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MCAS EL TORO
SSIC # 5090.

Public Information Materials

11/13/01
Public Meeting
Proposed Plan – Groundwater Cleanup
Operable Unit 1/Site 18 and Operable Unit 2A/Site 24

Held at Irvine Ranch Water District
Irvine, CA

Materials/Handouts Include:

1. Public Meeting Agenda – 11/13/01.
2. MCAS El Toro – Public Meeting Overview – 11/13/01.
3. MCAS El Toro –Proposed Plan – Groundwater Cleanup for Operable Units 1 and 2A – November 2001.
4. MCAS El Toro – Installation Restoration Program – Formal Public Meeting Presentation, Proposed Plan for Groundwater Cleanup for Operable Units 1 and 2A – November 13, 2001.
5. MCAS El Toro – Public Comment Form – 11/13/01.
6. MCAS El Toro – Public Meeting Evaluation Form – 11/13/01.
7. Transcript of the Public Meeting - Proposed Plan – Groundwater Cleanup for Operable Units 1 and 2A – November 13, 2001, held at the Irvine Ranch Water District, Multipurpose Conference Room.
8. Internet Access – Environmental Web Sites.
9. MCAS El Toro Administrative Record File – Information Sheet (for on-Station access); and MCAS El Toro Information Repository – Information Sheet.
10. MCAS El Toro – Where to Get More Information, Key Project Contacts.
11. Base Realignment and Closure Business Plan for MCAS El Toro, March 2000, Introduction Section.
12. RAB Membership Application – MCAS El Toro RAB.
13. MCAS El Toro RAB Meeting Schedule, Full RAB (Sept. 2001 – July 2002) and RAB Subcommittee (August 2000 – August 2001).
14. MCAS El Toro – Installation Restoration Program – Mailing List Coupon.
15. MCAS El Toro Installation Restoration Program – Restoration Advisory Board Mission Statement and Operating Procedures.
16. MCAS El Toro Restoration Advisory Board – Acronyms and Glossary of Technical Terms.
17. Memo from the Under Secretary of Defense, Subject: Responsibility for Additional Environmental Cleanup of Transfer of Real Property, July 25, 1997.
18. BRAC Environmental Program Fact Sheet, Institutional Controls: What they are and how they are used, Spring 1997.
19. A Guide to Establishing Institutional Controls at Closing Military Installations, Department of Defense, February 1998.
20. Brochure – Commonly Asked Questions Regarding the Use of Natural Attenuation for Chlorinated Solvent Spills at Federal Facilities.

BECHTEL NATIONAL INC.

CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

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Southwest Division
Mr. Richard Selby, Code 02R1
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: January 15, 2002
CTO #: 200 (EL2)
LOCATION: MCAS El Toro

FROM: Jane W. Wilhelm for
Thurman L. Heironimus, Project Manager

DESCRIPTION: MCAS El Toro, Public Information Materials 11/13/01 Public Meeting, Groundwater Cleanup Operable Unit 1/Site 18 and Operable Unit 2A/Site 24 Meeting Held at Irvine Ranch Water District, Irvine, CA

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AGENDA

MCAS El Toro Public Meeting

Proposed Plan – Groundwater Cleanup
Operable Unit 1/Site 18 and Operable Unit 2A/Site 24

November 13, 2001 – 6:00-9:00 p.m.

Time	Activity
6:00-7:00	Open house/information display session, offers community members opportunity to speak directly with Marine Corps, Navy, BRAC Cleanup Team members, and representatives from the Orange County Water District and Irvine Ranch Water District. Opportunity to provide court reporter with oral comments.
6:45-7:00	Set up chairs for presentation segment
7:00-7:30	Formal presentation
7:30-8:00	Open Question and Comment segment
8:00-9:00	Court reporter to take comments after formal portion of meeting and continue open house/information displays

Tables/Stations:

1. Sign-in/Greeters
2. General Environmental
3. Remedial Investigation & Risk Assessment
4. Feasibility Study/Proposed Plan
5. Public Comments/Court Reporter

MCAS El Toro - Public Meeting Overview
Proposed Plan – Groundwater Cleanup
Operable Unit 1/Site 18 & Operable Unit 2A/Site 24

- This public meeting has been organized to provide the community with a step-by-step approach for obtaining information, asking questions, and providing comments on the Marine Corps' Proposed Plan for Groundwater Cleanup at MCAS El Toro Installation Restoration Program Operable Unit 1/Site 18 and Operable Unit 2A/Site 24.

- Community members have the opportunity to discuss the issues directly with representatives from the Marine Corps, Navy, the BRAC Cleanup Team composed of regulatory agencies from U.S. EPA and Cal-EPA, and the Orange County Water District and the Irvine Ranch Water District at various tables throughout the room. It is recommended that meeting attendees follow the sequence listed below.

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Table 1 – Sign-in/Greeter:

Provides opportunity to sign-in, obtain agenda, get an overview of the purpose of the meeting, receive a copy of Proposed Plan, and have the opportunity to be added to the mailing list.

Table 2 - General Environmental:

Presents an overview of the Installation Restoration Program and other environmental cleanup programs at the Station.

Table 3 - Remedial Investigation and Risk Assessment

Focuses on the environmental investigation conducted to evaluate the presence, nature, and extent of groundwater contamination and the plume of contaminated groundwater that extends approximately 3 miles from MCAS El Toro. Briefly explains the risk assessment component of the remedial investigation.

Table 4 – Feasibility Study/Proposed Plan for Groundwater Cleanup

Explains the feasibility study process that includes screening of technologies, developing cleanup alternatives, the evaluation of alternatives based on U.S. EPA evaluation criteria. The Proposed Plan presents the Marine Corps' Preferred Remedy for cleanup of VOC-contaminated groundwater.

Table 5 - Public Comments/Court Reporter

Provides community members the opportunity to formally submit written or oral comments to the Marine Corps regarding the Proposed Plan for Groundwater Cleanup. In addition, information on the Information Repository and the Administrative Record will be available.

Proposed Plan — Groundwater Cleanup for Operable Units 1 and 2A at Marine Corps Air Station El Toro

November 2001

Marines Propose Joint Treatment Facility for Groundwater Plume Cleanup

The Marine Corps is requesting comments from the public on alternatives for cleanup (remediation) of contaminated ***groundwater*** at Installation Restoration Program ***Operable Unit*** (OU) 1 Site 18, the Regional Groundwater ***Plume*** and OU-2A Site 24, the ***Volatile Organic Compound*** (VOC) Source Area, at Marine Corps Air Station (MCAS) El Toro (see figure on page 2 and map on page 5). This Proposed Plan summarizes and proposes a final remedy for groundwater at OU-1 and OU-2A.

Soil cleanup at Site 24 was addressed previously in an Interim ***Record of Decision*** (ROD) signed in September 1997. The remedy for soil has been implemented and closure documentation for cleanup of soil was submitted for regulatory review in June 2001. A separate Final ROD for soil will be developed in 2002.

For more information on the Public Comment Period and Public Meeting, see page 2.

This Proposed Plan notifies the public of opportunities to comment on several alternatives and presents the Marine Corps' preferred remedy that addresses groundwater at Sites 18 and 24 and protects both public health and the environment. This Plan provides an overview of environmental investigation results, and summarizes the cleanup alternatives that underwent detailed evaluation. More detailed descriptions of the remedial investigation and cleanup alternatives are presented in the Draft Final Remedial Investigation Reports and the Draft Final Feasibility Study Reports, respectively. These reports are available for public review at the Heritage Park Regional Library in Irvine, and are part of the MCAS El Toro Installation Restoration Program Administrative Record file (see page 22).

Remedial investigations concluded that VOCs, primarily the industrial solvent ***trichloroethene*** (TCE), are present in groundwater at Site 18 and in soil and groundwater at Site 24. VOCs in the soil at Site 24 have migrated into the ***shallow groundwater unit*** beneath the site and then into the regional groundwater ***(principal aquifer)***. TCE is present in a groundwater plume that extends about 3 miles west of the Station to Culver Drive in Irvine. This groundwater is currently not used as a drinking water source. The source of contamination is TCE and other solvents that were believed to have been used for degreasing parts, paint stripping, and other maintenance activities performed within the Site 24 boundary to support the Station's mission as an aviation center. Usage of TCE at the Station was discontinued in about 1975.

The Marine Corps' remedial action objectives for the shallow groundwater unit and the principal aquifer are to: reduce concentrations of VOCs in groundwater to the more stringent of federal or state ***water quality standards;*** control VOC migration; and prevent ***domestic use*** of groundwater containing VOCs above ***cleanup goals*** until cleanup is achieved.

The preferred remedy, Alternatives 8A and 10B' combined, is to extract contaminated groundwater and treat it to remove VOCs until it complies with cleanup goals and water quality standards of the federal ***Comprehensive Environmental Response, Compensation, and Liability Act*** (CERCLA) (see page 16). VOC treatment to meet CERCLA standards would be conducted at a VOC treatment plant constructed at the planned Irvine Desalter Project (IDP) treatment plant. Groundwater will also be treated at the IDP

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Definitions of Technical Terms

To assist readers in understanding technical terms, a glossary is included in the Proposed Plan. The first time a technical term is presented it appears in *bold/italic* typeface. Refer to the glossary on page 23 for definitions.

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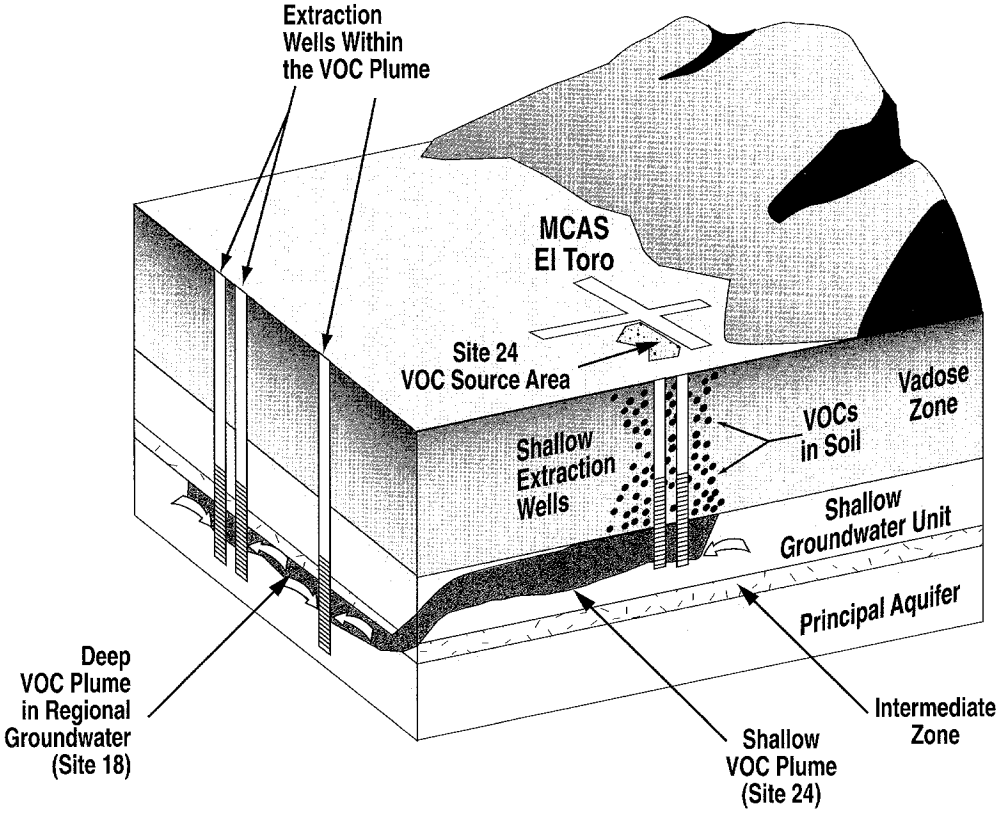
by the Irvine Ranch Water District to remove ***total dissolved solids*** (TDS) and ***nitrates*** in a non-CERCLA treatment program so the water is suitable for recycled water purposes such as irrigation and industrial use (see page 3). Elevated levels of TDS and nitrates resulted from natural conditions and regional agricultural practices rather than MCAS El Toro operations. Treatment to remove TDS and nitrates is not the Marine Corps' responsibility. The Interim ROD for Site 24 selected ***soil vapor extraction*** (SVE) for remediation of VOCs in soil (see page 15). This Proposed Plan provides an update on the progress of SVE remediation at Site 24.

A final remedy for groundwater will be selected after the public comment period has concluded and all comments have been reviewed and considered. The selection of the final remedy for groundwater cleanup at Sites 18 and 24 will be documented in the ROD (see page 20). A separate Final ROD will document final soil cleanup at Site 24.

Figure 1—Underground View of the VOC Plume



Opportunities for Public Involvement

Public Meeting — Tuesday, November 13, 2001 6:00-9:00 p.m.

Irvine Ranch Water District, Multipurpose Conference Room, 15600 Sand Canyon Avenue, Irvine

You are invited to attend a public meeting to discuss the information presented in this Proposed Plan regarding the groundwater cleanup at Installation Restoration Program Operable Unit 1 Site 18 and at Operable Unit 2A Site 24 at MCAS El Toro. Marine Corps representatives will provide visual displays and information on the environmental investigations and the cleanup alternatives evaluated. You will have the opportunity to ask questions and formally comment on the alternatives. (Agenda: 6:00-7:00 Open House/Information Displays, 7:00-8:00 Formal Presentation/Question Session, 8:00-9:00 Public Comments/Oral and Written.)

Public Comment Period — November 7–December 7, 2001

We encourage you to comment on this Proposed Plan and site-related documents during the 30-day public comment period. You may submit written comments by mail **postmarked no later than December 7, 2001** to: Mr. Dean Gould, Base Realignment and Closure (BRAC) Environmental Coordinator, Environmental Division, MCAS El Toro, P.O. Box 51718, Irvine, CA 92619-1718. Comments may also be sent to Mr. Gould by fax to (949) 726-6586, or via e-mail at GouldDA@efdsw.navfac.navy.mil no later than December 7, 2001. Public comments received during this period, or in person at the public meeting, will be included in the Responsiveness Summary portion of the Record of Decision and considered in the final cleanup and closure decision for groundwater at these sites (see page 20).

Irvine Desalter Project

The Irvine Desalter Project (IDP) is a proposed water supply development project initiated by the Orange County Water District and the Irvine Ranch Water District (OCWD/IRWD). Priorities of this project are to extract and treat groundwater to: (1) develop a local water supply drawing from the principal aquifer; (2) intercept, contain, and treat groundwater with high concentrations of total dissolved solids (TDS) and nitrates; (3) and accept and treat for VOC removal the groundwater that the Marine Corps must remediate. The IDP as developed by OCWD/IRWD is composed of two separate components—a Nonpotable System and a Potable System—designed to treat groundwater from two areas in the principal aquifer and from the shallow groundwater unit at Site 24.

