección
- Cobertura de rellenos sanitarios
- Calentamiento *in situ*

Ex situ

- Tratamiento agrónomo
- Abonamiento
- Tratamiento de mezclas
- Lavado de suelos
- Estabilización
- Incineración
- Desorción térmica

http://www.frtr.gov

FRTR: Por sus siglas en Inglés, Federal Remediation Technologies Roundtable, Me
Redonda Federal sobre Technologías de Tratamiento

Documentación de Proyectos (costo y funcionamiento)

Tecnologías de remediación de aguas subterráneas

- Aspersión de aire en suelos
- Biocorrección
- Bioabsorción
- Pozos cíclicos
- Cosolventes sulfactantes
- Extracción bi-fásica
- Aspersión soterrada
- Oxidación *In-situ*
- Reducción natural de compuestos no-clorados
- Reducción natural de hidrocarburos no-clorados
- Barreras Reactivas Permeables
- Bombeo y Tratamiento
- Fitocorrección
- Lavado con vapor
- Barreras verticales soterradas

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Technology Cost and Performance

What's Hot? What's New?
FRTR Meetings
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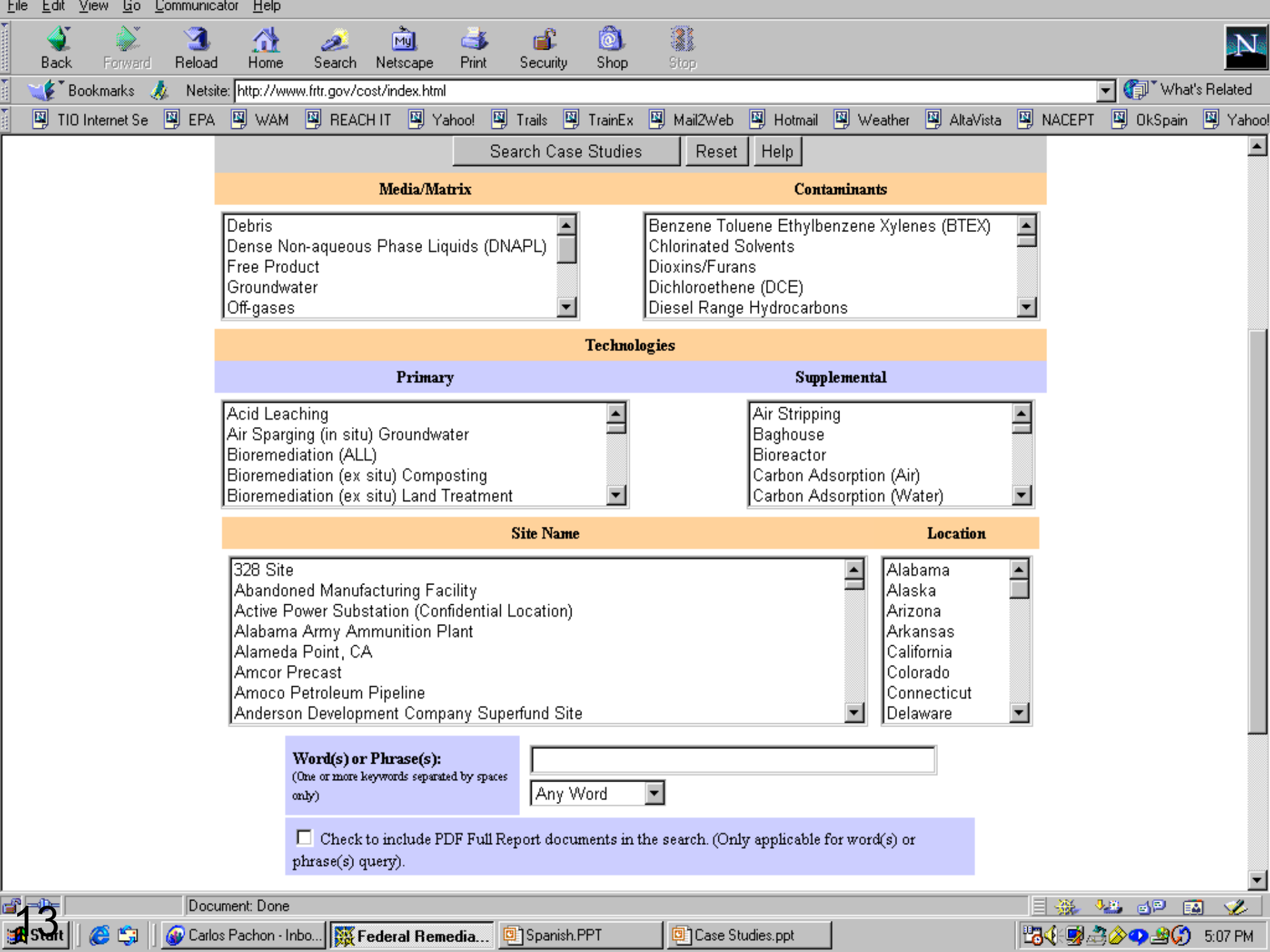
Technology Cost and Performance
Remediation Optimization
Other Focus Areas
Publications
Information Links

Member agencies of the FRTR are working jointly to make data more widely available on real experiences and lessons learned in selecting and implementing treatment and site characterization technologies to clean up soil and groundwater contamination at hazardous waste sites. The remediation case study reports describe the performance and cost of technology applications at full-scale and large-scale demonstration projects.

