



Hazardous Waste Clean-Up Information (CLU-IN) On-line Remediation Databases FACT SHEET

This fact sheet briefly describes eight on-line remediation databases available on the Hazardous Waste Clean-Up Information (CLU-IN) Web site (www.cluin.org) sponsored by the U.S. Environmental Protection Agency's (EPA) Office of Superfund Remediation and Technology Innovation (OSRTI), Technology Innovation and Field Services Division (TIFSD). These databases provide timely information about selected pilot- and full-scale applications of innovative treatment and site characterization technologies for EPA remedial project managers (RPM), other federal and state personnel, consulting engineers, technology developers and vendors, remediation contractors, researchers, community groups, and individual citizens. They have recently been updated, reformatted, and made available through a Universal Search Engine. They facilitate and encourage the hazardous waste remediation community to share their knowledge and experiences about innovative technologies. This fact sheet also describes how to submit new information or update existing information in these databases.

EIGHT ON-LINE REMEDIATION DATABASES (Maintained by TIFSD)

Five technology specific databases – Alternative Landfill Covers (ALC), In Situ Thermal (IST) Treatment, In Situ Chemical Oxidation (ISCO), In Situ Flushing (ISF), and Phytotechnology — provide useful information about pilot- and full-scale applications of these technologies;

One contaminant specific database for methyl tert-butyl ether (MtBE) provides stakeholders with site-specific data to help select treatment approaches at remediation sites, including drinking water contaminated with MtBE;

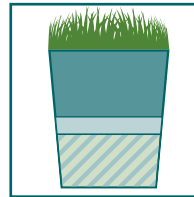
One media-specific database – the Fractured Bedrock Focus Area — provides brief profiles of characterization and remediation processes at fractured bedrock sites; and

One scale specific database – the Remediation Technology Demonstrations Project Profiles — describes pilot-scale remediation projects to address soil and ground water remediation.

Information in each database is typically provided as project profiles that include background information on the site (name, location, and type), project information (scale, status, project dates, technology description, and contaminants and media treated), performance and cost data, points of contact, and references. EPA obtained data from site managers, regulatory officials, and technology providers, as well as from published reports, conference proceedings, and other available reference materials to prepare the project profiles in each database.

The on-line remediation databases can be searched by either using a pick list for selected parameters for each database or by using key words. Search results are listed alphabetically by site or project name.

For additional related information, visit the database Web sites described in this fact sheet.



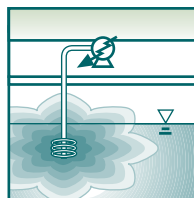
Alternative Landfill Covers

www.cluin.org/products/altcovers/

ALC systems are increasingly considered for use at waste disposal sites when equivalent performance to conventional final cover systems can be demonstrated or where some moisture is required to sustain biological processes. They have been considered at sites such as municipal solid waste (MSW) landfills, hazardous waste landfills, and radioactive waste sites. Unlike conventional covers that use materials with low hydraulic permeability, ACLs are designed to manage hydrological processes at an area, which include precipitation, soil water storage, surface runoff, evapotranspiration (ET), and infiltration to minimize percolation.

As of August 2006, the on-line ALC database contains 93 profiles (some sites involve multiple projects, and some projects encompass multiple covers or cover types), based on four types of ALC. These four types include monolithic ET covers (63 profiles); capillary barrier ET covers (23 profiles); asphalt covers (7 profiles); and bioengineering management covers (4 profiles). Of these, 47 profiles describe pilot-scale and 45 profiles address full-scale applications.

For more information about the ALC database, contact Kelly Madalinski, EPA, by telephone at (703) 603-9901 or by e-mail at madalinski.kelly@epa.gov.



In Situ Thermal Treatment

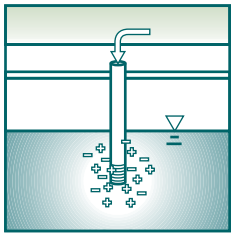
www.cluin.org/products/thermal/

IST treatment includes technologies that involve steam injection, electrical resistance heating (ERH), conductive heating, radio-frequency (RF) heating, and hot air injection.

These technologies treat chlorinated solvents, non-chlorinated volatile organic compounds (VOC), semivolatile VOCs (SVOC), polycyclic aromatic hydrocarbons (PAH), oils and petroleum products, polychlorinated biphenyls (PCB), and wood preserving compounds in ground water and soil. IST technologies heat the subsurface and destroy or enhance the removal of contaminants, including those present as non-aqueous phase liquids (NAPL).

As of August 2006, the on-line IST treatment database includes 98 profiles, describing 40 pilot- and 52 full-scale applications of IST treatment. The profiles cover five types of IST treatment technologies (some profiles describe more than one technology). They include steam heating (37 profiles); ERH (34 profiles); conductive heating (17 profiles); RF heating (6 profiles); and hot air injection (3 profiles).