- Nonpotable System—groundwater from Site 24 and areas inside the principal aquifer VOC plume (which is contaminated above drinking water standards) would be extracted, treated, and conveyed for use as recycled water. Only the VOC-related portion of the IDP that treats water from Site 24 and areas inside the principal aquifer VOC plume would be considered part of the Marine Corps' CERCLA remedy.
- Potable System—groundwater from areas outside the principal aquifer VOC plume would be extracted and treated to remove TDS and nitrates. There are no known VOCs in the potable well locations. Treated water would then be supplied for domestic purposes. This is not part of the Marine Corps' CERCLA remedy.
- Based on detailed groundwater modeling studies, the VOC plume will remain contained under the proposed extraction plan. Production from the upgradient potable wells will be extracted from groundwater separate from the VOC plume.

IRWD is responsible for planning, land and right-of-way acquisition, design, construction, operation and maintenance of project facilities located off-base, with full review and support assistance from OCWD. OCWD is responsible for groundwater basin protection and management. The IDP is two projects in one, a potable system and non-potable system. These systems will be kept completely separated from one another to assure the protection of public health.

The IDP was prompted by a regional groundwater study conducted in 1984 that identified the migration of inorganic constituents, mainly TDS and nitrates, from the Irvine area toward the main portion of the Orange County groundwater basin. The elevated levels of TDS and nitrates in groundwater in the Irvine area are mostly attributable to the geology of the area and to agricultural and irrigation practices that have long been prevalent in the region. Later studies identified the presence of TCE in area groundwater. After the discovery of TCE in groundwater, the OCWD/IRWD modified the IDP to treat VOCs in addition to TDS/nitrates.

Cleanup of VOC contamination is the responsibility of the Marine Corps who developed and evaluated several potential remedial alternatives to achieve cleanup. Some of the alternatives for VOC contamination in groundwater relied on the IDP as the key component. The preferred remedy presented in this Proposed Plan is based upon the Nonpotable System component of the IDP.

Under the terms of a settlement agreement negotiated between the United States and OCWD/IRWD, the United States will pay for VOC-related components of the IDP and treatment for VOC removal, and OCWD/IRWD would pay for removal of TDS and nitrates. The United States is not required to pay for removal of TDS and nitrates because the elevated concentrations of these chemicals were not caused by Station operations. This remedy will protect the public and meet the groundwater cleanup objective of the Marine Corps and the water supply objectives of OCWD/IRWD. The settlement agreement was signed by OCWD/IRWD (June 2001) and the United States (U.S. Navy, July 2001; U.S. Department of Justice, September 2001).

Multi-Agency Environmental Team Concurs with Preferred Remedy

The Base Realignment and Closure (BRAC) Cleanup Team (BCT), composed of the Marine Corps, the U.S. Environmental Protection Agency (U.S. EPA), and the Cal-EPA, was established when MCAS El Toro was designated for closure. The primary goals of the BCT are to protect human health and the environment, to expedite the environmental cleanup, and to coordinate the environmental investigations and cleanup at the Station.

The team completed its review of the ***Remedial Investigation*** and ***Feasibility Study*** reports for Sites 18 and 24. The team also reviewed the modeling results for OU-1 Alternative 8A and the evaluation of how this alternative meets the U.S. EPA evaluation criteria (see page 18). Based on these reviews and on continuing discussions held regarding the findings of the field investigations, and the results of human health risk assessments, the BCT agrees that the combination of Alternatives 8A and 10B' represents the optimal solution for remediation of groundwater at Sites 18 and 24. The Final ROD that documents soil cleanup will be developed in 2002.

Environmental Investigation Overview

To effectively manage the cleanup effort at MCAS El Toro, the Marine Corps organized the Station's Installation Restoration Program (IRP) sites into Operable Units. Operable Units, or OUs, are areas where similar cleanup activities can be implemented. The MCAS El Toro IRP sites that are the focus of this Proposed Plan are: OU-1 Site 18, Regional Groundwater Plume; and OU-2A Site 24, Volatile Organic Compound (VOC) Source Area. An overview of the environmental investigation results pertaining to groundwater contamination at these two sites and soil contamination at Site 24 is presented below.

Site Background

MCAS El Toro was commissioned in 1943 as a Marine Corps pilot fleet operation training facility. In 1950, the Station was selected for development as a master jet station and permanent center for Marine Corps aviation on the West Coast. The Station's mission involved the operation and maintenance of military aircraft and ground-support vehicles and equipment. Much of the industrial activity (aircraft maintenance and refurbishment) took place in the southwestern quadrant of the Station where Site 24 is located.

The first indication of groundwater contamination at the Station occurred during routine water quality monitoring in 1985 when the Orange County Water District (OCWD) discovered the VOC trichloroethene (also called TCE) in groundwater at an irrigation well approximately 3,000 feet northwest of MCAS El Toro. A VOC is an organic, or carbon-containing, compound that evaporates easily at room temperatures. VOCs are commonly used as solvents for machinery and parts degreasing, paint stripping, and other industrial applications. Groundwater from the above-mentioned irrigation well is used for agricultural purposes. Drinking water wells located approximately three miles from the irrigation well do not contain TCE. Subsequent investigations showed that the VOC contamination originated from Site 24.

Site Descriptions

OU-1 Site 18, Regional Groundwater Plume, is the area of groundwater contamination in the principal aquifer that extends from the source area (Site 24) beyond the western boundary of the Station approximately three miles to the west beneath the City of Irvine. The overall regional groundwater investigation area is bound by Interstate 405, Harvard Avenue, and Trabuco Road. Figure 2 on page 5 shows the locations of Sites 18 and 24 and the concentrations of TCE in the shallow and principal aquifer.

OU-2A Site 24, the VOC Source Area, encompasses approximately 200 acres in the southwest quadrant of the Station. Site 24 also includes the footprint of the VOC plume in the shallow groundwater unit. Two large aircraft hangers (Buildings 296 and 297) and several smaller buildings within the Site 24 boundary were used for aircraft and support vehicle maintenance and repair. Aircraft maintenance at Buildings 296 and 297 were believed to have used industrial solvents containing TCE for degreasing parts, paint stripping, and aircraft washing. No records were kept that describe the precise origin, nature, and use of TCE at the site, or the circumstances or quantities of individual releases. Solvents released at Site 24 contaminated the soil and groundwater beneath the surface. Solvents containing TCE have not been used at the Station since about 1975.

On July 2, 1999, operational closure of all military activities at MCAS El Toro was completed. The Marine Corps' mission at the Station was incorporated into Marine Corps Air Station Miramar operations in San Diego, California

Previous Studies

After the discovery of TCE in the off-Station groundwater, the Marine Corps conducted several studies that were designed to determine the nature and extent of contamination and plan the best means of remediation.

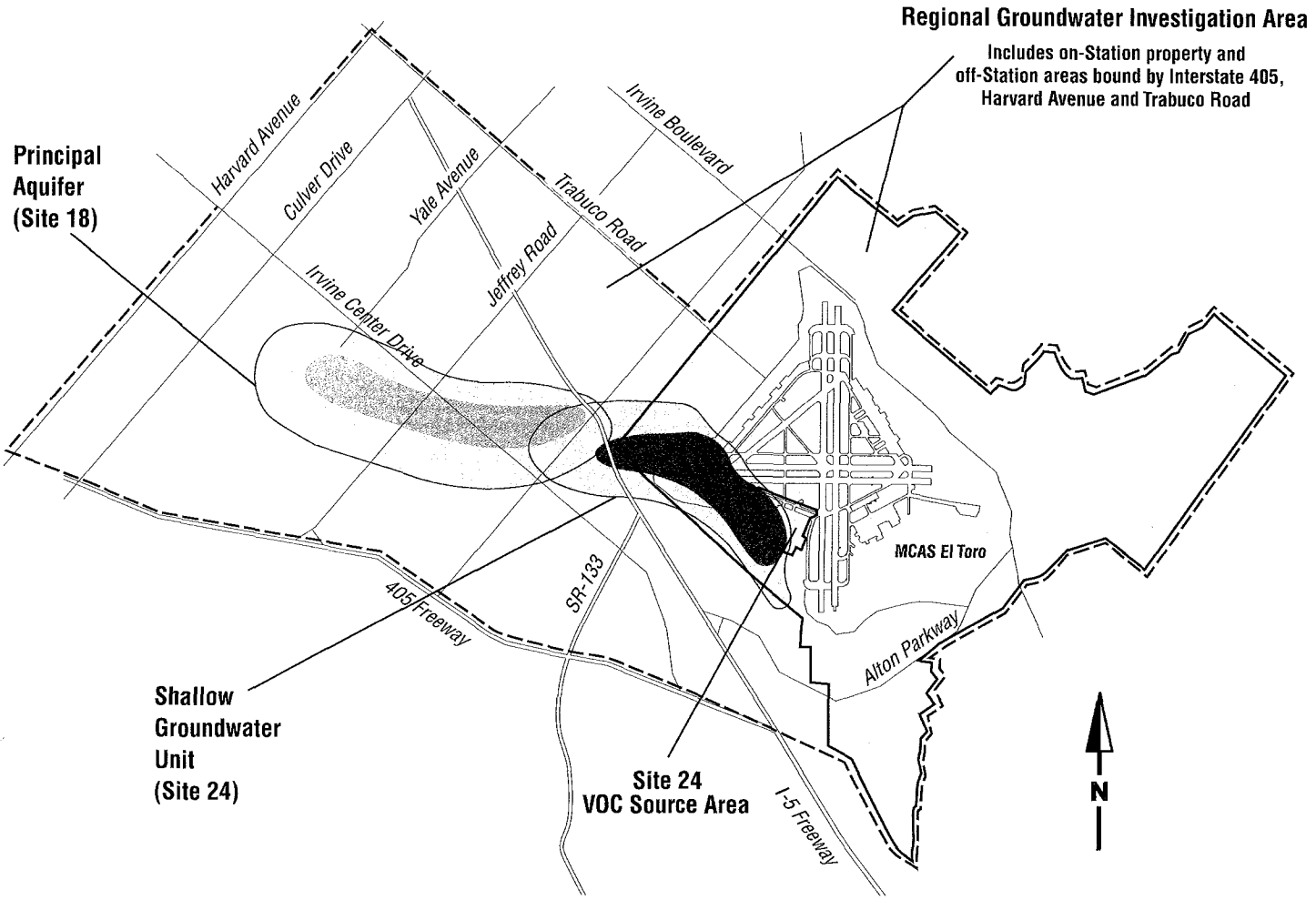
In 1987, the Marine Corps conducted a perimeter study to investigate whether VOCs were present near the Station boundary. Investigation results indicated that VOCs were present in the shallow groundwater unit near the Station's southwest boundary.

Remedial investigations (RI) of Sites 18 and 24 were conducted from 1992 to 1996. The objective was to further assess and characterize the nature and extent of chemical releases into the environment reported in previous studies and assess potential risks to human health and the environment. Feasibility studies (FS) were performed after the RI to evaluate potential cleanup alternatives for contaminated groundwater at Site 18 and for contaminated groundwater and soil at Site 24.

Remedial Investigation Focus

The RI applied a phased approach to conduct sampling of soil, soil gas, and groundwater to assess the types of contaminants present. The first phase concentrated on IRP sites within the Station to locate the VOC source, and on groundwater west of the Station boundary (OU-1 Site 18) to determine the extent of VOC contamination in groundwater. This early phase of the groundwater investigation tested soil and groundwater for a variety of chemicals (i.e., nitrates, dissolved minerals, and VOCs) and determined that only VOCs were attributed to past Station practices. The second phase of the RI concentrated on Site 24 the VOC Source Area, to further characterize and refine the extent of soil and groundwater contamination.

Figure 2—Site Location Map



TCE Concentrations in Regional Groundwater:

- From 5 ppb to 20 ppb
- From 20 ppb to 50 ppb
- Above 50 ppb, some areas above 500 ppb

Boundaries:

- MCAS El Toro
- Regional groundwater investigation area

Note: Concentrations above 5 ppb exceed the state and federal water quality standard

During the RI, groundwater samples were collected at different depths from newly constructed monitoring wells, pre-existing wells, and temporary well points in and around Sites 18 and 24. Analysis of groundwater samples provided information needed for determining where and to what extent VOCs are present in groundwater. For each sample, the measured concentration (or level) of the detected chemical was recorded and compared to federal and state ***water quality standards.*** The data were mapped as VOC plumes in the groundwater to assess potential risks to human health and the environment. Soil and gas samples were collected from near the surface to the water table at Site 24 to help locate the VOC sources of the regional groundwater plume. Detailed maps and lists of the chemicals and their detected levels are presented in the OU-1 and OU-2A RI/FS Reports. Information on the public availability of these reports is on page 22.

What the Remedial Investigation Found

VOCs in Soil and Groundwater Originate at Site 24

The RI concluded that VOC contamination, primarily TCE, was present in the soil and groundwater at Site 24. The Marine Corps determined that TCE is the predominant VOC present in soil and ***soil gas*** beneath the area of Buildings 296 and 297. Other VOCs, including tetrachloroethene (PCE), carbon tetrachloride, 1,1-dichloroethene (1,1-DCE), and Freon 113 were also found in the soil at Site 24 but at lower concentrations.

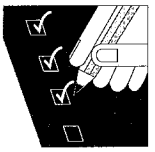
VOC-contaminated soil was not a risk to human health because most of the contamination was located far below the ground surface. However, the VOC-contaminated soil in the area beneath Buildings 296 and 297 was determined to be an ongoing source of the low-level regional VOC groundwater contamination. VOCs, primarily TCE, have migrated from the soil at Site 24 into the shallow groundwater and then into the principal aquifer. In addition to TCE, other VOCs, including PCE, 1,1-DCE, and carbon tetrachloride, are present in the groundwater but at much lower concentrations. Figure 1, presented on page 2, shows the link established between the VOC-contaminated soil and groundwater.

Extent of VOC Plume in Groundwater

Data evaluation focused on determining the extent of the VOC plume in both the shallower groundwater (80 to 110 feet below ground surface), and in the deeper groundwater (200 to 450 feet deep) that makes up the area's principal aquifer. Key findings are summarized below:

- The VOC groundwater plume extends from the VOC Source Area about 3 miles west of the Station.
- Within the Station boundaries, TCE is generally limited to shallow groundwater, with the highest concentrations up to 4,850 parts per billion (ppb) beneath the area of Building 296 at Site 24.
- Outside the Station boundaries, the water quality of the shallow groundwater in most cases is better than the federal and state water quality standard of 5 ppb for TCE. In the principal aquifer, TCE concentrations range from barely detectable to above the limit allowed for drinking water. The highest reported concentration of TCE in the principal aquifer was 61 ppb.
- TCE concentrations gradually decrease as the contamination moves farther away from the source area.

Human Health Risk Assessment



As part of the remedial investigations, human health risk assessments were performed at OU-1 Site 18, Regional Groundwater Plume and OU-2A Site 24, VOC Source Area, to evaluate whether environmental cleanup or controls are necessary as a result of potential risks to human health from exposure to untreated groundwater. Results from the risk assessments indicate that if action is not taken to remediate groundwater and/or prevent exposure to untreated groundwater, potential risks to human health are present if untreated water is used for domestic purposes (i.e., drinking or bathing). Ecological risk assessments, which evaluate risks to plant and animal life from exposure to contaminants, were not performed at either site because no wildlife is present at the highly industrialized Site 24 and groundwater is present too far below the surface of either site for plant and animal exposure. The human health risk assessment results are discussed on page 7.