- FRTR Remediation Case Study Searchable Database provides capability to search all 313 case studies by keywords and categories, including media/matrix, contaminant types, primary and supplemental technology types, specific site names, or location (states).
- Site Characterization and Monitoring Case Studies document experiences and lessons learned in selecting and implementing innovative site characterization and monitoring technologies in 110 cleanup and demonstration projects.
- General Information on Case Studies Learn more about the remediation case studies including formats available, FRTR workgroup contacts, various publications, and summary analysis of information contained in the reports.
- Technology Cost Analysis Links are available from individual FRTR member-agencies.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Debris
Dense Non-aqueous Phase Liquids (DNAPL)
Free Product
Groundwater
Off-gases
Contaminants
Benzene Toluene Ethylbenzene Xylenes (BTEX)
Chlorinated Solvents
Dioxins/Furans
Dichloroethene (DCE)
Diesel Range Hydrocarbons
Technologies
Primary
Acid Leaching
Air Sparging (in situ) Groundwater
Bioremediation (ALL)
Bioremediation (ex situ) Composting
Bioremediation (ex situ) Land Treatment
Supplemental
Air Stripping
Baghouse
Bioreactor
Carbon Adsorption (Air)
Carbon Adsorption (Water)
Site Name
328 Site
Abandoned Manufacturing Facility
Active Power Substation (Confidential Location)
Alabama Army Ammunition Plant
Alameda Point, CA
Amcor Precast
Amoco Petroleum Pipeline
Anderson Development Company Superfund Site
Location
Alabama
Alaska
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
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Abstract | Online Report | Download Report

Air Sparging/Soil Vapor Extraction at Eaddy Brothers, Hemingway, South Carolina

A

Site Name:	Eaddy Brothers
Location:	Hemingway, SC
Period of Operation:	July 1999 - present (data available through August 2000)
Cleanup Type:	Full scale

Technology: Air Sparging/Soil Vapor Extraction (SVE)
- SVE system consists of approximately 230 feet of horizontal SVE piping installed immediately below the asphalt parking lot surface of the site; piping is connected to a 20 HP Lamson Blower operating at 12 to 14 inches of mercury; extracted vapors are treated using a thermal oxidizer.
- Air sparging system, which began operating two weeks after the SVE system was activated, consists of ten vertical air sparging wells, each installed at a depth of about 26 feet with 5-foot well screens; wells are connected to a Kaeser SK-26 air sparge compressor operating at 68 to 70 psi.
- A total of 28 wells (on-and off-site) are used to monitor groundwater

Cleanup Authority: RCRA UST

State Contact:
Read S. Miner, P.G.
Hydrogeologist
South Carolina Dept. of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201
Telephone: (803) 898-4350
Fax: (803) 898-4330
E-mail: minerrs@columb26.dhec.state.sc.us

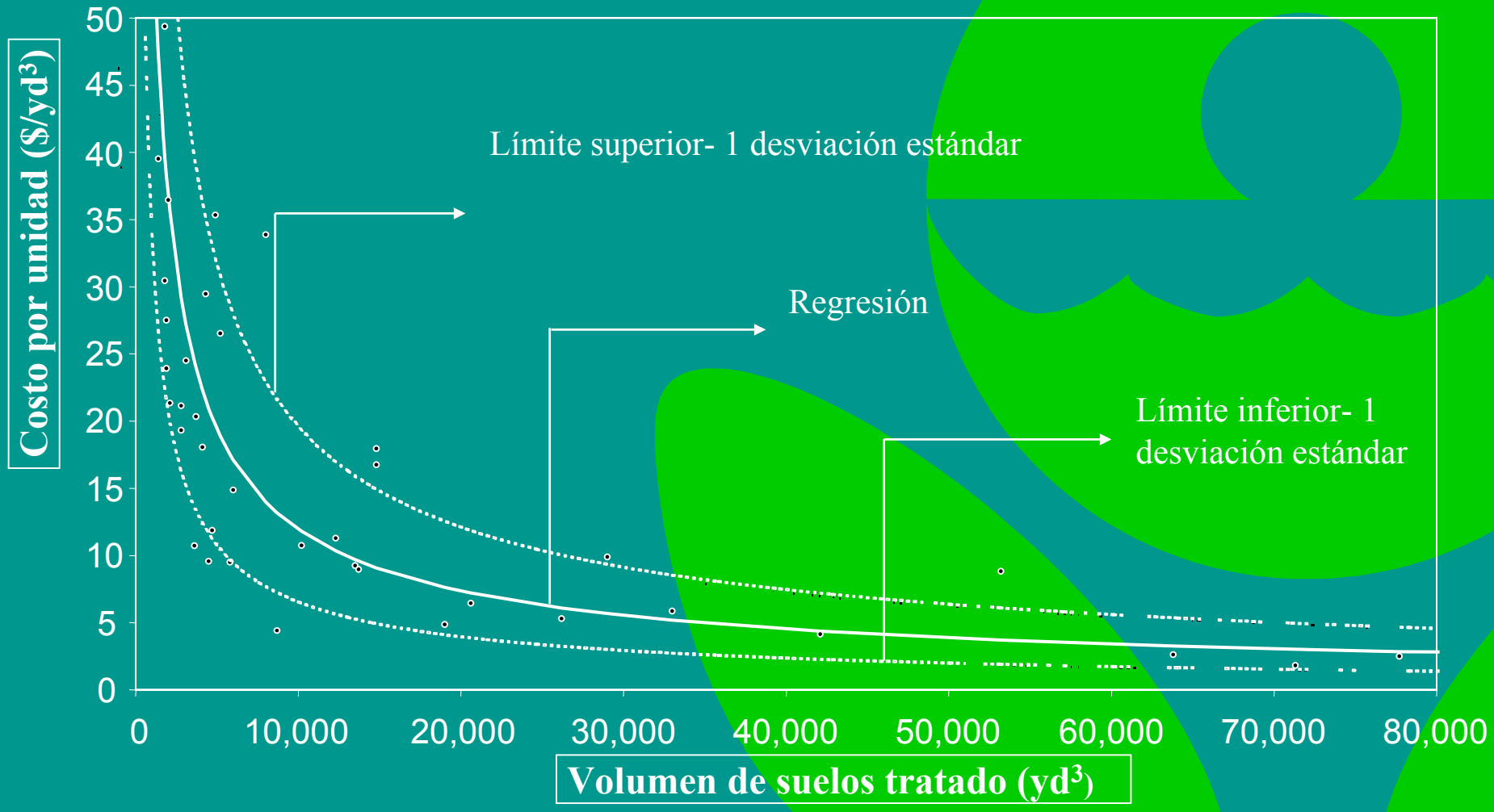
Contractor:
Consultech
Environmental, Inc.
1800 MacLeod Dr.,
Suite F
Lawrenceville, GA 30043
Telephone: (678)
377-0400
Fax: (678) 377-0051
www.consultechenv.com