For more information about the IST treatment database, contact Jim Cummings, EPA, by telephone at (703) 603-7197 or by e-mail at cummings.james@epa.gov.



In Situ Chemical Oxidation

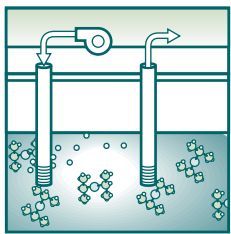
www.cluin.org/products/chemox/

ISCO is the process of injecting oxidants and coamendments into the subsurface to chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable,

less mobile, or inert. ISCO is especially useful in treating NAPLs and can be applied to contaminants that include chlorinated solvents, non-chlorinated VOCs, SVOCs, petroleum products, PAHs, PCBs, explosives and propellants, and pesticides. Commonly used oxidizing agents include permanganate (either sodium or potassium), Fenton's reagent (hydrogen peroxide and iron catalyst), hydrogen peroxide, and ozone.

As of August 2006, the on-line ISCO database contains 45 profiles that describe completed, full-scale applications using four oxidants. (Some profiles involve more than one oxidant and information about the type of oxidant was not provided for some profiles.) Oxidants include permanganate (16 profiles); Fenton's reagent (15 profiles); hydrogen peroxide (3 profiles); and ozone (2 profiles).

For more information about the ISCO database, contact Jim Cummings, EPA, by telephone at (703) 603-7197 or by e-mail at cummings.james@epa.gov.



In Situ Flushing

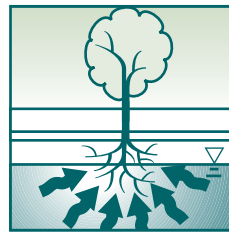
www.cluin.org/products/isf

ISF involves injecting or infiltrating an aqueous solution into a zone of contaminated soil or ground water, followed by extraction and above ground treatment of the elutriate (the flushing solution mixed with contaminants). In some rare cases, the

flushing solution and treated contaminants may be left in place. The solutions used for ISF may consist of surfactants, cosolvents, acids, bases, oxidants, chelants, solvents, or water. Recent applications have also documented the use of cyclodextrin, a non-toxic, modified sugar, as a flushing agent. These flushing solutions typically increase the mobility or solubility (or both) of the contaminants. Many organic and inorganic contaminants can be treated using ISF, including NAPLs, VOCs, SVOCs, PCBs, pesticides, non-volatile metals, cyanides, and radioactive contaminants.

As of August 2006, the on-line ISF database includes information on 23 ISF profiles, of which 11 are pilot- and 12 are full-scale projects. Water is the most frequently used flushing agent (14 profiles), followed by Dowfax™, ethanol, Ivey-sol nonionic surfactant (SPG), n-pentanol, and sodium dihexyl sulfosuccinate (2 profiles each). Other flushing agents used include aerosol OT, Brij 97, calcium carbonate, calcium chloride, tert butanol, and Tween 80. Some projects used more than one flushing agent.

For more information about the ISF database, contact John Quander, EPA, by telephone at (703) 603-7198, or by e-mail at quander.john@epa.gov.



Phytotechnology

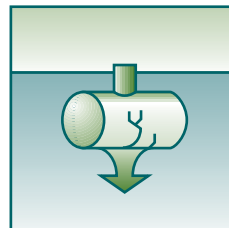
www.cluin.org/products/phyto/

Phytotechnology is an emerging technology that uses various types of plants to degrade, extract, contain, or immobilize contaminants in soil, ground water, surface water, and sediments.

Phytotechnology has been used to treat various contaminants, such as chlorinated solvents, metals, explosives and propellants, pesticides, PAHs, radionuclides, and petroleum hydrocarbon compounds.

As of August 2006, the on-line Phytotechnology database includes 113 profiles, of which 64 are pilot-scale, 44 are full-scale, and 5 are large greenhouse-scale applications. The on-line database addresses mainly six phytomechanisms (more than one phytomechanism may apply to some projects). They include phytoextraction (47 profiles); rhizodegradation (31 profiles); hydraulic control (31 profiles); phytostabilization (16 profiles); phytovolatilization (11 profiles); and rhizofiltration (1 profile).

For more information about the Phytotechnology database, contact Ellen Rubin, EPA, by telephone at (703) 603-0141 or by e-mail at rubin.ellen@epa.gov.



MtBE Treatment

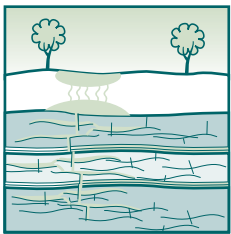
www.cluin.org/products/mtbe/

Fuel oxygenates such as MtBE have been widely used for the past several decades in the U.S. as gasoline additives to boost octane ratings and to reduce air pollution. Leaking above ground or underground storage tanks or accidents that involve

transport vehicles have contaminated soil and ground water with MtBE in many locations. In some cases, concentrations of MtBE have reached sources of drinking water. Several in situ and ex situ technologies are used to treat MtBE in ground water, soil, and drinking water.