Subsequent to the RI, a risk assessment was also performed for chemicals in groundwater from the well that provides water for North Lake. This lake is used year round for recreational purposes. The risk assessment showed that the groundwater does not pose an unacceptable risk to human health.

Identifying Exposure Pathways

To assess potential human health risks, information on the types and amounts of chemicals present at each site was collected during the remedial investigations. Possible exposure pathways, which show how people could come in contact with these chemicals, were then identified. The residential risk assessment hypothetically assumes people are living at a site for a period of 30 years.

To determine potential risks from exposure to untreated groundwater, the human health risk assessments assumed that untreated groundwater from Sites 18 and 24 would serve as a source of water for ***domestic use.*** The hypothetical assumptions are considered conservative because there is no current use of the groundwater for domestic purposes. Site 24 is also expected to continue to be used for industrial, not residential, purposes in the future.

Estimating Human Health Risks

Calculated risk levels are an indication of potential risks, and are not an absolute prediction that risk will occur at a certain level. Actual human exposures and risks are likely to be much

less than those calculated for the risk assessments. The assumptions made during the risk assessment process are intended to lead to an overestimation of risk and provide a margin of safety to protect public health and the environment.

Risks to human health associated with exposure to and toxicity of chemicals were estimated for cancer-causing (carcinogenic) and noncancer-causing (noncarcinogenic) effects. For carcinogens, potential risk is expressed in terms of the probability of an individual contracting cancer (cancer risk). To estimate noncancer risks, a hazard index is applied. The probability of an individual contracting cancer is expressed as the number of additional cancer cases that would occur within a population, and is calculated assuming an individual has an extended exposure to the chemicals (30-year period). The term "additional cancer cases" refers to cancer cases that could occur, in addition to those cases that otherwise occur in a population not exposed to the chemicals in untreated groundwater.

To manage risks and protect human health from known or suspected carcinogens, the U.S. EPA has established generally allowable *exposure levels* at general concentration levels that represent an *excess* lifetime cancer risk to an individual of between 10^{-4} (1 additional case in a population of 10,000) and 10^{-6} (1 additional case in a population of 1,000,000). Risk estimates between 10^{-4} and 10^{-6} may call for remedial action and estimates greater than 10^{-4} usually call for remedial action. Various site specific factors such as exposures, types of contaminants, and potential future uses are factored into the determination and selection of a remedy that protects human health.

In addition, for groundwater actions, federal and state MCLs ***(maximum contaminant levels)*** and non-zero MCLGs ***(maximum contaminant level goals)*** for specific chemicals are generally used to gauge whether remedial action is warranted. MCLs are the maximum permissible level of a contaminant delivered to any user of a public water system. MCLs are enforceable standards. Under the federal Safe Drinking Water Act, MCLGs are non-enforceable concentrations of drinking water contaminants, set at the level at which no known or anticipated adverse effects on human health occur. MCLGs are usually the starting point for determining the regulated MCL.

Noncarcinogenic risks are expressed as a hazard index. The U.S. EPA considers a hazard index of less than 1 as protective of human health. A hazard index of 1 indicates that the exposure to the chemicals has limited potential for causing adverse health effects (e.g., respiratory distress). A site with a hazard index greater than 1 does not by itself require remedial action, but indicates the need to take into account the types of chemicals, historical activities, and potential toxic effects of the chemicals of concern.

Risk Assessment Results

Groundwater

The additional chance of a resident contracting cancer from exposure to untreated groundwater is greater than 10^{-4} at some locations in the shallow groundwater unit beneath Site 24. In the principal aquifer, VOC concentrations are much lower, and the corresponding risk levels due to VOCs are between 10^{-5} and 10^{-6}. Risk that was estimated from exposure to naturally occurring inorganic compounds (dissolved minerals) and manmade compounds such as nitrates (from fertilizers) in the principal aquifer was somewhat higher, on the order of 10^{-4} to 10^{-5}. Elevated concentrations of inorganic chemicals and nitrates that cause these risks are believed to be the result of the geology of the area and agricultural practices, not Marine Corps activities.

The human health risk assessments also indicated that there is a potential for noncancer risks associated with exposure to untreated groundwater. In the shallow groundwater unit, the hazard index exceeded 1 for both adult and child residents. Potential noncancer risks were due to TCE and carbon tetrachloride. Noncancer risks also exceeded a hazard index of 1 in several wells at Site 18 due to TCE, carbon tetrachloride, herbicides, inorganics, and nitrates. Only the risks due to VOCs are attributable to Station activities (past use of industrial solvents for aircraft maintenance).

Human health risks (cancer-causing and noncancer-causing) in the shallow groundwater unit were high enough to warrant remedial action. The VOCs in the principal aquifer exceed MCLs. Therefore, remedial action is being taken to bring the VOCs into compliance with the water quality standards.

INTERNET CONNECTION

For access to information on MCAS El Toro (Restoration Advisory Board meeting minutes, proposed plans, and fact sheets), check out the *Southwest Division Naval Facilities Engineering Command Web Site* at:

www.efdsw.navfac.navy.mil/environmental/envhome.htm

Summary of Groundwater Remedial Alternatives

The Marine Corps' remedial action objectives for the shallow groundwater unit and principal aquifer are to:

- reduce concentrations of VOCs in groundwater to the more stringent of federal or state water quality standards;
- control the migration of groundwater containing VOCs above cleanup levels; and
- prevent domestic use of groundwater containing VOCs above cleanup levels until cleanup is complete.

These objectives shaped the development of several remedial alternatives that would prevent exposure to contaminated groundwater, minimize further migration of already-contaminated groundwater, and restore the groundwater to federal and state cleanup levels, known as maximum contaminant levels or MCLs. The MCLs represent water quality standards that are protective of human health. Table 1 shows the criteria and standards for the VOCs most commonly detected in groundwater at Sites 18 and 24.

Development of Alternatives

Remedial alternatives are developed and evaluated by performing a feasibility study. Separate feasibility studies were conducted for Site 18 and Site 24, however these studies were prepared in close coordination to ensure consistency of approach and ensure that the Marine Corps looked at a wide range of possible alternatives. Alternatives for Site 18 were developed and evaluated in the Draft Final Interim Action Feasibility Study Report issued in August 1996. Site 24 alternatives were presented in the Draft Final Phase II Feasibility Study issued in December 1997.

In 2000, a final alternative was developed for Site 18. This alternative is a refinement based on the other alternatives evaluated. A description and technical evaluation of the alternative was transmitted to the regulatory agencies by means of a technical memorandum in April 2001. A copy of this technical memorandum is available for review in the Administrative Record file and at the Information Repository (see page 22).

The first step in the feasibility study process was to identify and evaluate a wide range of potential technologies to accomplish the cleanup objective. This evaluation focused on technologies to contain the migration of contaminants in groundwater, treat the groundwater in place *(in situ* treatment), or treat the groundwater once it has been extracted to the surface *(ex situ* treatment). The Marine Corps also evaluated a variety of technologies to use or dispose of the extracted and treated groundwater. Each of these technologies was screened on the basis of its effectiveness, implementability, and cost, consistent with U.S. EPA and National Oil and Hazardous Substances Contingency Plan (NCP) guidance for feasibility studies. The most effective technologies were developed into remedial alternatives and subjected to further evaluation. Table 2 shows technologies evaluated for groundwater at Sites 18 and 24.

Computer modeling was used to evaluate the most effective remedial alternatives. Investigation results have demonstrated that there is a connection between the soil, which was the source of contamination, and the shallow groundwater unit and principal aquifer. Therefore, the modeling was used to simulate VOC ***infiltration*** through the soil and the movement of VOCs in groundwater over the next 20 to 40 years. By varying the location and number of wells, the model was used to compare the relative rate of contaminant removal, amount of migration of contaminants, and time to reach the state and federal cleanup standards.

Table 1
Criteria and Standards for VOCs Most Commonly Detected in Groundwater at MCAS El Toro Sites 18 and 24 Round 12 Routine Groundwater Monitoring (June 2000)

Chemical VOC	Concentration (parts per billion)		
	U.S. EPA Maximum Contaminant Level (MCL)	California Maximum Contaminant Level (MCL)	Maximum Reported Concentration
Carbon tetrachloride	5	0.5	14
1,1-Dichloroethene	7	6	28
cis-1,2-Dichloroethene	70	6	9.2
Tetrachloroethene (PCE)	5	5	5
Trichloroethene (TCE)	5	5	1,009

Sources:
Federal and state cleanup standards are established in 40 Code of Federal Regulations §141.61(a) and Title 22 California Code of Regulations §64444, respectively.

Notes:
1) The U.S. Marine Corps cleanup standard is the more stringent of the federal and state MCLs.
2) Maximum reported concentrations from Round 12 Routine Groundwater Monitoring Report conducted in June 2000.

Groundwater Remedial Alternatives

The remedial alternatives developed in the feasibility studies consist of a No Action alternative and a variety of alternatives that actively treat contaminated areas.

Table 2
Technologies Evaluated for OU-1 and OU-2A
Feasibility Studies

Containment

Hydraulic Containment (wells)
Physical Barriers (slurry wall)

Removal of Contaminants

Groundwater Extraction (wells)
Vacuum-Enhanced Groundwater Extraction

In-Situ Treatment (performed in place)

Monitored Natural Attenuation
Treatment of Groundwater in Place (air sparging or bioremediation)

Ex-Situ Treatment (remove and treat above ground)

Physical Treatment of Extracted Groundwater (carbon adsorption, air stripping, steam stripping)
Chemical Treatment of Extracted Groundwater (oxidation)
Biological Treatment of Extracted Groundwater (bioremediation)
Air Emission Controls and Treatment (adsorption, catalytic conversion, thermal destruction)

Discharge/Use

Discharge to Publicly Owned Treatment Works
Discharge to Surface Waters
Reinjection of Treated Groundwater
Evaporation Ponds
Beneficial Use (domestic, irrigation, etc.)

The No Action alternative is used as a baseline against which the other alternatives are evaluated. Except for the No Action alternative, each of the remedial alternatives for groundwater at Sites 18 and 24 contains four components:

- extracting groundwater from the shallow groundwater unit and/or principal aquifer;
- treating the extracted groundwater for VOCs to meet water quality standards for disposal or use;
- disposing of or using the treated groundwater;
- preventing inadvertent use of contaminated groundwater until remediation is complete.

The alternatives differ in the estimated number and conceptual placement of groundwater extraction wells, treatment methodology, and the disposal options used. Common elements of each alternative are the use of institutional controls such as deed restrictions to protect extraction and monitoring equipment and prevent inadvertent use of contaminated groundwater until remediation is complete. Institutional controls also ensure that provisions exist for access by the Department of the Navy (DoN) and the regulatory agencies to conduct or oversee monitoring and maintenance activities. SVE was accepted as the remedial alternative for soil at Site 24 in an Interim ROD signed in September 1997, and was implemented beginning in 1999. The Final ROD that documents cleanup of the soil will be developed in 2002. For information on remediation of VOC-contaminated soil conducted at Site 24, see page 15.

Site 18 Alternatives

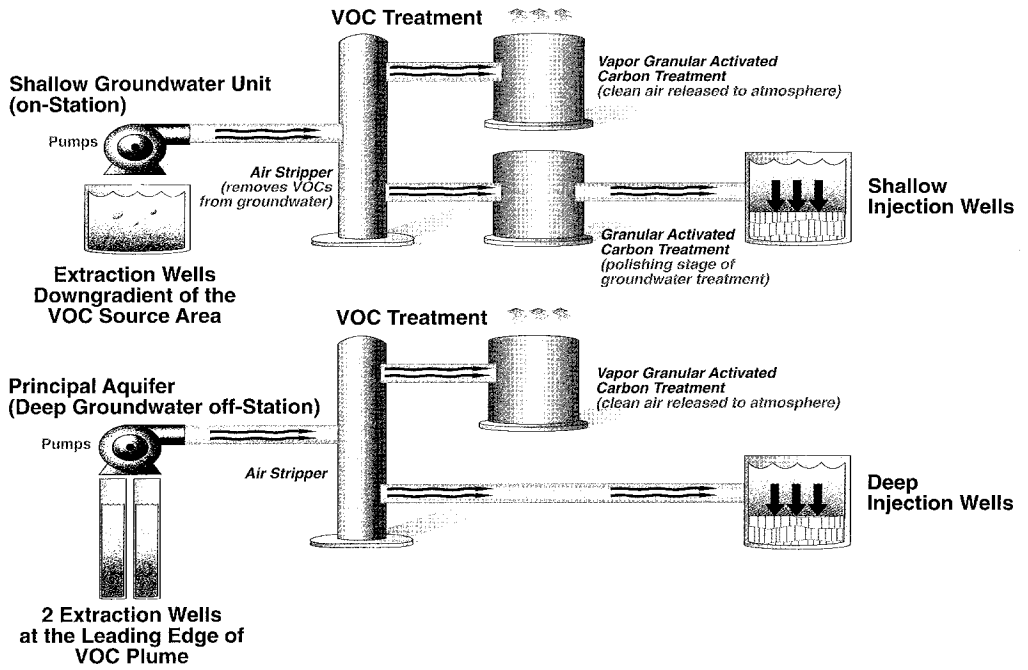
Twelve alternatives were initially evaluated for Site 18. Nine alternatives were screened out based on effectiveness, implementability, and cost. In addition to the No Action alternative, two alternatives, 2A and 6A, were retained for detailed evaluation due to their effectiveness in terms of the mass of VOCs removed, time to remediate the groundwater, and cost.

When BRAC Cleanup Team (BCT) members, U.S. EPA, Cal-EPA Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board (RWQCB), reviewed the Draft Interim Action Feasibility Study in 1995, concern was expressed over the high cost of groundwater extraction and treatment to reduce the low concentrations of TCE in the principal aquifer (Alternative 2A – $56.4 million and Alternative 6A – $40.3 million, see page 17). The BCT suggested that the Marine Corps evaluate lower-cost alternatives and a ***monitored natural attenuation*** approach for the principal aquifer. In response to agency comments, the Marine Corps developed three additional alternatives (7A, 7B, and 8). These alternatives incorporate some monitored natural attenuation in the principal aquifer combined with extra ***monitoring wells*** that are used to assess the progress of ***natural attenuation.***

In 2000, an additional alternative, Alternative 8A, was developed by the Irvine Ranch Water District and Orange County Water District to address public concerns with reuse of treated VOC plume groundwater. This alternative uses separate treatment systems depending on whether groundwater is contaminated or uncontaminated. The technical adequacy of Alternative 8A was evaluated by means of computer modeling. Results were provided to the BCT in April 2001 in an attachment to a technical memorandum titled, Evaluation of Alternative 8A with Respect to National Contingency Plan Criteria, and are part of the Administrative Record file.