Contaminants: MTBE, BTEX, Naphthalene
- MTBE concentrations as high as 5,110,000 ug/L

Análisis de Costos de Tecnologías de Remediación – Año 2000

- Análisis de datos de costos de seis tecnologías de remediación: biocorrección, desorción térmica, extracción de vapores, incineración local y barreras reactivas permeables
- Centrado en el **costo por unidad** de masa tratada
- Datos de costos claramente definidos
  - Basados en datos obtenidos en proyectos de agencias federales
  - Gastos asociados con la aplicación de la tecnología
- Creación de curvas de costos
- El análisis confirma que el costo por unidad disminuye al aumentar el volumen en todas las tecnologías

Curva de Costos – Bioaeración



Sistema EPA REACH IT

- Servicio de información gratuito que permite la búsqueda y comparación de tecnologías de caracterización y remediación por Internet
- Información sobre 371 tecnologías de tratamiento y 160 de análisis y caracterización de contaminantes
- Información detallada de 900 proyectos de tratamiento del Superfondo
- Opciones de búsqueda flexibles con varios parámetros: tecnología, contaminante, medio y nombre o ubicación de proyectos
- Actualización continua a partir del 2002

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Updated November 12, 2001

REmediation And CHaracterization Innovative Technologies

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EPA REACH IT, sponsored by EPA's Technology Innovation Office, is a system that lets environmental professionals use the Internet to search, view, download, and print information about innovative remediation and characterization technologies.

Select a Search Option by clicking o tabs above.

A

- Use the **Guided Search** tab to conduct simple searches for specific technologies, service providers, or sites. The Guided Search is designed to provide information on as many technologies, service providers, and sites as possible, with minimal filtering of search results. In some cases, the guided search may provide results for technologies, service providers, or sites that are not as relevant to your specific data needs. If you want to tailor your search to a narrow scope, select the Custom Search.

  For more information about the G rch please go to the Guided Search Help page.

B

- Use the **Most Common Searches** ew a dynamic update of the five most commonly requested searches on technologies or contaminant groups for the past calendar month. The Most Common Searches provide one-click searching for commonly requested information, and shows at a glance the types of technologies and contaminants that EPA REACH IT users are most interested in.

  For more information about the M mmon Searches, please go to the Most Common Searches Help page.

C

- Use the **Custom Search** tab to create a customized search that uses multiple database elements to narrow the scope of search results. The Custom Search finds information on technology, service provider, and site characteristics, so you can generate results for a broad class of characteristics, or tailor your search to a targeted scope. By selecting the appropriate search criteria in the custom search you can eliminate from your search results the technologies, service providers, and sites that are not revelant to you.

  For more information about the Custom Search, please go to the Custom Search Help page.