As of August 2006, the on-line MtBE treatment database includes 420 profiles, of which 358 address full-scale applications, 51 address pilot-scale applications, and 11 are bench-scale applications. The MtBE treatment technologies described in the profiles include 15 drinking water treatment profiles and 12 remediation technologies (some projects used more than one technology). They include soil vapor extraction (SVE) (182 profiles); air sparging (168 profiles); in situ bioremediation (ISB) (104 profiles); pump-and-treat (P&T) (99 profiles); excavation (41 profiles); ISCO (33 profiles); multi-phase extraction (MPE) (31 profiles); ex situ bioremediation (12 profiles); phytoremediation (9 profiles); thermal desorption (4 profiles); biosparging (2 profiles); and IST (1 profile).

For more information about the on-line MtBE treatment database, contact John Quander, EPA, by telephone at (703) 603-7198, or by e-mail at quander.john@epa.gov.



Fractured Bedrock

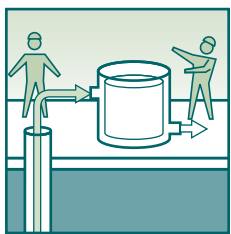
www.cluin.org/fracrock/

Characterization and remediation of contaminated ground water at fractured bedrock sites are hampered by the complex geology, the heterogeneous distribution and orientation of the fractures, and the movement of contaminants and

fluids in fracture networks and rock matrices. Several characterization and remediation technologies are currently being used both at pilot- and full-scale levels to improve the understanding of these sites. The on-line database provides information on the characterization and remediation technologies used at fractured bedrock sites.

As of August 2006, the on-line fractured bedrock database includes 92 profiles, addressing 8 remediation and 12 characterization technologies. The remediation technologies include ISB (33 profiles); ISCO (23 profiles); P&T (24 profiles); SVE (15 profiles); fracturing (12 profiles); MPE (8 profiles); IST (4 profiles); and ISF (2 profiles). The characterization technologies include vertical chemical profiling (28 profiles); borehole geophysics (26 profiles); coring (23 profiles); fluid logging (20 profiles); flow (14 profiles); pumping tests (12 profiles); fracture trace analysis (10 profiles); tracer (dye) test (11 profiles); surface seismic surveys (4 profiles); surface conductivity surveys (3 profiles); ground-penetrating radar surveys (4 profiles); and downhole seismic surveys (2 profiles). Some profiles involve more than one technology.

For more information about the fractured bedrock database, contact Rich Steimle, EPA, by telephone at (703) 603-7195, or by e-mail at steimle.richard@epa.gov.



Remediation Technology Demonstrations

www.cluin.org/products/demos/

Prior to use in full-scale clean up applications, new technologies or new applications of existing technologies are often tested in pilot-scale demonstrations.

EPA has developed this on-line database to summarize timely information about selected pilot-scale demonstration projects. Projects address soil and ground water remediation technology demonstrations, completed and ongoing, which have been performed in the North America. Characterization technologies and modeling are not addressed in these profiles.

As of August 2006, the on-line database includes 151 profiles. These include 15 remediation demonstration technologies (some profiles involve more than one technology), as follows: ISB (84 profiles); phytoremediation (13 profiles); ISCO (9 profiles); IST (9 profiles); permeable reactive barriers (7 profiles); fracturing (4 profiles); ISF, ex situ bioremediation (3 profiles each); composting, electrochemical treatment, land treatment (2 profiles each); and biosparging, chemical immobilization, electrokinetic separation, and vitrification (1 profile each).

For more information about the Remediation Technology Demonstration database, contact John Quander, EPA, by telephone at (703) 603-7198, or by e-mail at quander.john@epa.gov.

How to Submit New Profiles or Update Existing Profiles

EPA encourages project managers, site owners, and technology vendors to add new profiles to the databases or to update existing profiles, especially for sites where work is undertaken with participation of federal or state project managers. All data submitted must be based on published literature.

A user may select the "Update an Existing Profile" button on the home page to add more recent data, add data for more fields, or correct errors in existing data for databases that address ALC, IST treatment, ISCO, fractured bedrock, and MtBE treatment. A user may also submit a new profile by selecting the "Submit a New Profile" button on the home page.

A user may download and fill out a form to either provide information about a new profile or update an existing profile for databases that address ISF and phytotechnology. The form can then be e-mailed to EPA.

A user can send comments about an existing project for the Remediation Technology Demonstrations database. A user may directly contact EPA to submit a new project.

EPA will review all information submitted before it is made available to the public.

Contact Us

If you have any questions or comments about the information provided in this fact sheet, please contact:

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