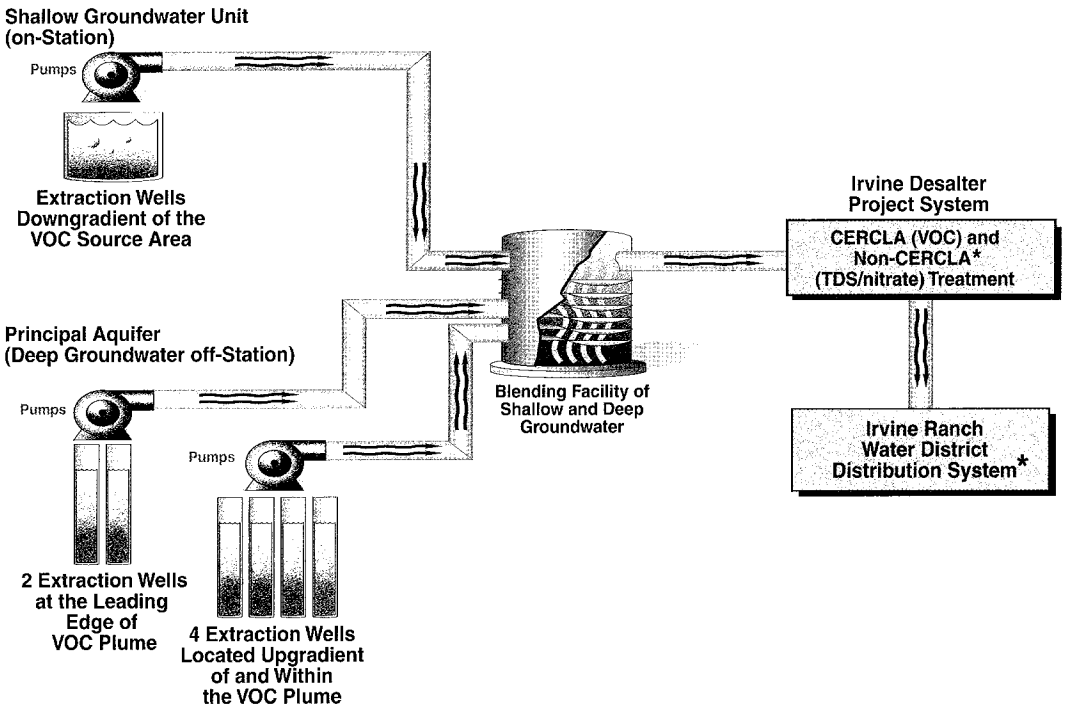
To assist readers in understanding the alternatives developed for Sites 18 and 24, brief descriptions and illustrations are presented on pages 10 through 13. Table 3 on page 14 provides a comparison summary of the OU-1 alternatives for the principal aquifer followed by a similar comparison of the OU-2 alternatives for the shallow groundwater unit.

Alternatives 2A and 9 Conceptual Design



Operation of the SVE system at Site 24 is an integral part of Alternative 9.

Alternatives 6A and 10A Conceptual Design



** Associated with local water supply. TDS/nitrate treatment is not a component of the CERCLA remedial action requirements.*

Operation of the SVE system at Site 24 is an integral part of Alternative 10A.

Site 18 Alternatives

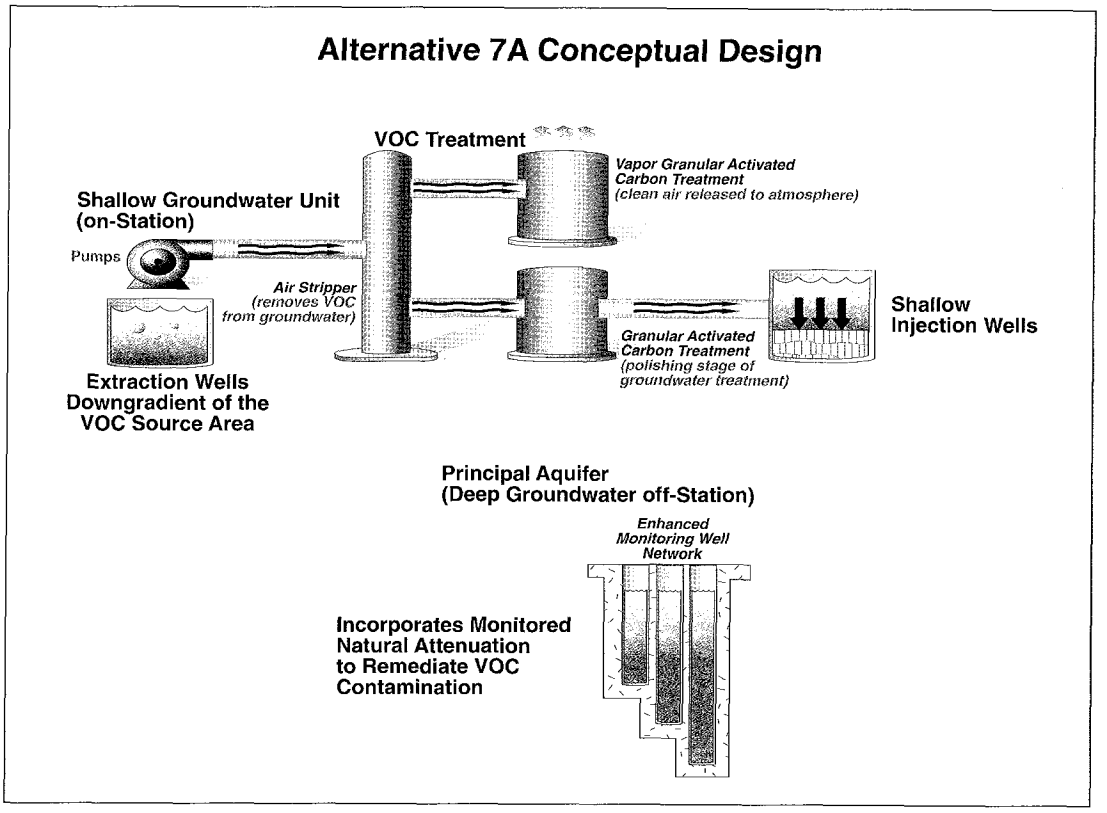
Alternative 2A – involves construction of separate groundwater extraction, treatment, and injection systems for the shallow groundwater unit and principal aquifer. Groundwater from each of these areas is conveyed (piped) to separate treatment facilities to remove VOCs and is then pumped (injected) back into the groundwater unit it came from. Cleanup of the shallow groundwater unit is estimated to take 52 years, and the principal aquifer 43 years.

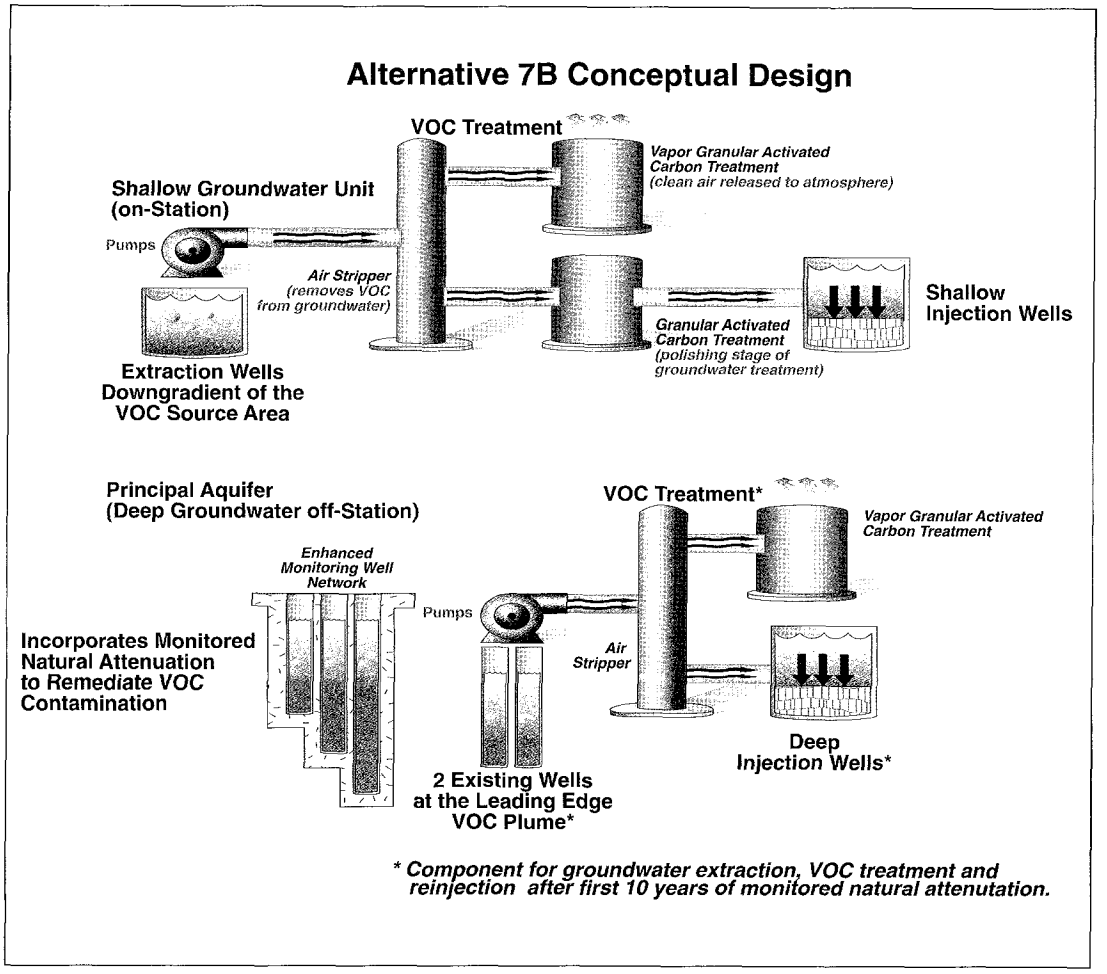
Alternative 6A – groundwater from the shallow groundwater unit and principal aquifer is extracted, blended (mixed), and conveyed to the IDP for removal of VOCs. Treated groundwater is distributed to the public for domestic purposes such as drinking and bathing. Cleanup of the shallow groundwater unit is estimated to take 48 years, and the principal aquifer 49 years.

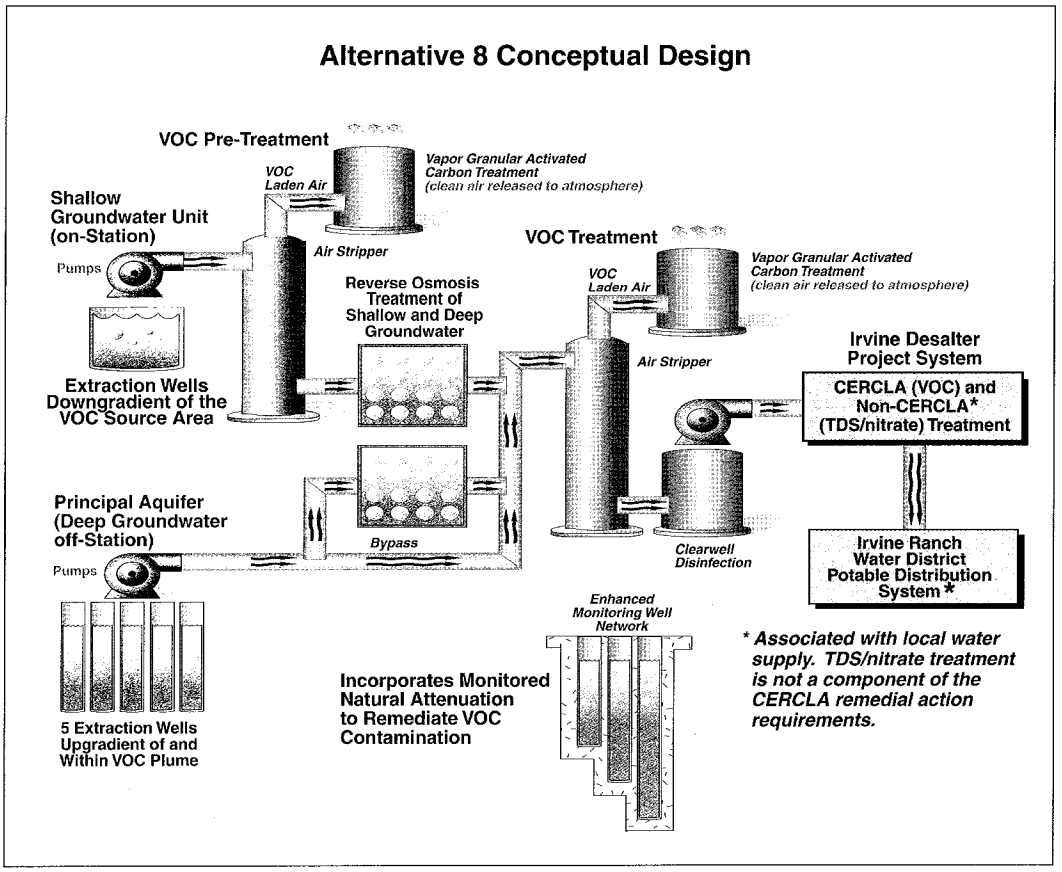
Alternative 7A – uses the same shallow groundwater extraction, treatment, and reinjection system as 2A and incorporates monitored natural attenuation to remediate VOC contamination in the principal aquifer. Shallow groundwater unit cleanup is estimated to take 52 years, and the principal aquifer 60 years.

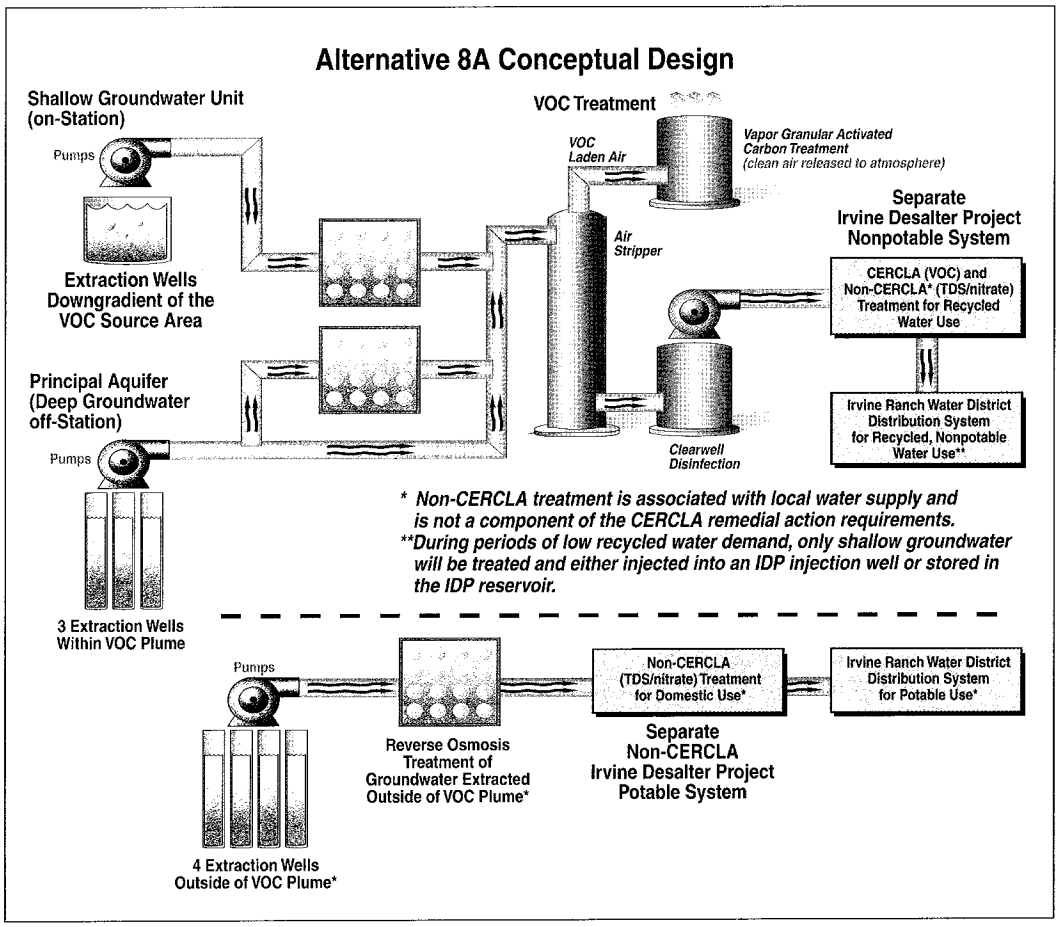
Alternative 7B – is identical to 7A except it is assumed that after 10 years two existing irrigation wells at the leading edge of the VOC plume are no longer used for agriculture due to reduced demand or because TDS concentrations are too high for irrigating crops. In Alternative 7B, the Marine Corps acquires the existing irrigation wells after 10 years, treats the extracted groundwater from these wells to remove VOCs, and injects the treated groundwater upgradient of the VOC plume in the principal aquifer. Cleanup of both the shallow groundwater unit and the principal aquifer is estimated to take 54 years.