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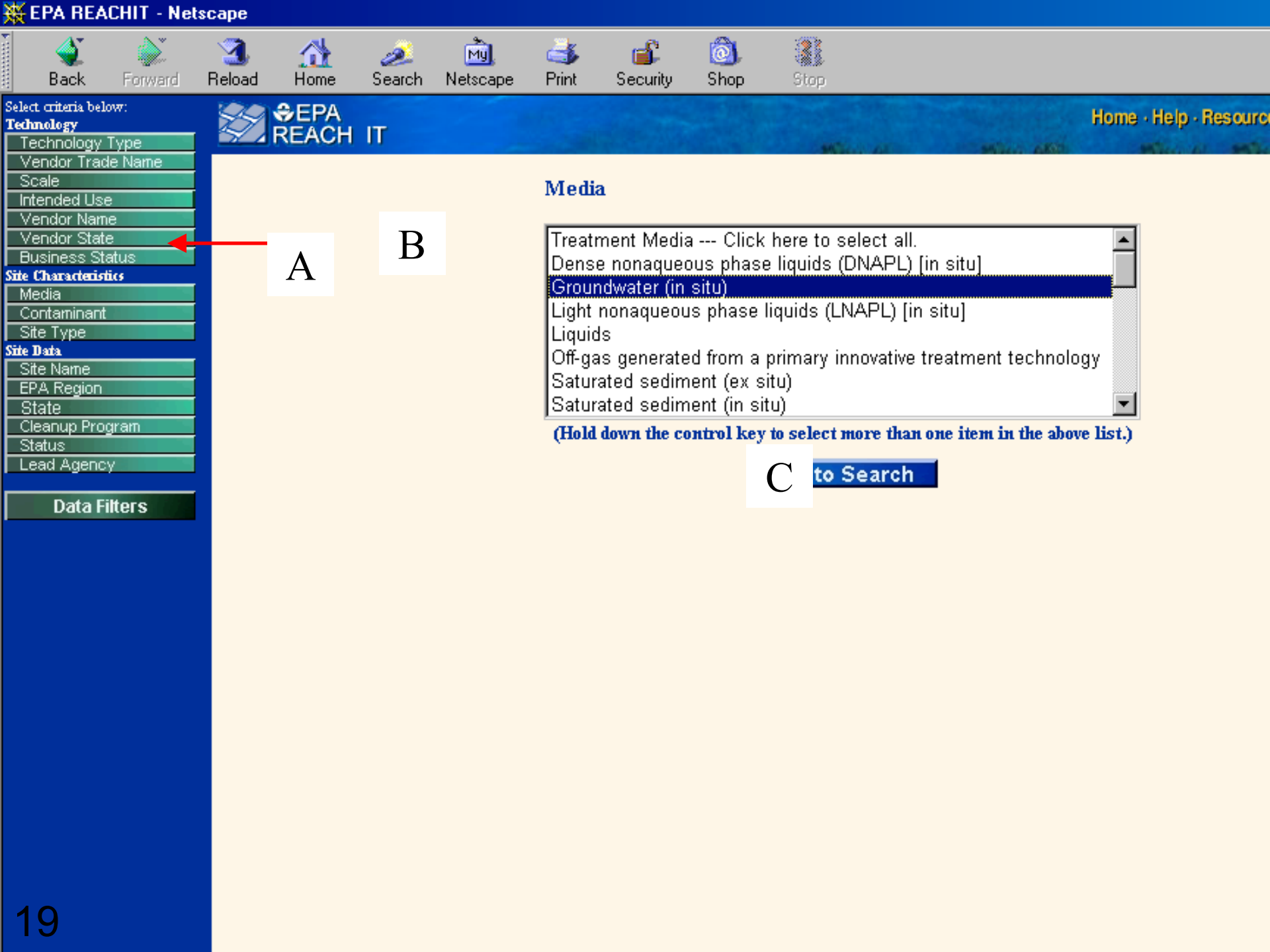
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A
B
Media
Treatment Media --- Click here to select all.
Dense nonaqueous phase liquids (DNAPL) [in situ]
Groundwater (in situ)
Light nonaqueous phase liquids (LNAPL) [in situ]
Liquids
Off-gas generated from a primary innovative treatment technology
Saturated sediment (ex situ)
Saturated sediment (in situ)
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C
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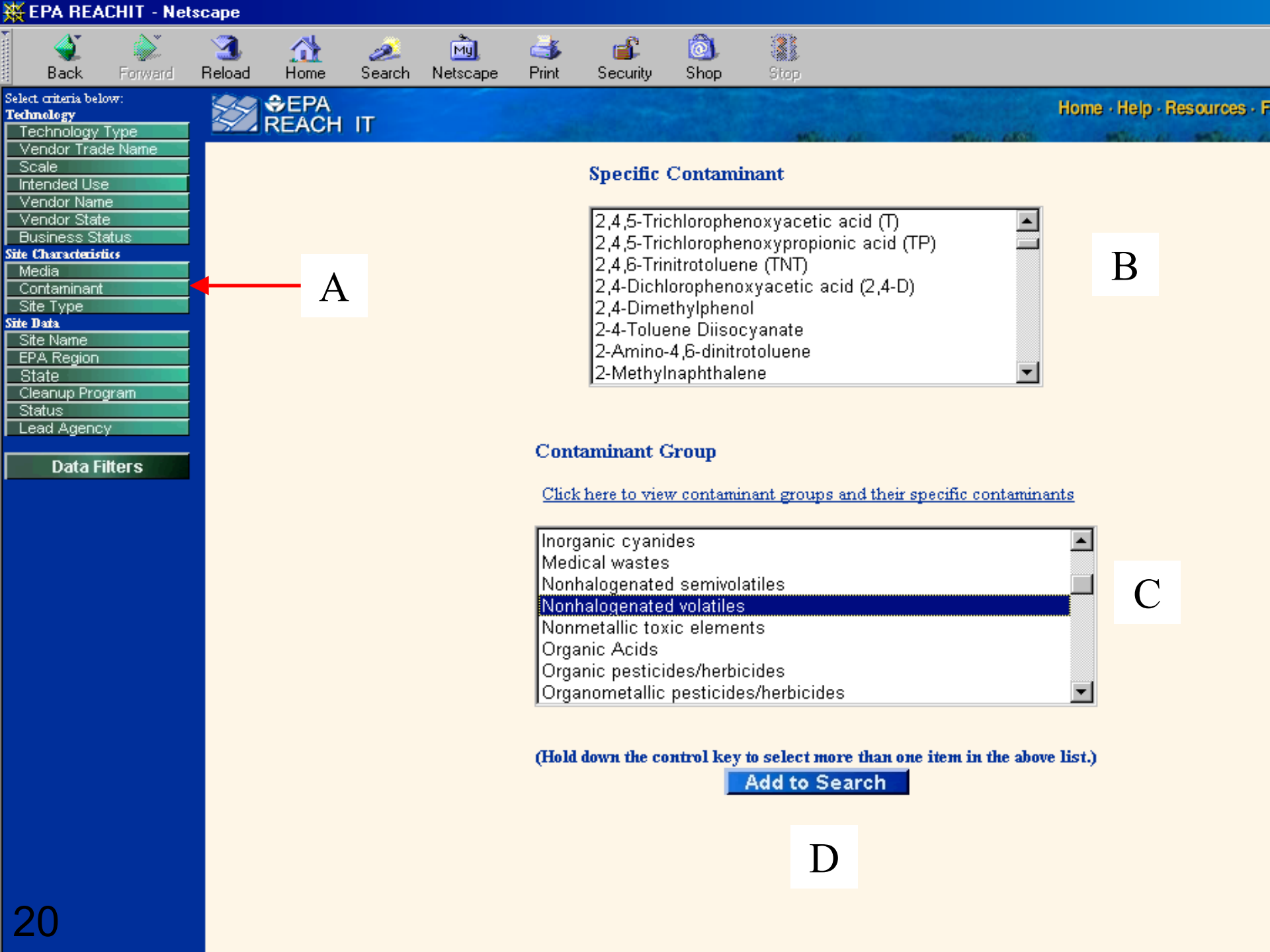
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Media
Contaminant
Site Type
Site Data
Site Name
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A
Specific Contaminant
2,4,5-Trichlorophenoxyacetic acid (T)
2,4,5-Trichlorophenoxypropionic acid (TP)
2,4,6-Trinitrotoluene (TNT)
2,4-Dichlorophenoxyacetic acid (2,4-D)
2,4-Dimethylphenol
2-4-Toluene Diisocyanate
2-Amino-4,6-dinitrotoluene
2-Methylnaphthalene
B
Contaminant Group
