NAVFAC
Naval Facilities Engineering Command

Welcome to the Naval Facilities Engineering Service Center! We are NAVFAC's Navy-wide technical center, delivering quality products and services in the following areas:

- Shore, Ocean, and Waterfront Facilities
- Energy and Utilities
- Environmental
- Amphibious and Expeditionary Systems.

As a member of the NAVFAC team, we provide worldwide support to the Navy, Marine Corps, and other DoD agencies. We provide solutions to technical problems through engineering, design, construction, consultation, test and evaluation, technology demonstration/implementation, and program management support. We leverage technology to enhance our clients' effectiveness and efficiency. We use existing technology where we can, identify and adapt breakthrough technology when appropriate, and perform technology development when required.

The ESC headquarters is located at NAVAL Base Ventura County in Port Hueneme, CA. The East Coast Detachment is located in the Navy Yard in Washington, DC.

NAVFAC Naval Facilities Engineering Command

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Welcome to Environmental Focus, a product of the Environmental Department of the Naval Facilities Engineering Service Center.

As one of the Navy's leading environmental centers, our environmental mission is to offer our customers aggressive and professional assistance in complying with environmental regulations. Our objective is simple--we want to help you solve your environmental cleanup, compliance,and pollution prevention problems.

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Environmental Restoration & BRAC

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Pollution Prevention

Technology Implementation and Customer Liaison Office

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- Broad Agency Announcement Innovative Environmental Technologies and Methodologies (BAA)
- Ecological Risk Assessment (ECO) page
- Joint Service Pollution Prevention (P2) Library
- Naval Environmental Protection Support Service (NEPSS) Specialty Offices
- Navy Pollution Abatement Ashore Technology Demo/Validation Program
- Partnership News--Arizona, California, and Hawaii
- Stormwater Best Management Practices (BMP) Decision Support Tool
- Tech Transfer (T^2), Environmental Restoration
- Tri-Services Environmental Support Centers Coordinating Committee Charter

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NAVFAC Environmental Restoration & BRAC Website

These web pages are a one-stop resource for Navy Remedial Project Managers (RPMs) and other environmental professionals jnvolved in environmental cleanup.

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Stages of Site Cleanup

Announcements

◆ RITS

Planning is underway for the next seminar, RITS Fall 2006. Thanks to all who attended the Spring offering. The Spring 2006 presentations have not yet been posted online, pending re-location of the Environmental Restoration and BRAC (ERB) web site to a different server. Please check back here from time to time as we will update this information when the Spring 2006 presentation files have been posted.

◆ 2006 Cleanup Conference

The Navy and Marine Corps Cleanup Conference is sponsored by the Naval Facilities Engineering Command. The purpose of the conference is to promote information exchange and provide training to foster fast track cleanup of the Navy's past hazardous waste sites.

◆ Newsletters

The Fall 2005 RPM News newsletter is now available. Topics in this issue are Naval Installation Restoration Information Solution (NIRIS) Update, New Projects Kick Off in 2005 to Support Environmental Restoration, Demonstrate

Innovative Technologies at Your Environmental Restoration Site, Revised Guidance Heralds Groundwater Remediation Technology's Coming of Age, Technology Transfer (T2) News, and Fall 2005 CECOS Restoration Training Schedule

Hot Topics

Program Information

- Five Year Plan 2003-2007 (March, 2004)
  This book is published annually by the Chief of Naval Operations (CNO). It details the Department of the Navy's environmental cleanup program for sites contaminated by past disposal practices. The Five Year Plan, as it is commonly called, contains information on accomplishments to date, goals for completion, success stories, funding levels, and detailed statistics on each Navy and Marine Corps base being cleaned up under the program.

- IR Manual 2001 Update (November, 2003)
  The IR Manual focuses on moving an IR Program site from Identification and Investigation to Cleanup and Closure. It represents a compilation of DERP requirements, policy, and guidance, providing information to help ensure appropriate coordination of the IR Program within the DON and with other supporting Federal, State, and local government agencies. It also provides a management framework for identifying applicable environmental statutes and making sure that statute requirements are met. The Manual is presented in a "user-friendly" fashion to aid in understanding and applying the information presented.

- OPNAV5090.1B Change 3 (March, 2003)
  OPNAV Instruction 5090.1B, Change 3, 17 Oct 2002. Changed pages and summary of changes to the Navy Environmental and Natural Resources Program Manual.