Alternative 8 – extracts groundwater from wells downgradient in the shallow groundwater unit and from five existing wells located upgradient of and within the VOC plume in the principal aquifer. Water from both extraction well systems is blended and conveyed to the IDP for treatment and reuse for domestic purposes. Groundwater downgradient of the extraction wells is remediated using monitored natural attenuation. Shallow groundwater unit cleanup is estimated to take 59 years, and the principal aquifer 70 years.







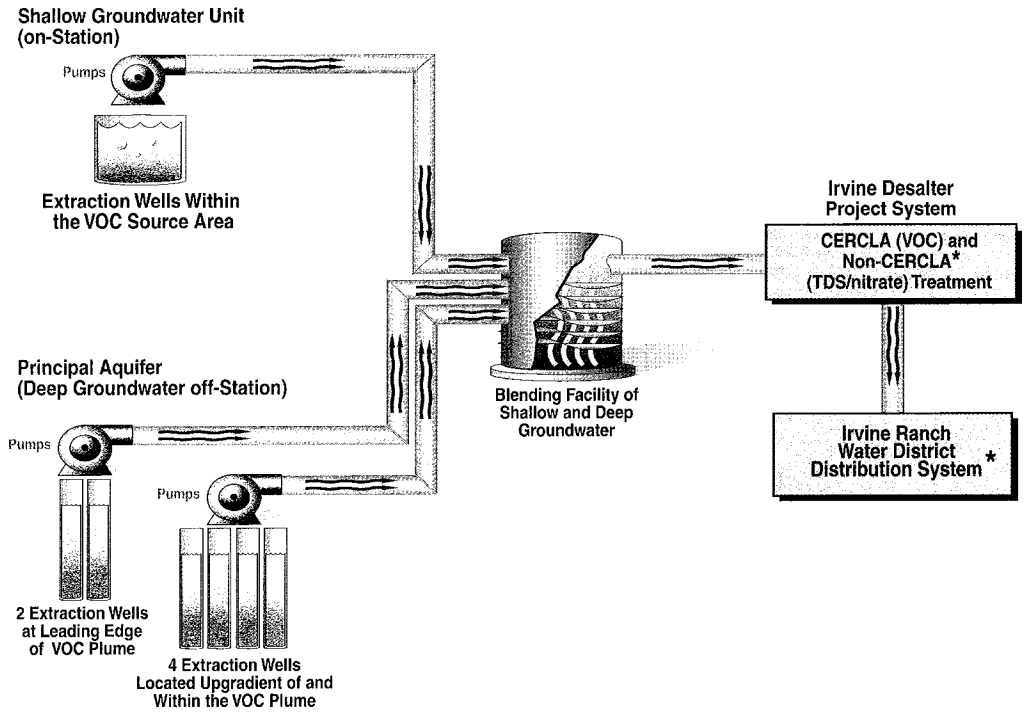


Alternative 8A – Contaminated groundwater from the shallow groundwater unit and from within the VOC plume in the principal aquifer is extracted, blended, and conveyed to the IDP for removal of VOCs during a portion of the year. Treated groundwater is used for non-domestic purposes such as irrigation and industrial water supply. During some times of the year it is assumed that water is not needed for irrigation or other purposes. During those time periods, groundwater will not be extracted from the principal aquifer. Groundwater will continue to be extracted from the shallow groundwater unit. The extracted water will be treated at the IDP and will be injected downgradient of the shallow groundwater unit VOC plume or stored in an IRWD nonpotable reservoir. An independent non-CERCLA system extracts groundwater from areas outside the VOC plume. This water is treated to remove low concentrations (below drinking water standards) of VOCs and to remove TDS and nitrates. Treated water from the non-CERCLA system is distributed for domestic use. Cleanup of the principal aquifer is estimated to take 95 years and could take significantly less time depending on the final well sites selected and the extraction rates.

Site 24 Alternatives

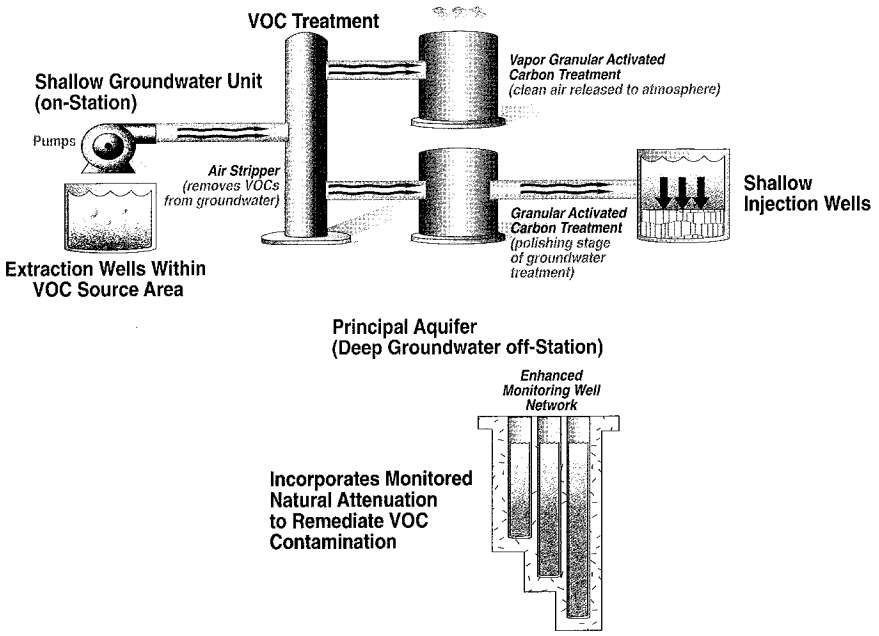
In addition to the No Action alternative required by the NCP, four other alternatives (9, 10A, 10B, and 11) were developed for Site 24. All of these alternatives used computer modeling to simulate the removal of contaminants from the soil at Site 24 using soil vapor extraction technology.

Alternative 10B Conceptual Design



** Associated with local water supply. Not a component of the CERCLA remedial action requirements. Operation of the SVE system at Site 24 is an integral part of Alternative 10B.*

Alternative 11 Conceptual Design



Operation of the SVE system at Site 24 is an integral part of Alternative 11.

Alternative 9 – is identical to the Site 18 Alternative 2A except for slightly different assumptions used in the computer modeling, including operation of the SVE system, which reduces cleanup time. See page 10 for the illustration of the conceptual design. Shallow groundwater unit cleanup is estimated to take 44 years, and the principal aquifer 25 years.

Alternative 10A – is identical to the Site 18 Alternative 6A except for slightly different assumptions used in the computer modeling, including operation of the SVE system. See page 10 for the conceptual design illustration. Cleanup time of the shallow groundwater unit is estimated to take more than 80 years, and the principal aquifer 30 years.

Alternative 10B – is similar to the Site 24 Alternative 10A (and Site 18 Alternative 6A) except that the extraction wells in the shallow groundwater unit are located within the areas with the highest VOC contamination. Groundwater is extracted from these wells in the shallow groundwater unit, blended with groundwater extracted from wells in the principal aquifer, and conveyed to the IDP for treatment of VOCs. Shallow groundwater unit cleanup is estimated to take 19 years, and the principal aquifer 34 years.

Alternative 11 – is similar to the Site 18 Alternative 7A except that the extraction wells in the shallow groundwater unit are located in the areas with the highest VOC concentrations. Groundwater in the principal aquifer is remediated using monitored natural attenuation. An enhanced monitoring well network would be used to assess the progress of natural attenuation. Shallow groundwater unit cleanup is estimated to take 38 years, and the principal aquifer 31 years.

Table 3

Comparison of Operable Unit 1 Site 18 Alternatives

Alternative No.	Primary Purpose of Principal Aquifer Remediation	Where Principal Aquifer Groundwater Treated and by Whom	Reuse of Treated Groundwater	Estimated Remediation Time in Principal Aquifer (Years)	Estimated Total Mass of VOCs Removed in 20 Years (Pounds)
2A	Containment	Navy treats groundwater from the principal aquifer at off-Station treatment facility	Injected back into principal aquifer	43	12,540
6A	Mass removal and containment	IDP* joint treatment facility	Distributed to the public for domestic water purposes	49	13,750
7A	Monitored natural attenuation	No treatment of groundwater from the principal aquifer	None	60	11,830
7B	Monitored natural attenuation with containment after 10 years	After 10 years, Navy treats groundwater at an off-Station treatment facility	Injection after 10 years	54	11,750
8	Mass removal	IDP joint treatment facility	Distributed to the public for domestic water purposes	70	13,200
8A	Mass removal and containment	IDP joint treatment facility	Distributed to the public for recycled water purposes	95+	14,000

Comparison of Operable Unit 2A Site 24 Alternatives

Alternative No.	Primary Purpose of Shallow Groundwater Unit Remediation	Where Shallow Groundwater Treated and by Whom	Reuse of Treated Groundwater	Estimated Remediation Time in Shallow Ground-water Unit (Years)	Estimated Total Mass of VOCs Removed in 20 Years (Pounds)
9	Containment	Navy treats at on-Station facility	Injected back into shallow groundwater unit	44	4,870
10A	Containment	IDP joint treatment plant	Distributed to the public for domestic water purposes	80	4,570
10B	Mass removal	IDP joint treatment plant	Distributed to the public for recycled water purposes	19	4,630
11	Mass removal	Navy treats at on-Station facility	Injected back into shallow groundwater unit	38	4,800

Notes:

*IDP = Irvine Desalter Project

+ Computer modeling shows that Alternative 8A is the most effective alternative during the first 20 years of operation at removing the initial mass of VOC contamination. By further optimizing the well placement of the extraction wells in the remedial design phase, remediation time may be significantly shortened.

- A comparative Cost Estimate Summary of the OU-1 and OU-2 alternatives are presented on Table 4 on page 17.
- The No Action alternative, which is used as a baseline to evaluate other alternatives, is not listed above.

Cleanup Progress of VOC-Contaminated Soil at Site 24

Remedial action objectives for soil were to: reduce concentrations of VOCs in the VOC Source Area to prevent or minimize further degradation of the shallow groundwater unit above the MCL for drinking water; and continue vadose zone remediation until the average VOC soil gas concentrations are below threshold concentrations (concentrations capable of contaminating groundwater above the MCLs). In September 1997, the BRAC Cleanup Team signed an Interim Record of Decision (ROD) that documented the remedy selected to remove VOCs from soil and established cleanup goals to determine when remediation was complete. VOC-contaminated soil at Site 24 is not a risk to human health because VOC concentrations near the surface are very low. However, at the time of the RI, contaminated soil was a potential ongoing source of contamination to the groundwater. Cleanup goals were developed to help minimize or prevent groundwater contamination above the MCLs. At the time of the FS, cleanup of soil was estimated to take 2 to 4 years to complete. Actual cleanup time has been significantly less.

Site 24 Soil Gas Concentrations and Cleanup Goals

VOC	Maximum Pre-cleanup Concentrations*	Soil Gas Cleanup Goals in Interim ROD*	Maximum Post-cleanup Concentrations*
Trichloroethene (TCE)	6,120	27	13
Tetrachloroethene (PCE)	192	69	30
Carbon tetrachloride	31	61	N/A**
1,1-Dichloroethene	447	563	N/A**

*(micrograms per liter)
**Not applicable (pre-cleanup concentrations were below cleanup goals)

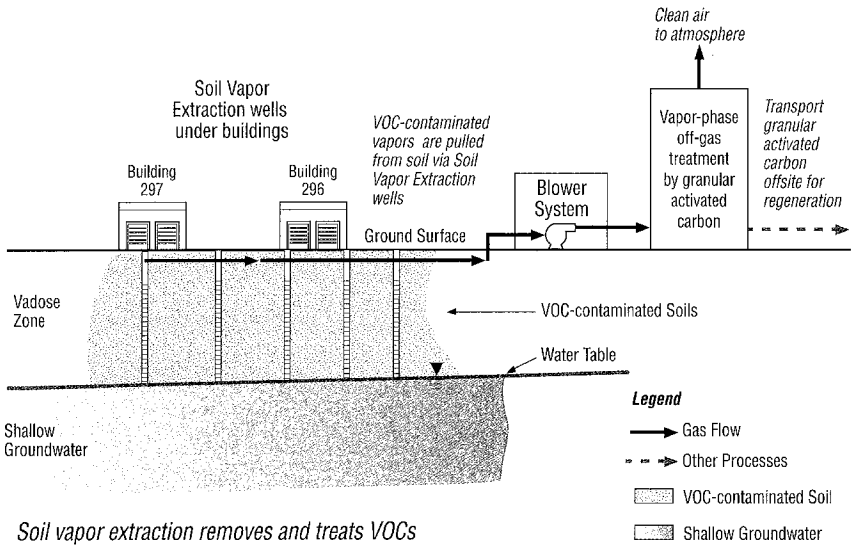
SVE was the process selected for remediation of soil at Site 24. This process effectively removes VOCs from the soil without requiring excavation. VOCs are removed when a vacuum is applied to a network of underground extraction wells above the groundwater table, and contaminants, in the form of vapor or gas, are pulled to the surface. The extracted VOC vapors are passed through a granular activated carbon filter system. VOCs are trapped on the granular activated carbon filters and clean air is dispersed into the atmosphere. The activated carbon is then transported to an off-Station treatment facility for regeneration so it can be used again.

Pilot tests conducted at Site 24 prior to the remedial action removed approximately 870 pounds of TCE, demonstrating that SVE is effective, technically feasible for site conditions, and poses a minimum of risk to public health and the environment.