Click here to view contaminant groups and their specific contaminants
Inorganic cyanides
Medical wastes
Nonhalogenated semivolatiles
Nonhalogenated volatiles
Nonmetallic toxic elements
Organic Acids
Organic pesticides/herbicides
Organometallic pesticides/herbicides
C
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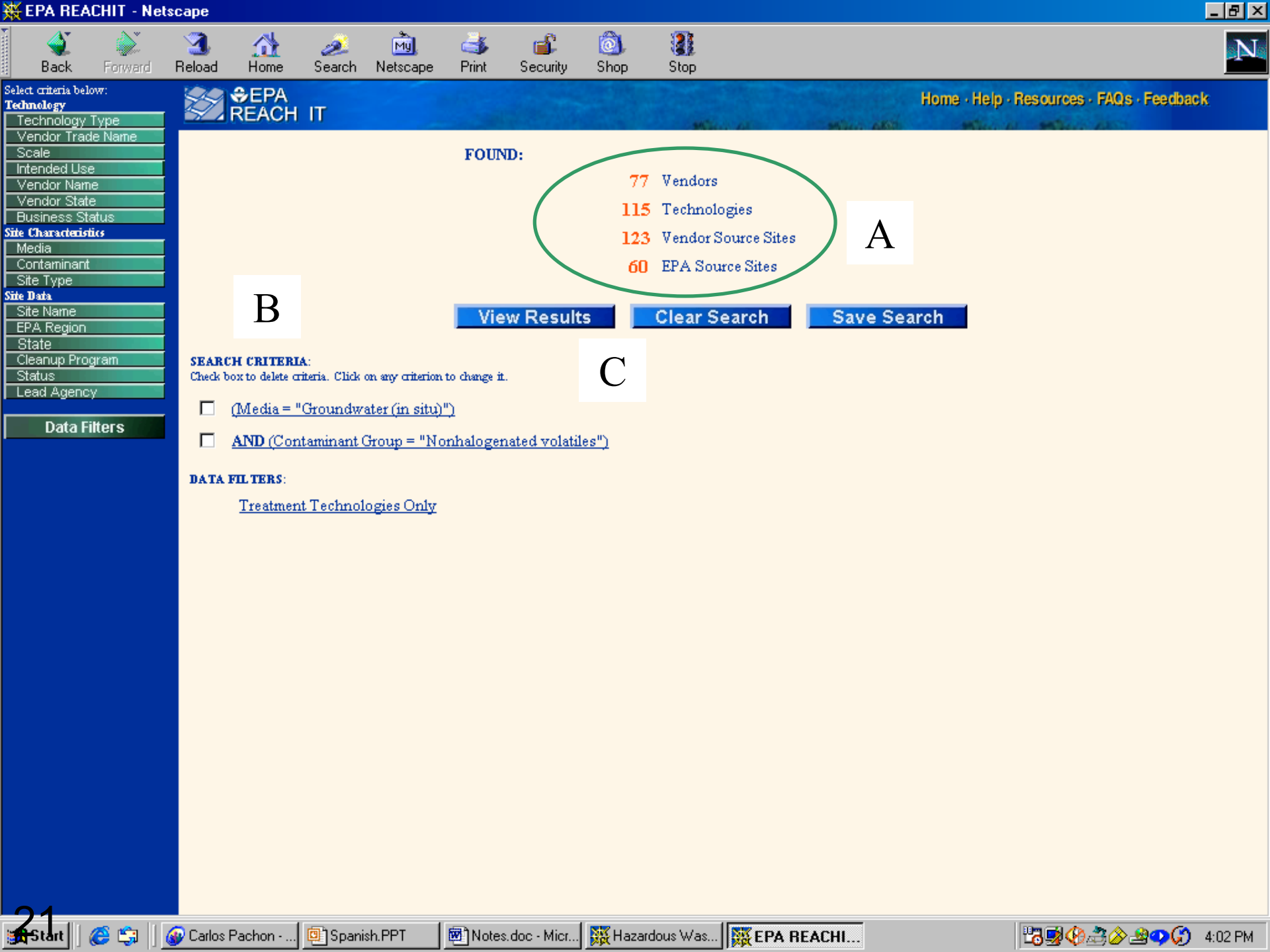
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Vendor Trade Name
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Vendor Name
Vendor State
Business Status
Site Characteristics
Media
Contaminant
Site Type
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77 Vendors
115 Technologies
123 Vendor Source Sites
60 EPA Source Sites
A
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View Results
Clear Search
Save Search
C
SEARCH CRITERIA:
Check box to delete criteria. Click on any criterion to change it.
(Media = "Groundwater (in situ)")
AND (Contaminant Group = "Nonhalogenated volatiles")
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A