- BRAC (February, 2000)
  General information on Base Realignment and Closure (BRAC) programs

⊞ Submit Feedback

The Engineering Service Center is a field activity of the Naval Facilities Engineering Command.
Contact the NFESC Environmental pagemaster by mail: NFESC ESC424,1100 23rd Ave., Port Hueneme, CA 93043, Telephone (805)982-4290 or via Email to: nfesc40pagemaster at navy.mil
Contact the NFESC Webmaster by mail: NFESC ESC12, 1100 23rd Ave. #F-19B, Port Hueneme, CA 93043, Telephone (805)982-4539 or via Email to: webmaster at nfesc.navy.mil

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Find information on a particular technology here. When you click on the blue link for the technology you are interested in, you will find an Abstract and Description of the technology, followed by Applicability, Cost, Duration, and Limitations information, along with a list of Related Pages, Related Documents, and Related Sites, if applicable.

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Air Sparging
Information on a technology used to clean up groundwater contaminated with volatile or semi-volatile organic compounds by injecting air below the water table to volatilize them for removal by Soil Vapor Extraction (sve).

Air Stripping (Ex-Situ)
Information on a technology used to clean up ground water contaminated with volatile organics by pumping water up to a treatment facility on the surface that volatilizes compounds from the water, then re-injects the water.

Air Stripping (In Well)
Information on a technology used to clean up ground water contaminated with volatile organic compounds by injecting air into the lower of two screened zones in the well, which both volatilizes them for removal by Soil Vapor Extraction (see) and establishes the circulation of aerated water between lower and upper zones.

Asphalt Mixing (Use as Aggregate)
Description of asphalt aggregate remedial technology used to clean up soils or granular silica materials contaminated with petroleum hydrocarbons of non-hazardous concentrations of metals.

Submit Feedback

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Vertical Cutoff Wall

Description of vertical cut-off wall remedial technology used to create a barrier to in place ground water contaminated with organic compounds and light and dense non-aqueous phase liquids (LNAPL and DNAPL).

Vitrification (Ex-Situ)

Description of ex-situ vitrification remedial technology used to clean up excavated soil contaminated with organic or inorganic compounds.

Vitrification (In-Situ)

Description of in-situ vitrification remedial technology used to clean up in place soils contaminated with organic compounds and some radionuclides.

Submit Feedback

Vertical Cutoff Wall

Abstract:

A vertical cutoff wall is a structure that acts as a barrier to prevent horizontal flow of contaminated groundwater or nonaqueous-phase liquids (NAPLs).

Description:

There are several approaches that have been used to control groundwater flow.

- Sheet pile cutoff walls are constructed by driving interlocking steel or high-density polyethylene (HDPE) into the ground. The joints between individual sheets are typically plugged with a clay slurry (steel sheets) or an expanding gasket (HDPE sheets). The steel piles can be driven directly into the ground, while the synthetic piles need to be driven with a steel backing that is removed once the synthetic sheet is in place.
- Slurry walls can be constructed using several different methods. For example, with the trench method, a trench is dug and back filled with a slurry mixture of bentonite and native materials. With a vibrating beam method, a steel plate is forced into the ground. As the plate is removed, bentonite is injected to fill the space of the beam. A typical slurry wall installed by trenching ranges in width from about 0.5 to 2 m and can be installed to depths of up to approximately 50 m, depending on the site geology. Slurry walls created with the vibrating beam method are much narrower and are typically installed at shallower depths.
- Grouting is another direct method to control the migration of contaminated groundwater. A grout wall is constructed by injecting fluids under pressure into the ground. The grout moves away from the zone of injection, fills pores in the formation, and solidifies, which reduces the hydraulic conductivity of the formation. Typical grouting compounds include cement, bentonite, and silicate
- Geomembranes are synthetic sheets installed in open or slurry-supported trenches to control contaminant spread. Geomembranes can provide very low hydraulic conductivity. The sheets generally are constructed of either HDPE o polyvinyl chloride (PVC). This technology is still in the development stage and there are concerns regarding long-term performance.