To remediate soil, the Marine Corps used the treatment equipment that successfully removed VOCs from soil at Norton Air Force Base in San Bernardino, California. Transfer and installation of that equipment was completed in 1998. In January 1999, the remedial design for the SVE system was completed and operational testing of the Central Treatment System remediation equipment commenced. The remedial action began in March 1999 with the use of portable SVE systems to extract from existing SVE wells. The Central Treatment System operations and installation of the initial phase of additional SVE wells and the associated vapor conveyance piping began in May 1999.

Significant progress in remediating the vadose zone soils had taken place and vapor concentrations at all the SVE wells were below the soil gas cleanup goals by the end of calendar year 1999. ***Rebound*** testing of existing SVE wells and the installation of supplemental SVE wells to confirm that soil gas cleanup goals have been achieved throughout the soil gas plume was completed in April 2000. Closure verification sampling was completed in September 2000 and a draft vadose zone closure report documenting that soil gas cleanup goals have been attained was submitted for regulatory review in June 2001. The Final ROD to document completion of soil cleanup at Site 24 will be developed in 2002.

Figure 3—SVE Treatment Process - Site 24



Soil vapor extraction removes and treats VOCs from beneath Buildings 297 and 296 and other areas at Site 24.

The Marine Corps' Preferred Remedy for Groundwater Cleanup

The Marine Corps has proposed Alternative 8A for remediation of the principal aquifer at Site 18 and Alternative 10B' for remediation of the shallow groundwater unit at Site 24. These alternatives are based in part upon CERCLA-related aspects of the proposed Irvine Desalter Project addressed in a settlement agreement entered into by the United States and OCWD/IRWD. Key components of the preferred alternative and related settlement agreement are summarized below. The Marine Corps' rationale for proposing these alternatives is presented on page 19.

Alternative 8A – consists of three extraction wells located within the VOC plume in the principal aquifer. These wells are assumed to have a combined seasonal extraction rate of 2,500 gallons per minute. The Marine Corps, OCWD/IRWD, and regulatory agencies will establish the exact well locations and pumping rates during the remedial design phase. Cleanup time of the principal aquifer is estimated at 95 years and could take significantly less time depending on the final well sites selected and the extraction rates.

Alternative 10B' *(pronounced Alternative 10B prime)* – a variation of Alternative 10B that conceptually consists of multiple extraction wells located within the areas of highest VOC concentration in the shallow groundwater unit at Site 24. Alternative 10B' differs from Alternative 10B in that the minimum extraction flow rate is reduced from 800 gallons per minute to 440 to 550 gallons per minute. The Marine Corps, OCWD/IRWD, and the regulatory agencies will establish the actual number and location of the wells during the remedial design phase. Even though the total pumping rate is reduced, computer modeling shows the time to remediate VOCs in the shallow groundwater unit to the MCLs is approximately the same as Alternative 10B. Shallow groundwater unit cleanup is estimated at 20 years and could take significantly less time depending on the final well sites selected and the extraction rates.

Institutional Controls – The preferred alternative also includes institutional controls to protect extraction and monitoring equipment, prevent in advertent use of contaminated groundwater, and allow access for monitoring, maintenance, and any additional remediation.

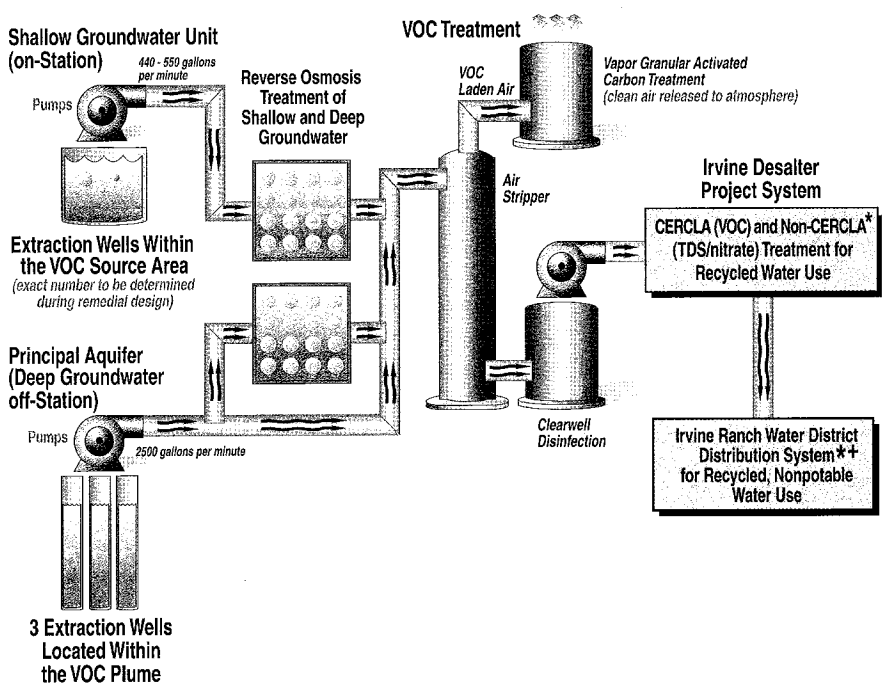
Additional Measures – If the Marine Corps' preferred remedy is selected, the Record of Decision will include specific procedures designed to provide additional protection to the public beyond groundwater remediation and compliance with water quality standards. In the unlikely event that additional contaminants are detected that might not be adequately treated by the IDP, these procedures will provide for temporary and/or permanent shutdown of the IDP, subject to concurrence by the Marine Corps, U.S. EPA, and Cal-EPA, pending further study of the need for additional treatment.

The ROD will also provide that the Marine Corps will conduct further evaluation of monitored natural attenuation for the principal aquifer if the IDP is permanently terminated for any reason. This is based upon currently available information indicating that natural attenuation may be an appropriate backup remedy in the event of IDP termination.

Settlement Agreement — The United States and OCWD/IRWD have negotiated a settlement agreement concerning incorporation of the VOC-related components of the IDP into a CERCLA Record of Decision for VOC-contaminated groundwater at Operable Unit 1 Site 18 and Operable Unit 2A Site 24. The settlement agreement also resolves the liability of the United States to OCWD/IRWD for treatment of contaminants. Under this agreement, the United States will bear the costs of VOC treatment of extracted groundwater from the principal aquifer and a share of the associated extraction and conveyance (piping) costs. OCWD/IRWD will continue to bear the normal costs associated with non-domestic, recycled water supply and treatment requirements including those for TDS and nitrates.

The preferred remedy and the settlement agreement together

Preferred Remedy Conceptual Design Alternatives 8A and 10B' Combined



** Associated with local water supply. TDS/nitrate treatment is not a component of the CERCLA remedial action requirements. Non-CERCLA wells in the principal aquifer are not shown because they are not part of the CERCLA remedy.*

+ During periods of low recycled water demand, only shallow groundwater will be treated and either injected into an IDP injection well or stored in the IDP reservoir.

benefit the Marine Corps, OCWD/IRWD, and the public. The Marine Corps benefits through avoidance of costs for groundwater disposal. OCWD/IRWD benefits because the United States pays for a portion of the costs associated with the IDP. The public benefits from being able to restore a valuable water resource, improve supply reliability, and allow development of both potable and nonpotable water supply sources.

This settlement agreement was approved and signed by representatives from OCWD/IRWD (June 2001), and the United States of America, Department of the Navy (July 2001), and Department of Justice (September 2001). The settlement agreement is contingent upon finalization of a ROD selecting the preferred remedy, Alternatives 8A and 10B' combined, and will take effect upon the date the final signature is obtained from the BRAC Cleanup Team signatories (the Navy, U.S. EPA, Cal-EPA Department of Toxic Substances Control, and the California Regional Water Quality Control Board). Although the Marine Corps is not soliciting comment on this settlement agreement, a signed copy is available in the Administrative Record file.

The Marine Corps and OCWD have also negotiated a separate contract for OCWD/IRWD to accept, treat for VOCs, and take ownership of the groundwater extracted from the shallow groundwater unit. OCWD/IRWD has already signed the contract. The Department of the Navy will sign the contract when the remedy for OU-2A Site 24 based upon Alternative 10B' is selected in a ROD and concurred pursuant to the MCAS El Toro Federal Facility Agreement. The proposed contract provides that it will remain in effect until the regulatory agencies concur that the requirements of the ROD have been met.

Table 4 – Groundwater Remedial Alternatives – Comparative Cost Estimate Summary

Cost Category	Estimated Cost in Millions $										
	Operable Unit 1 Site 18 Alternatives *40 years of estimated operation (shallow groundwater unit) 40 years of estimated operation (principal aquifer)*						**Operable Unit 2A Site 24 Alternatives** *20 years of estimated operation (shallow groundwater unit) 40 years of estimated operation (principal aquifer)*				**Preferred Remedy Sites 18 & 24**
	Alt.2A	**Alt.6A**	**Alt.7A**	**Alt.7B**	**Alt.8**	**Alt. 8A**	**Alt.9**	**Alt.10A**	**Alt.10B'**	**Alt.11**	**Alternative 8A (principal aquifer) Alternative 10B' (shallow groundwater unit)**
Capital Costs	29.9	21.3[a]	18.0	25.9	17.1[a]	16.2	23.6	20.0	21.5	14.2	14.8[b]
Includes design and construction of groundwater treatment and distribution systems that pertain to the VOC-related groundwater contamination.											
Operation, Maintenance and Monitoring Costs	26.5	19.0[a]	16.0	22.3	15.2[a]	17.5	18.1	26.2	26.1	9.6	15.9[b]
Includes operating and maintaining groundwater treatment and distribution systems that pertain to the VOC-related groundwater contamination.											
Total – Present Worth Costs[c]	56.4	40.3[a]	34.0	48.2	32.3[a]	33.6[d]	41.7	46.2	47.6	23.8	30.6[b][d]
Covers all costs to complete VOC portions of groundwater and treatment systems and includes a contingency to cover cost increases that may occur as a result of unforeseen conditions. Total present worth costs for each alternative include cleanup of both the shallow groundwater unit and principal aquifer.											
Detailed information on estimated costs is presented in the Feasibility Studies. The settlement agreement contains costs associated with the preferred remedy.											

Notes:

(a) Figure represents the United States payment for 100% of the VOC treatment requirements associated with the IDP and a portion of the dual-purpose IDP components such as extraction and conveyance requirements.

(b) The cost of the preferred alternative is based on actual costs contained in the settlement agreement and in the contract for treatment of groundwater from the shallow groundwater unit. The cost assumes 20 years of operation in the shallow groundwater unit and 40 years in the principal aquifer.

(c) Present worth costs for Sites 18 and 24 alternatives are taken directly from the OU-1 IAFS and the Site 24 FS and are expressed in 1995 and 1997 dollars, respectively. These costs are presented for comparison purposes only.

(d) Total number is rounded off.

Evaluation of the Preferred Remedy

Each alternative has undergone detailed evaluation and analysis, using evaluation criteria developed by the U.S. EPA. The nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied in order for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major tradeoffs among alternatives. Generally, the modifying criteria are taken into account after public comment is received on the Proposed Plan and reviewed with the various State regulatory agencies to determine if the preferred alternatives remain as the most appropriate remedial action. The nine criteria are defined below and are accompanied by the key points from the evaluation of the preferred remedy. The preferred remedy is a combination of Alternative 8A for the principal aquifer and Alternative 10B' for the shallow groundwater unit. A chart that summarizes evaluation of the groundwater alternatives is shown on page 19. The locations of where to view the feasibility studies and other reports that provide a more detailed explanation of the evaluation of alternatives are found on page 22.

A. Threshold Criteria

1. Overall Protection of Human Health and the Environment – *assesses whether a cleanup remedy provides adequate public health protection and describes how health risks posed by the site will be eliminated, reduced, or controlled through treatment, engineering controls, or institutional and regulatory controls.*

- The preferred alternative provides short-term protection through institutional controls that prevent the use of contaminated groundwater and long-term protection by removing VOCs and remediating the aquifer to water quality standards for VOCs.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) – *addresses whether a cleanup remedy will meet all federal, state, and local environmental statutes or requirements (see page 21).*

- VOC-contaminated water will be treated at a minimum to meet water quality standards.
- Emission controls will be used to ensure compliance with air quality standards.

B. Primary Balancing Criteria

3. Long-Term Effectiveness and Permanence – *refers to the ability of a remedy to continue protecting human health and the environment over time after the cleanup action is completed.*

- Extraction and treatment of groundwater using ***air stripping*** is a proven, effective technique for removing VOCs and remediating groundwater (air forced through water releases VOCs).
- Requires some treatment of residual wastes (used carbon, filters), generally through regeneration or disposal.

4. Reduction of Toxicity, Mobility, and Volume – *refers to the degree to which a cleanup alternative uses treatment technologies to reduce: 1) harmful effects to human health and the environment (toxicity), 2) the contaminant's ability to move (mobility), and 3) the amount of contamination (volume).*

- Significantly reduces toxicity and volume through treatment.
- Shallow groundwater unit extraction wells placed within the TCE hot spot remove VOC mass more effectively than wells placed at the leading edge of the plume.
- Computer modeling indicates that the leading edge of the plume will be contained east of Culver Drive in Irvine and that the plume will not impact extraction wells associated with the potable water system. This will be confirmed by groundwater monitoring.
- Removal and treatment of VOCs produces few by-products.

5. Short-Term Effectiveness – *assesses how well human health and the environment will be protected from impacts due to construction and implementation of a remedy. Also considers time to reach cleanup goals.*

- Does not present substantive risks to on-Station workers or the community; potential for some dust generation during well installation.
- Potential air emissions are easily controlled through activated carbon adsorption.
- Removes most of the mass in the first 20 years.

6. Implementability – *refers to the technical feasibility (how difficult the alternative is to construct and operate) and administrative feasibility (coordination with other agencies) of a remedy. Factors such as availability of materials and services needed are considered.*

- Technology is readily available.
- Successful pilot tests demonstrate feasibility of extracting and treating contaminated groundwater.
- Allows evaluation of monitored natural attenuation if the IDP is permanently terminated for any reason by OCWD/IRWD.
- Treatment and reuse of groundwater is technically feasible.

7. Cost – *evaluates the estimated capital costs and present worth in today's dollars required for design and construction and long-term operation and maintenance costs of a remedy.*

- $30.6 million, includes capital costs, operation and maintenance costs, and monitoring costs (see Table 4 on page 17).
- Saves the government money because the Marine Corps does not need to dispose of the treated groundwater.
- Treatment of VOCs at the IDP is less costly than on-Station treatment and disposal.
- If the IDP is permanently terminated, allows for evaluation of monitored natural attenuation before a replacement treatment system is considered.

C. Modifying Criteria

8. State Acceptance – *reflects whether the State of California's environmental agencies agree with, oppose, or have no objection to or comment on the Marine Corps' preferred alternative.*

- The State of California concurs with Marine Corps' preferred remedy for groundwater.

9. Community Acceptance – *evaluates whether community concerns are addressed by the remedy and if the community has a preference for a remedy. Although public comment is an im-*

portant part of the final decision, the Marine Corps is compelled by law to balance community concerns with the other criteria.

- MCAS El Toro community-based Restoration Advisory Board has had the opportunity to review and comment on the OU-1 and OU-2A Remedial Investigation and Feasibility Study (RI/FS) Reports.
- Proposed Plan and Draft Final RI/FS Reports are currently available for public comment.
- Public comment on this Proposed Plan and the Draft Final RI/FS Reports will be reviewed and considered during the preparation of the Record of Decision.