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Display Columns:
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- [x] Site

Sort by: E
- ( ) Vendor
- ( ) Technology
- (•) Site

Comparison Reports

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30 Vendors
36 Technologies
21 Vendor Source Sites
27 EPA Source Sites

(Technology Type = "Air Sparging (in situ) - Groundwater") **AND** (Media = "Groundwater (in situ)") **AND** (Contaminant Group = "Nonhalogenated volatiles")

Results D

Site B	Vendor C	Technology
Allied Steel Click here to view details.	Integrated Environmental Solutions, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater-Quick-Purge **Click here to view details.**
Amcor Precast Click here to view details.	Wasatch Environmental, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater-Density Driven Convection (DDC)
Amcor Precast F Click here to view de	Wasatch Environm G Click here to view	Air Sparging (in situ) - Groundwater-Density Driven Convection (DDC) H **Click here to view details.**
Amoco Petroleum Pipeline Click here to view details.	Residuals Management Technology, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater
Borden South Click here to view details.	Wasatch Environmental, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater-Density Driven Convection (DDC) **Click here to view details.**
Brookhaven National Laboratory (USDOE) - OU 4 Click here to view details.	NA Click here to view details.	Air Sparging (in situ) - Groundwater
Burgess Brothers Landfill - OU 01 Click here to view details.	NA Click here to view details.	Air Sparging (in situ) - Groundwater
Cecil Field Naval Air Station - OU 2, Site 5 Click here to view details.	Bechtel Environmental, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater
Chemical Facility Click here to view details.	ENVIROGEN, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater **Click here to view details.**
Chemical Manufacturer Click here to view details.	ENVIROGEN, Inc. Click here to view details.	Air Sparging (in situ) - Groundwater **Click here to view details.**

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Regulation
Project Type
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Performance
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Vendor Source Site: Amcor Precast, Density Driven Convection (DDC)-Air Sparging (in situ) - Groundwater, Wasatch Environmental, Inc.

A

Site Name: Amcor Precast

Site Location: Ogden, Utah
☑ This project took place at another site (ie. test facility).

Volume/Quantity Treated:

Area treated (in situ projects): 30000 square feet

Depth treated (for in situ projects): *information not provided.*

Equipment Scale: Full Scale

Project Status:

B

Site Type or Waste Source:
Gasoline Service Station/Petroleum Storage Facility

Project Type:
UST

Regulation/Statute/Organization
UST corrective action

Lead Agency
Information not provided.

Media Treated
Groundwater (in situ)
Light nonaqueous phase liquids (LNAPL) [in situ]
Soil (in situ)

C

Performance Data

Contaminant or Pollutant Parameter	Untreated Concentration Range (Min to Max)	Units	Treated Concentration Range (Min to Max)	Units	Cleanup Standard or Goal	Units
Benzene	0 to 4.7	mg/L	0 to	mg/L	to 0.01	mg/L
Benzene	0 to 7.8	mg/L	0 to	mg/L	to 0.2	mg/L
Ethylbenzene	0 to 19	mg/L	to 0.1	mg/L	to 70	mg/L
Ethylbenzene	0 to 2.7	mg/L	to 0.02	mg/L	to 0.7	mg/L
Naphthalene	0 to 6.3	mg/L	to 0.01	mg/L	to 0.02	mg/L
Toluene	0 to 9.4	mg/L	to 0.26	mg/L	to 1	mg/L

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Programa EPA de Verificación de Tecnologías

Caracterización y Monitoreo de Sitios Cotaminados

Categorías	Tecnologías Verificadas	Informe
Cono de penetración con fluorescencia inducida por láser	2	Completado
XRF Portátil (SITE)	7	Completado
GC/MS Portátil	2	Completado
Muestreo de gases en suelos (SITE)	6	Completado
Monitoreo de cabezal de pozo (COV)	5	Completado
Análisis de PCB	9	Completado
Software de apoyo al análisis de decisiones	6	Completado
Muestreo de aguas subterráneas	6	Completado
Kits de análisis de explosivos	4	Completado
Kits de análisis de HPT	5	En revisión
Muestreo de sedimentos (SITE)	2	Completado
Detección de plomo en polvo	8	Proyecto nuevo