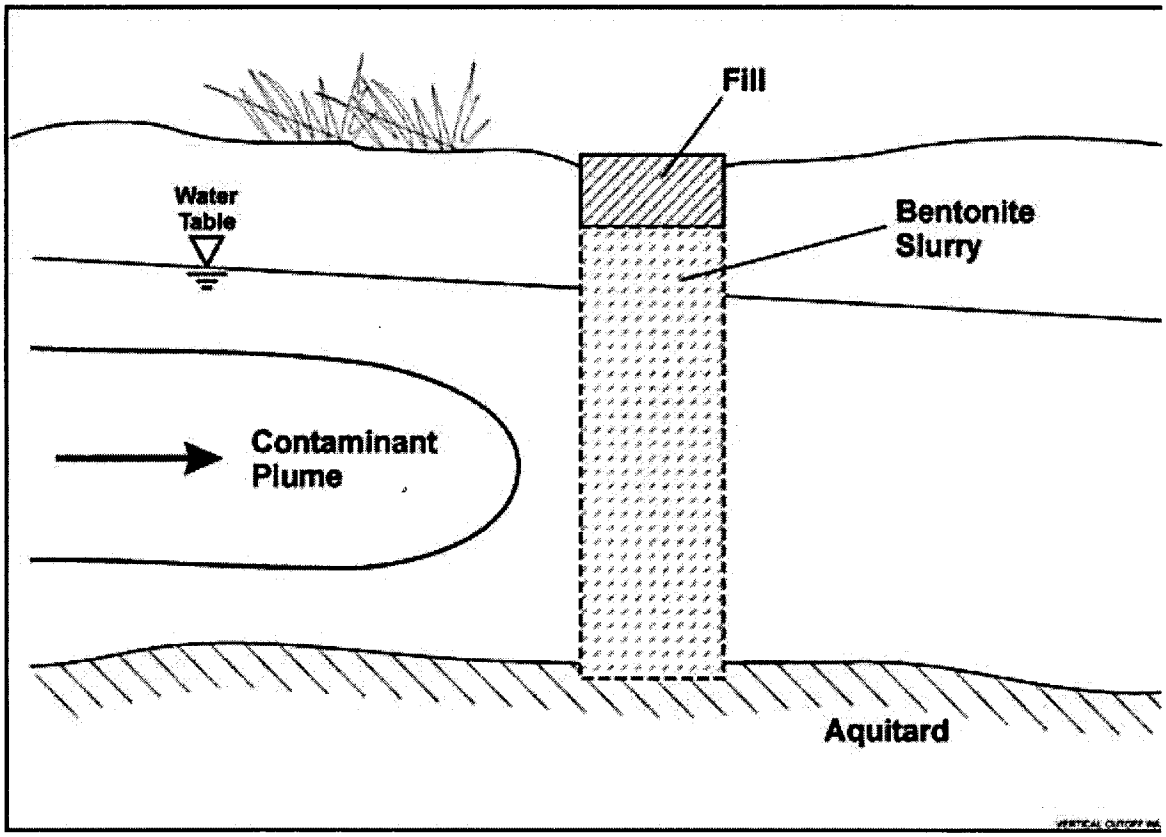

Figure CR8. Vertical Cutoff Wall

Applicability

Vertical cutoff walls are installed to limit the migration of contaminated groundwater and can be applied to remediate halogenated and nonhalogentated volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs); polychlorinated biphenyls (PCBs); ordnance compounds; inorganics; light, nonaqueous-phase liquid (LNAPL); and dense, nonaqueous-phase liquid (DNAPL). In many cases barriers can be installed very quickly, thus providing additional time before remedial action is required. Vertical cutoff walls can be used in conjunction with pump-and-treat systems to reduce the volume of water that must be extracted to maintain hydraulic control around a contaminant source.

Cost

$25 to $80 per square foot of barrier - steel sheet pile with grouted joints (depth 0 - 60').

$2 to $10 per square foot of barrier - soil bentonite slurry wall (depth 0 - 80').

$6 to $15 per square foot of barrier - soil bentonite slurry wall (depth 80 - 150').

$40 to $200 per square foot of barrier - grout wall (depth 0 - 400').

$8 to $25 per square foot of barrier - geomembrane (depth 0 - 80').

The major cost items included in the cost estimate range for a vertical cutoff wall are designated below.

Major Cost Items to Implement a Vertical Cutoff Wall

Pretreatment Activities Included in Cost

- None

Fixed Cost Items Included

- Barrier trench excavation[(a)]
- Barrier installation
- Sampling well installation

Variable Cost Items Included

- Site supervision
- Site quality assurance and health and safety support
- Sampling and analysis for process control

Residuals Management Activities Included in Cost

- Off-site disposal of soil excavated from treatment wall trench[(a)]

Comments

Indirect costs such as project management, design and engineering, vendor selecti home office support, permit preparation and fees, regulatory interaction, site characterization, treatability testing, performance bond, and contingencies are not included in the estimated cost range.

(a) Applicable only for slurry walls.

Duration

Installation time for a vertical cutoff wall typically ranges from 1 to 2 months. Long-term operation and maintenance is required to monitor cutoff wall integrity. The peri of time requiring active monitoring and maintenance is expected to be 20 years or longer. The duration of operation and matenance is dependent on the following conditions:

- Cleanup goals
- Geohydrologic setting
- Chemical nature of the contaminants
- Concentration of the contaminants.

Limitations

The following factors may limit the applicability and effectiveness of the process:

- Contaminants remain in place at the site.
- All of the methods described above, except grouting, become significantly more costly or impossible to install at depths greater than 80 feet.
- Most of the approaches involve a large amount of heavy construction.
- For best performance, the wall should be keyed several feet into a low-permeability layer.
- The location of sheet pile walls requires planning to avoid existing structures or underground utilities.
- Generally, vertical cutoff walls cannot be installed at sites that contain construction rubble or cobbles in the subsurface.
- Long-term performance of cutoff walls is not proven.