Table 5 – Comparative Analysis of Remedial Alternatives*

U.S. EPA Criteria	No Action 1	Site 18 Alternatives 2A	6A	7A	7B	8	8A	Site 24 Alternatives 9	10A	10B	11	Preferred Remedy 8A/ 10B'
1 Overall Protection of Human Health and the Environment	X	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2 Compliance with Applicable or Relevant and Appropriate Requirements	N/A	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3 Long-Term Effectiveness and Permanence	○	◕	●	◒	◒	●	●	●	◕	●	●	●
4 Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment	○	◕	●	◒	◒	●	●	●	◒	◕	●	●
5 Short-Term Effectiveness	○	●	●	◕	●	◒	◕+	◕	◒	●	◕	◕
6 Implementability	●	◒	NAF	◕	◕	NAF	●	◒	NAF	◕	◕	●
7 Cost	●	○	◒	◕	◒	◕	◕	◒	◒	◒	●	◕
8 State Acceptance – State concurs with the preferred remedy.												●
9 Community Acceptance – This criteria will be addressed in the Record of Decision.												

X – does not meet criteria ✔ – meets criteria N/A – not applicable

NAF – not administratively feasible

** In this analysis, remedial alternatives for each site are only evaluated against each other. Thus, Site 18 Alternatives are not to be compared with Site 24 Alternatives.*

+ By further optimizing the placement of extraction wells in the remedial design phase, remediation time may be significantly shortened.

Relative Performance in Satisfying Criteria

○	◒	◕	●
Least Acceptable Performance	Fair Performance	Moderate Performance	Good Performance

Rationale for the Marine Corps' Preferred Remedy for Groundwater Cleanup

The Marine Corps prefers Alternative 8A and Alternative 10B' for remediation of groundwater at Sites 18 and 24 for several reasons, including cost-effectiveness, implementability, and anticipated community acceptance.

The preferred remedy is cost effective. The cost of combined Alternative 8A/10B' is lower than the cost of any other alternatives that actively remediate the principal aquifer. The Marine Corps' costs are reduced because they do not need to pay to dispose of treated groundwater.

The preferred remedy is readily implemented. The technology that will be used to remediate groundwater is proven and readily available. In addition, the OCWD/IRWD are prepared to proceed once the preferred groundwater remedy is selected and finalized in the ROD.

Finally, the Marine Corps anticipates a higher level of community acceptance for the preferred remedy because these alternatives restore and make beneficial use of scarce groundwater resources. The preferred remedy also uses separate treatment systems for groundwater from contaminated and uncontaminated areas and does not reuse previously contaminated groundwater for potable purposes. Community acceptance will be evaluated following the public comment period (see page 20).

Status of Installation Restoration Program Activities

Remediation of contaminated groundwater associated with Installation Restoration Program (IRP) Operable Unit 1 Site 18 (off-Station regional groundwater) and Operable Unit 2A Site 24 (on- and off-Station shallow groundwater) represents a key component of the comprehensive environmental investigation and cleanup program underway at MCAS El Toro. Designed to protect public health and the environment, the IRP provides a structure for the Marine Corps to identify, investigate, and implement remedies for contamination that resulted from past operations and waste disposal activities. This effort is being coordinated with the operational closure of the Station that took place in July 1999. The IRP process for Operable Unit 1 Site 18 and Operable Unit 2A Site 24, is shown below.

To effectively manage the overall cleanup effort, the Marine Corps organized the IRP sites into Operable Units or OUs.

- OU-1 (Site 18) addresses the VOC contamination in the regional groundwater that extends 3 miles west of the Station.
- OU-2A includes VOC-contaminated soil and groundwater at Site 24, the VOC Source Area; and Site 25, the Major Drainage Channels at the Station.
- OU-2B (Sites 2 and 17) and OU-2C (Sites 3 and 5) address inactive landfill sites that contain a variety of waste materials.
- OU-3 includes the remaining IRP sites at the Station.

In 1997, the Marine Corps issued Proposed Plans and established public comment periods for: the Site 24 VOC Source Area for soil cleanup using soil vapor extraction technology; and for the Marine Corps' recommendation for No Further Action for OU-3 Sites 4, 6, 9, 10, 13, 15, 19, 20, 21, 22, and OU-2A Site 25. After consideration of public comments on the proposed alternatives, an Interim Record of Decision (ROD) formally documenting the remedial actions planned for soil at Site 24 and a ROD for these other sites were both finalized in September 1997. The Final ROD for soil at Site 24 will be developed in 2002.

In May 1998, the Marine Corps issued a Proposed Plan and established a public comment period for the OU-2B and OU-2C (landfill) sites. In July 2000, an Interim ROD for Sites 2 and 17 was finalized. Completion of the ROD process for closure of the landfills (Sites 2 and 17 and Sites 3 and 5) is anticipated to occur in 2001.

In May 1999, the Marine Corps issued a Proposed Plan for Sites 8, 11, and 12. Based on agency and public comments, only Site 11 was included in the ROD that was finalized in September 1999. Completion of the ROD process for Sites 8 and 12 is expected to occur in 2001.

A ROD documenting a no action decision for Sites 7 and 14 was finalized in June 2001. A ROD documenting the selected remedial action for Site 16 is expected to be finalized in 2002.

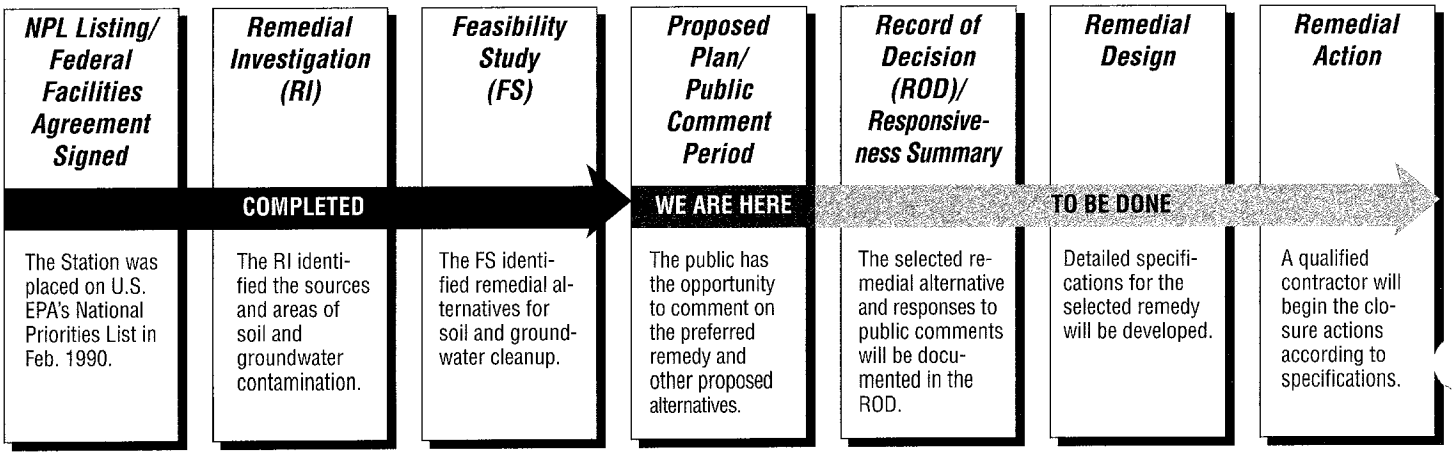
What Happens After the Public Comment Period?

After the close of the 30-day public comment period (November 7–December 7, 2001) for the OU-1 and OU-2A Proposed Plan, the next steps in the Installation Restoration Program process are the Record of Decision/ Responsiveness Summary and Remedial Design/Remedial Action.

The ROD formally documents the selection of the final remedial alternative for groundwater at Sites 18 and 24. Comments received in writing or verbally provided to the court reporter at the public meeting held on November 13, 2001 are documented and responded to in the Responsiveness Summary portion of the ROD. The Marine Corps will consider comments received from the public in the final selection of a remedial alternative.

Remedial design involves developing detailed designs and specifications for the selected remedy. Implementation of the preferred remedy would involve coordination of the Marine Corps, the regulatory agencies, and the Orange County Water District and Irvine Ranch Water District during the design phase. ***Remedial action*** refers to the construction, testing, and operation of the groundwater treatment system and requires similar cooperation between these agencies. If another alternative were selected, roles of the various agencies would be determined by the scope of that alternative.

MCAS El Toro Installation Restoration Program Process Groundwater Remediation – OU-1 and OU-2A



Applicable or Relevant and Appropriate Requirements for Remediation of VOC Contamination at OU-1 and OU-2A

The federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) states that remedial actions at sites listed on the National Priorities List must meet federal or state (if more stringent) environmental standards, requirements, criteria, or limitations that are determined to be legal applicable or relevant and appropriate requirements (ARARs). MCAS El Toro was listed on the National Priorities List in 1990. The intent of meeting ARARs is to select and implement cleanup or remedial actions that are protective of human health and the environment in accordance with regulatory requirements. Requirements of potential ARARs are divided into three categories:

- ***Chemical-specific*** *– are health- or risk-based numerical values for various environmental media, specified in federal or state statutes or regulations.*
- ***Location-specific*** *– addresses regulations that may require actions to preserve or protect aspects of environmental or cultural resources that may be threatened by remedial actions to be undertaken at the site.*
- ***Action-specific*** *– are regulations that apply to specific activities or technologies used to remediate a site, including design criteria and performance requirements.*

Potential ARARs that will be met by the preferred remedy (Alternatives 8A and 10B') for cleanup of VOC-contaminated groundwater at OU-1 (regional groundwater) and OU-2A (Site 24) at MCAS El Toro are listed below.

U.S. Environmental Protection Agency (U.S. EPA)

Substantive requirements of the following provisions of Title 40 of the Code of Federal Regulations pertaining to maximum contaminant levels (MCLs) and nonzero MCL goals for VOCs have been determined to be Federal ARARs:

- Section 141.61;
- Section 141.50 (Subpart F).

Substantive requirements of the following provisions of Title 22 of the California Code of Regulations (CCR) have been determined to be Federal ARARs:

- Determination of hazardous waste [Section 66261.24(a)(1)];
- System construction within 100-year floodplain [Section 66264.18(b)];
- Onsite waste generation [Sections 66262.10(a) and 66262.11]; and
- Pretransport requirements for hazardous waste [Sections 66262.30, 66262.31, 66262.32, 66262.33 and 66262.34].
- Groundwater monitoring [Sections 66264.93, 66264.97(b) and (e)(1)-(5), 66264.98, 66264.99, 66264.100 (a), (b), (c), (d), (f), and (g)(1)].
- Groundwater protection standards of MCLs for VOCs as determined under Section 66264.94 (except for 66264.94 (a)(2) and 66264.94 (b)); [Note: The Santa Ana Regional Water Quality Control Board (RWQCB) identified State Water Resources Control Board (SWRCB) Res. No. 92-49 as a groundwater and vadose zone protection standard. The Marine Corps does not agree with the RWQCB because SWRCB Res. No. 92-49 is no more stringent than Title 22 CCR Section 66264.94. However, because the standards are identical in these two regulations and the proposed remedy complies with the standards in both regulations, the RWQCB concurs with the proposed remedy while reserving its legal position.]
- While it is the Marine Corps' position that the designation of a point of compliance for the groundwater protection standard for VOCs at the downgradient edge of the VOC source area in Site 24 pursuant to Title 22 CCR 66264.95 would be appropriate and is supported by CERCLA, the NCP, and the Administrative Record for Sites 18 and 24, the Marine Corps agrees to comply with the groundwater protection standard throughout the VOC plume and does not intend to designate a point of compliance at this time, reserving its right to do so at a later time.
- The substantive requirements of Title 36 Code of Federal Regulations (CFR) Part 65; 40 CFR Section 6.301(c); and 16 USC Section 469 [National Archaeological and Historical Preservation Act] have been determined to be Federal location-specific ARARs. Further evaluations of compliance with these requirements will be conducted when exact locations of wells are identified during engineering design work.
- The substantive requirements of 40 CFR Part 6, Appendix A, excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); and 40 CFR Section 6.302(b) have been determined to be Federal location-specific ARARs [system construction within a floodplain].

The California EPA Department of Toxic Substances Control (DTSC)

The substantive requirements of the following provisions of Title 22 CCR have been determined to be State chemical-specific ARARs:

- Hazardous waste determinations [Sections 66261.22(a)(3) and (4), 66261.24(a)(2) to (a)(8), 66261.101, 66261.3(a)(2)(C), or 66261.3(a)(2)(F)]; and
- State MCL listings for organic chemicals [Section 64444(a)].

The following requirements of the California Civil Code and the California Health and Safety Code (HSC) have been determined to be state action-specific ARARs for implementation of institutional controls for on-Station property that will be transferred to a non-federal entity:

- California Civil Code Section 1471, Transfer of Obligations;
- HSC Sections 25202.5; 25222.1; and 25233(c).

In addition, on March 16, 2000, DON and DTSC executed a memorandum of agreement that formalizes the Environmental Restriction Covenant that will contain environmental restrictions and serve as a mechanism to implement institutional control use restrictions set forth in the OU-1/OU-2A ROD in accordance with DON policy.

The California Regional Water Quality Control Board–Santa Ana Region (RWQCB)

Substantive provisions of the following requirements have been determined to be State ARARs:

- Comprehensive Water Quality Control Plan (CWQCP) for the Santa Ana River Basin, 1995, Chapters 2 through 4;
- The substantive provisions of Water Code Section 13240 as implemented through the beneficial use designations and VOC water quality objectives in the CWQCP for the Santa Ana River Basin, 1995;
- State Water Resources Control Board (SWRCB) Resolution No. 88-63; and
- California Water Code, Division 7, Sections 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Act);
- The Santa Ana RWQCB identified the substantive provisions of the "Statement of Policy with Respect to Maintaining High Quality Waters in California" (SWRCB Res. No. 68-16) as a State ARAR and interprets it as prohibiting further migration of the VOC contaminant plume in Site 18; the USEPA and the Marine Corps do not agree that SWRCB Res. No. 68-16 applies to further migration; however, the Santa Ana RWQCB concurs with the proposed remedy and agrees that the preferred remedy will comply with their interpretation of SWRCB Res. No. 68-16 because the MCL line of the VOC plume will not move significantly past its current location; and
- Groundwater monitoring [California Code of Regulations, 27 CCR 20415 (e)(12)(B)].

South Coast Air Quality Management District (SCAQMD)

The substantive requirements of the following SCAQMD rules have been determined to be ARARs as discussed below:

- SCAQMD Rule 1303 [discharges to air] has been determined to be a Federal ARAR because the U.S. EPA approved this rule as a component of the State Implementation Plan (SIP) in accordance with 40 USC Section 7410 and portions of 40 CFR Section 52.220 [Clean Air Act]; and
- SCAQMD Rule 1401 [treatment requirements for discharges to air] is a State ARAR because it is not included in the SIP.