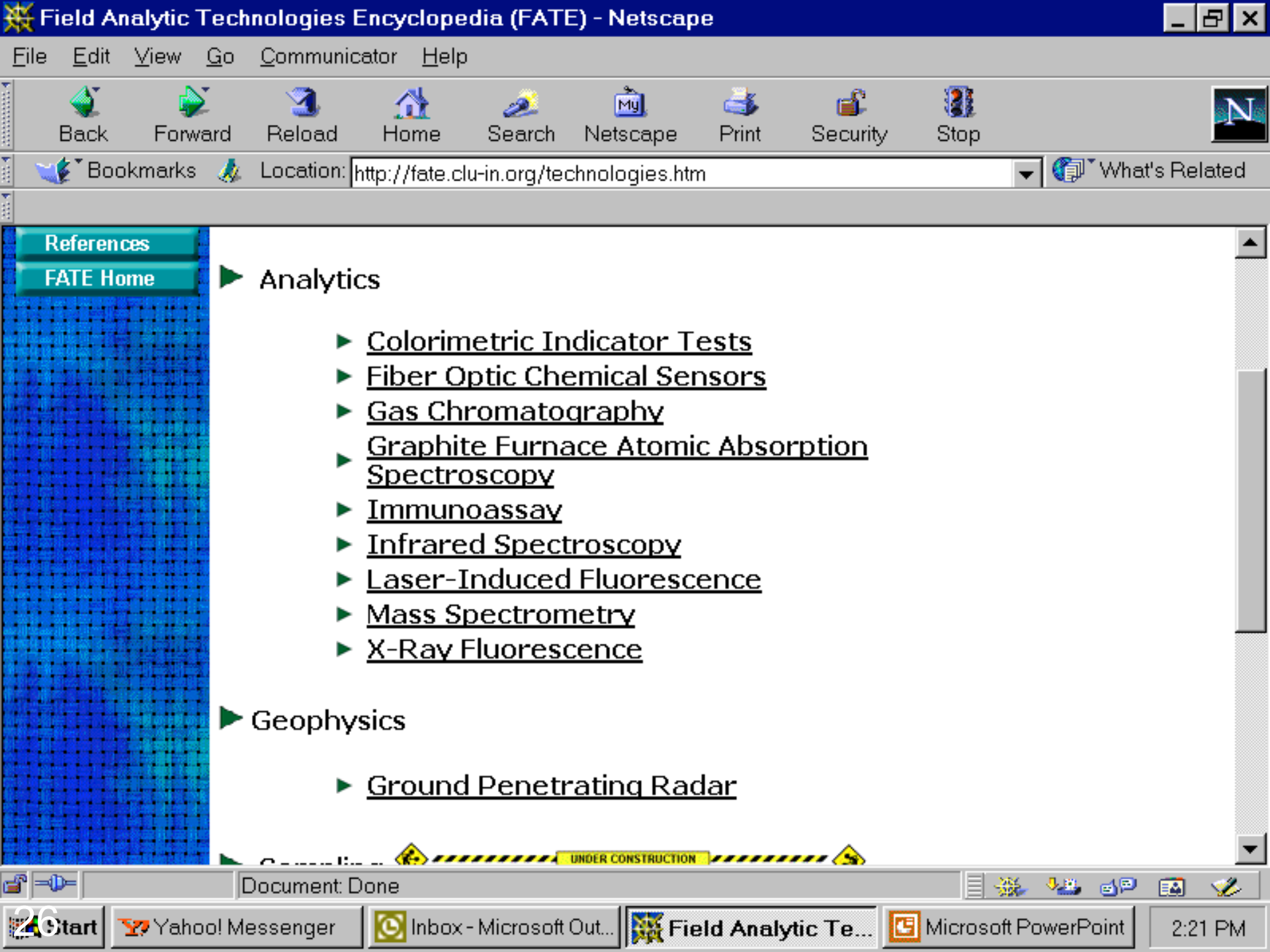
http://www.epa.gov/etv

Enciclopedia de Tecnologías Analíticas de Campo (FATE)*

- Enciclopedia en internet ofreciendo información sobre tecnologías analíticas de campo para la gestión de residuos nocivos.
- Actualmente incluye 10 clases de technologías, como tests indicadores cromométricos y fluorescencia por rayos X.
- Reúne información de múltiples fuentes sobre el funcionamiento, la verificación y proveedores de las tecnologías.

http://fate.clu-in.org/

* Por sus siglas en inglés, Field Analytical Technologies Encyclopedia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Description
Typical Uses
Theory of Operation
System Components
Mode of Operation
Target Analytes
Performance Specs
Advantages
Limitations
Cost Data
Documented Past Use
Vendor/Instrument Information
Verification/Evaluation Reports
Technology List

EPA United States Environmental Protection Agency

Gas Chromatography

US Army Corps of Engineers

TECHNOLOGIES

FATE HOME

Verification/Evaluation Reports

Verification of the performance of site characterization and field analytical technologies is conducted through a variety of programs. Evaluation and verification reports from EPA's Superfund Innovative Technologies Evaluation (SITE) Measuring and Monitoring Program, EPA's Environmental Technology Verification Program (ETV) program, along with links to certification statements from California EPA's (CalEPA) California Environmental Technology Certification Program, are provided below.

Superfund Innovative Technologies Evaluation (SITE) Measuring and Monitoring Program

The SITE Demonstration Program encourages the development and implementation of innovative treatment technologies for (1) remediation of hazardous waste sites and (2) monitoring and measurement. In the SITE Demonstration Program, the technology is field-tested on hazardous waste materials. Engineering and cost data on the innovative technologies are gathered so that potential users can assess the technology's applicability to a particular site. Data collected during the field demonstration are used to assess the performance of the technology, the potential need for pre- and post-treatment processing of the waste, applicable types of wastes and waste matrices, potential operating problems, and approximate capital and operating costs. The following reports from the measuring and monitoring program are available for gas chromatography:

No reports available for this technology

EPA's Environmental Technology Verification (ETV) Program

EPA's Environmental Technology Verification (ETV) Program verifies the performance of innovative technologies. ETV was created to substantially accelerate the entrance of new environmental technologies into the domestic and international marketplaces. ETV verifies commercialized, private sector technologies. After the technology has been tested, the companies will receive a verification report that they can use in marketing their products. The results of the testing also are available on the Internet. The following reports from the ETV program are available for gas chromatography:

- Bruker-Franzen Analytical Systems, Inc. Model EM640™ was verified for measurement of volatile organics in soil, water, and soil gas. The verification documents available consist of a verification report and verification

En Español

Agencia de Protección Ambiental de los Estados Unidos

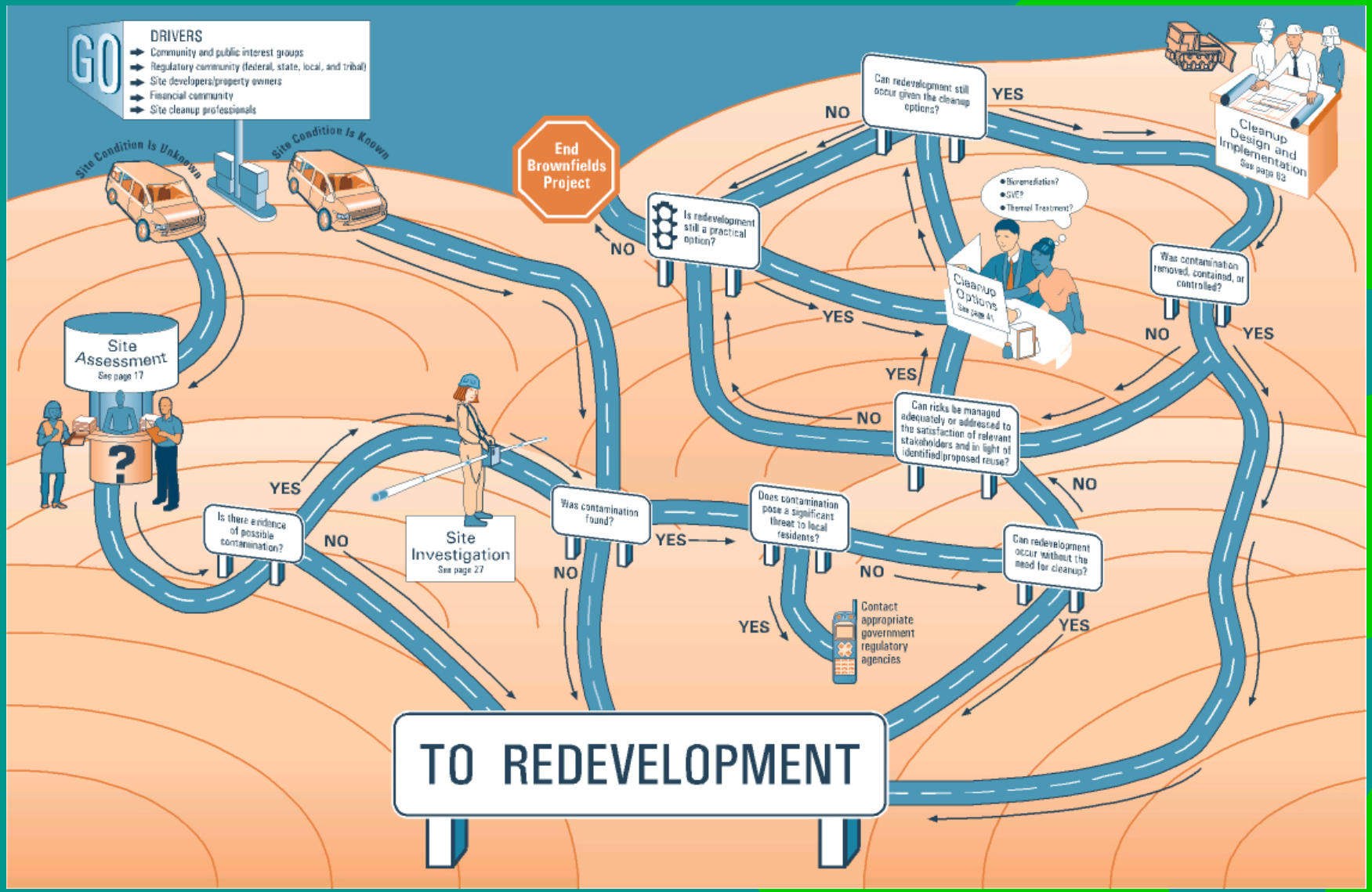
Oficina de Desechos Sólidos y Respuesta a Emergencias (5102G)

EPA 542-F-01-035S
Noviembre de 2001
http://clu-in.org

EPA

Rutas a Tecnologías Para la Investigación y Limpieza de Terrenos Contaminados

Decisiones en la Ruta



Ayudando a Definir las Opciones Tecnológicas

- Diseñado para aquellas personas que han de tomar decisiones en la gestión de sitios contaminados
- Identifica los pasos en el proceso de tratamiento: análisis, investigación, selección del tratamiento y su diseño e implementación.
- Ofrece objectivos típicos y preguntas clave
- Destaca temas de actualidad y ofrece recursos informativos asociados
- Incluye un glosario, resumen de siglas comunes, y tablas de los contaminates más comunes en cada tipo de sitio

EPA **Road Map to Understanding Innovative Technology Options for Brownfields Investigation and Cleanup, Third Edition**

Site Assessment

■ General Resources ■ Site-Specific Resources ■ Technology-Specific Resources

Assessing Contractor Capabilities for Streamlined Site Investigations (EPA 542-R-00-001)
View PDF
Developed by EPA's BTSC, the resource will assist decision makers on brownfields projects in evaluating the capabilities of contractors who are being considered to perform work in support of site investigations. The resource also identifies potential activities that contractors can perform to enhance the site investigation process through innovative approaches. A comprehensive series of questions that decision makers can use in interviewing contractors and evaluating those contractors' qualifications is presented, followed by information about the relevance of the questions and potential answers to them.

ASTM Standard Guide for Process of Sustainable Brownfields Development (E1984-98)
Order on line at www.astm.org
The guide, developed by ASTM, discusses the redevelopment of a brownfields property for all stakeholders. It identifies impediments to such redevelopment and suggests solutions that can facilitate completion of a successful project. It describes the flexible process of sustainable brownfields redevelopment that actively engages property owners, developers, government agencies, and the community in conducting corrective action, economic evaluation, and other efforts that promote the long-term productive reuse of a brownfields property. The guide, available at $35 per copy, can be downloaded from the ASTM web site, or ordered by telephone at 610-832-9585 or by facsimile at 610-832-9555.

ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E1527-00)
Order on line at www.astm.org
The purpose of the practice, developed by ASTM, is to define commercial and customary practices in the U.S. for conducting Phase I environmental site assessments of commercial real estate with respect to the range of contaminants within the scope of CERCLA, as well as petroleum products. Research and reporting requirements also are identified. The practice, available at $40 per copy, can be downloaded from the ASTM web site or ordered by telephone at 610-832-9585 or by facsimile at 610-832-9555.

Clean-Up Information Home Page on the World Wide Web
View on line at http://clu-in.org
The Internet site provides information about innovative treatment technologies and site characterization technologies to the hazardous waste remediation community. CLU-IN describes programs, organizations, publications, and other tools for EPA and other federal and state personnel, consulting engineers, technology developers and vendors, remediation contractors, researchers, community groups, and individual citizens. Information about issues related to site characterization also is provided: technology verification and evaluation; technology selection tools; guidance and application support; case studies; regulatory development; and publications.

Data Quality Objective Process for Hazardous Waste Site Investigations (EPA 600-R-00-007)
View PDF
The document focuses on the DQO process as the appropriate systematic planning process to support decision making. The DQO process is an

Cursos y Seminarios

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  - Reducción natural de solventes clorados: principios y prácticas
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