Reports and Documents Available for Review and Comment

The collection of reports and documents used by the Marine Corps in the selection of cleanup or environmental management alternatives is referred to as the Administrative Record (AR). A site-specific AR file has been compiled for Operable Unit 1 Site 18 and Operable Unit 2A Site 24 discussed in this Proposed Plan. Key documents include: the Phase I Remedial Investigation Draft Technical Memorandum (May 1993); Draft Final Operable Unit 1 Interim Remedial Investigation/Feasibility Study (RI/FS) Report, Nine Volumes (August 1996); Draft Final Phase II Remedial Investigation Report, Operable Unit 2A, Site 24, Four Volumes (March 1997); the Draft Final Phase II Feasibility Study Report, Operable Unit 2A, Site 24 (December 1997); Technical Memorandum; the Evaluation of OU-1 Alternative 8A with Respect to Nine NCP Criteria (October 2001); and the Draft Site Closure Report, Vadose Zone Remediation, IRP Site 24 (June 2001). Documents that pertain to groundwater remediation pilot tests include: Draft Final Groundwater Remediation Pilot Test Work Plan (July 1997) and Draft Groundwater Remediation Pilot Test Report (November 1998).

The RI/FS reports, the signed settlement agreement, other relevant documents that pertain to these sites, and a complete index of all MCAS El Toro documents are housed in the Information Repository at the Heritage Park Regional Library, 14361 Yale Avenue in Irvine, (949) 551-7151.

The complete collection of documents listed in the AR index is also available for review at MCAS El Toro. To schedule a time to review documents at the Station during the public comment period, contact Dean Gould at (949) 726-5398 or (619) 532-0784.

Where to Get More Information

Copies of Remedial Investigation and Feasibility Studies Reports, including the human health risk assessments and other key documents relating to environmental activities at MCAS El Toro, are available for public review at this Information Repository: **Heritage Park Regional Library, 14361 Yale Avenue, Irvine, California 92714; (949) 551-7151**. Current hours of operation: Monday – Thursday 10 a.m. to 9 p.m.; Friday – Saturday 10 a.m. to 5 p.m.; and Sunday 12 p.m. to 5 p.m.

The Marine Corps encourages community involvement in the decision-making process of the environmental restoration program at MCAS El Toro. If you have any questions or concerns about environmental activities at the Station, please feel free to contact any of the following project representatives:

Mr. Dean Gould
BRAC Environmental Coordinator
Base Realignment and Closure
MCAS El Toro
P.O. Box 51718
Irvine, CA 92619-1718
(949) 726-5398 or (619) 532-0784

Ms. Viola Cooper
Community Involvement Coordinator
Superfund Division
U.S. EPA
75 Hawthorne St. (SFD-3)
San Francisco, CA 94105
(800) 231-3075
(415) 744-2188

Ms. Kim Foreman
Public Participation Specialist
California EPA
Department of Toxic Substances Control
5796 Corporate Ave.
Cypress, CA 90630
(714) 484-5324

Glossary of Technical Terms

Air Stripping: A treatment technology that transforms VOCs in groundwater to gas for removal and treatment.

Aquifer: A particular zone or layer of rock or soil below the earth's surface through which groundwater moves in sufficient quantity to serve as a source of water.

Cleanup Goals: Chemical concentration levels that are the goals of the remedial action. Once the cleanup goals have been achieved, the remedy is considered protective of human health and the environment.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): Commonly known as the Superfund. This law authorizes EPA to respond to past hazardous waste problems that may endanger public health and the environment. CERCLA was authorized and amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Domestic Use: Use of water for drinking, cooking, and bathing.

Downgradient: Groundwater that is downstream of an area of soil or groundwater contamination.

Extraction Wells: Wells used to pump groundwater to the surface for treatment or for use.

Feasibility Study (FS): An analysis of cleanup or remedial alternatives to evaluate their effectiveness and to enable selection of a preferred alternative.

Federal Facility Agreement: A voluntary agreement entered into by the Navy, U.S. EPA, and Cal-EPA (Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board (RWQCB)) establishing an overall framework for how the investigation and cleanup of MCAS El Toro is to be conducted.

Groundwater: Underground water that fills pores in soil or openings in rocks.

Infiltration: Process by which dissolved chemical constituents are carried by water through the soil.

Intermediate Zone: A generally low permeability layer that separates that shallow groundwater unit from the principal aquifer at MCAS El Toro.

Maximum Contaminant Levels (MCLs): The maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are enforceable standards.

Maximum Contaminant Level Goal: A non-enforceable concentration of a drinking-water contaminant, set at a level at which no known adverse effects on human health occur.

Monitored Natural Attenuation: Refers to the routine sampling and testing of groundwater to assess the cleanup effectiveness of natural attenuation processes.

Monitoring Well: Wells drilled at specific locations either on or near a hazardous waste site, for the purpose of determining direction of groundwater flow, types and concentrations of contaminants present, or vertical or horizontal extent of contamination.

Natural Attenuation: The process by which a compound is reduced in concentration over time, through adsorption, degradation, dilution, and/or transformation.

Nitrates: Compounds containing nitrogen which dissolve in water and may have harmful effects on humans and animals. Nitrates are commonly used in fertilizers.

Operable Unit (OU): Term for each of a number of separate activities undertaken as part of a Superfund site cleanup.

Plume: A three-dimensional zone within the groundwater aquifer containing contaminants that generally move in the direction of, and with, groundwater flow.

Principal Aquifer: The main (regional) water-bearing aquifer in the vicinity of MCAS El Toro.

Rebound: The tendency of soil gas concentrations to increase after SVE is turned off.

Record of Decision (ROD): A public document that explains what cleanup alternative will be used at a specific NPL site. The ROD is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments and community concerns.

Remedial Action (RA): The actual construction or implementation phase that follows the remedial design of the selected cleanup alternative at a Superfund site.

Remedial Design (RD): The design of the selected cleanup alternative for a Superfund site.

Remedial Investigation (RI): One of the two major studies that must be completed before a decision can be made about how to clean up a Superfund site. (The FS is the second major study.) The RI is designed to determine the nature and extent of contamination at the site.

Shallow Groundwater Unit: The shallowest water-bearing zone beneath MCAS El Toro.

Soil Gas: Gas found in soil pore space. In contaminated areas, soil gas may include VOCs.

Soil Vapor Extraction (SVE): A process whereby contaminated soil gas is brought to the surface for treatment.

Trichloroethene (TCE): A volatile organic compound that has been widely used as an industrial solvent. TCE is a colorless, odorless liquid that, when inhaled or ingested in large amounts, can cause irritation of the nose, throat, and eyes, nausea, blurry vision, or dermatitis. EPA has classified TCE as a "probable human carcinogen."

Total Dissolved Solids (TDS): Used to reflect salinity of groundwater.

Upgradient: Groundwater that is upstream of an area of soil or groundwater contamination.

Volatile Organic Compound (VOC): An organic (carbon containing) compound that evaporates readily at room temperature. VOCs are commonly used in dry cleaning, metal plating, and machinery degreasing operations.

Water Quality Standards: State-adopted and U.S. EPA-approved ambient standards for water bodies. The standards cover the use of the water body and the water quality criteria which must be met to protect the designated use or uses.

MAILING LIST COUPON

If you would like to be on the mailing list to receive information about environmental restoration activities at MCAS El Toro, please complete the coupon below and mail to: Base Realignment and Closure, Attn: Dean Gould, Base Realignment and Closure Environmental Coordinator, MCAS El Toro, P.O. Box 51718, Irvine, CA 92619-1718.

❒ Add me to the MCAS El Toro Installation Restoration Program mailing list.

❒ Send me information on Restoration Advisory Board membership.

Name _____

Street _____

City _____ State _____ Zip Code _____

Affiliation (optional) _____ Telephone _____

Base Realignment and Closure
Attn: Mr. Dean Gould
BRAC Environmental Coordinator
MCAS El Toro
P.O. Box 51718
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MCAS EL TORO

Installation Restoration Program

Public Meeting

Proposed Plan
Groundwater Cleanup

Operable Unit 1 (Site 18)
Operable Unit 2A (Site 24)

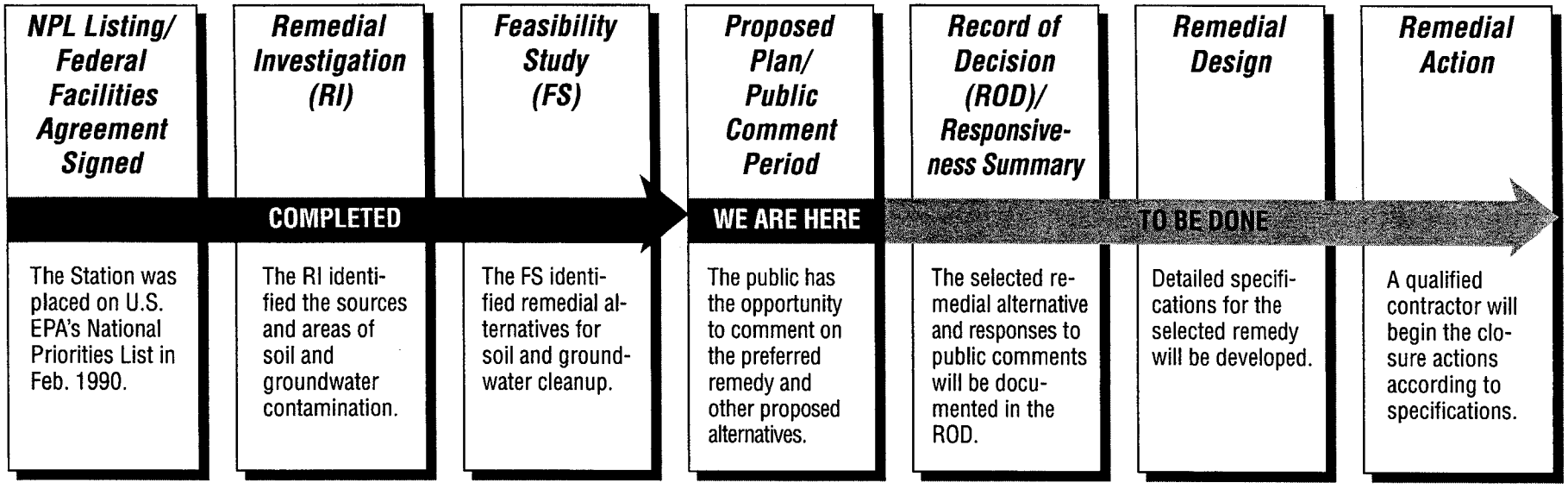
November 13, 2001

6:00-9:00 p.m.

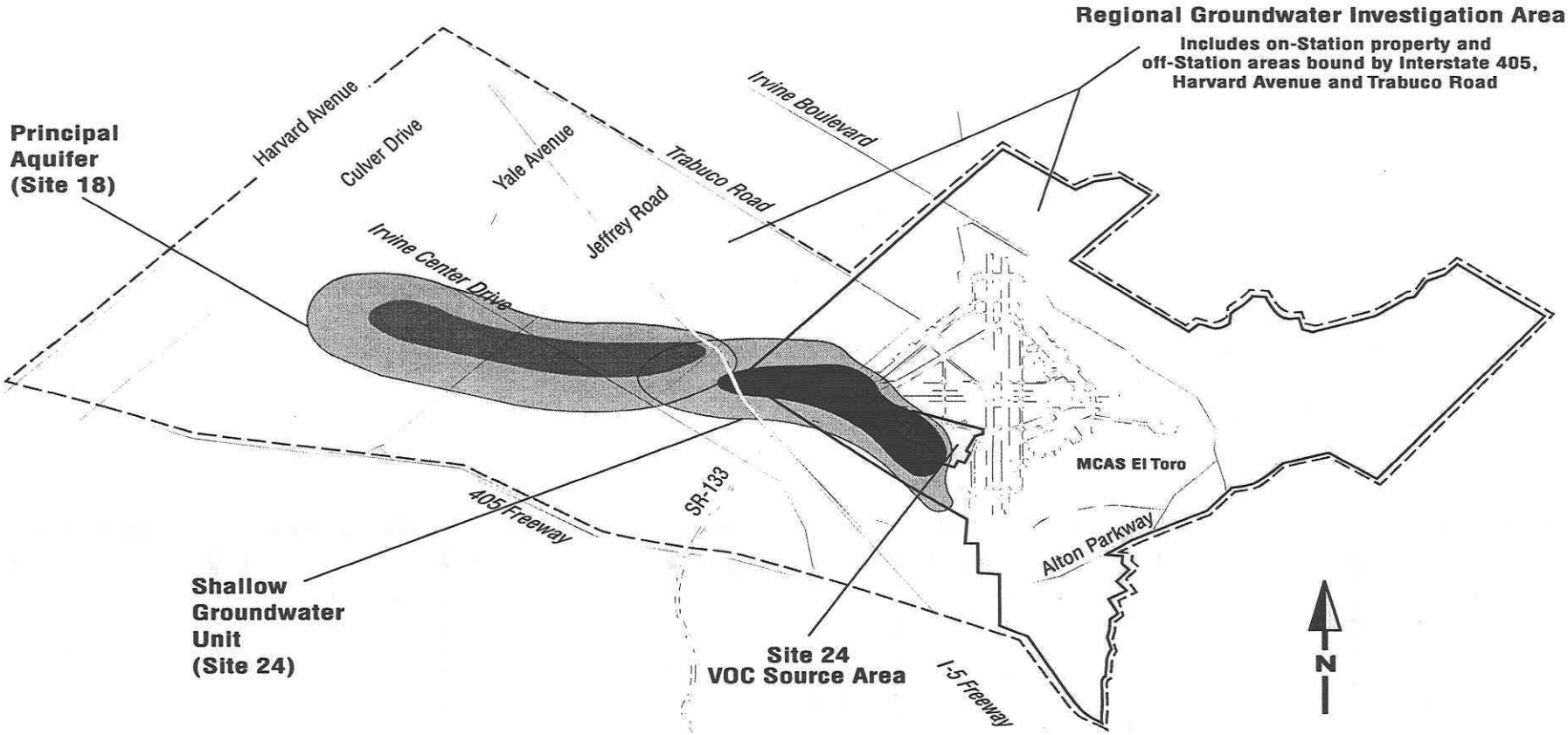
Purpose of Public Meeting

- Present the Proposed Plan for groundwater cleanup at Sites 18 and 24 to the community.
- *Specifically* - propose the CERCLA remedial (cleanup) action alternative for addressing the release of volatile organic compounds (VOCs) from MCAS El Toro into the regional groundwater.
- Comments solicited on whether the remedy meets the legal requirements of CERCLA and the National Contingency Plan.
- Opportunity for community to learn about :
  - Sites 18 and 24 and VOC groundwater contamination
  - Cleanup alternatives developed
  - Preferred remedy for groundwater cleanup
  - Ask questions, provide comments

MCAS El Toro Installation Restoration Program
Process Groundwater Remediation — OU-1 and OU-2A



Site Location Map



TCE Concentrations in Regional Groundwater:

- From 5 ppb to 20 ppb
- From 20 ppb to 50 ppb
- Above 50 ppb, some areas above 500 ppb

Note: Concentrations above 5 ppb exceed the state and federal water quality standard

Boundaries:

- MCAS El Toro
- Regional groundwater investigation area

Site Descriptions

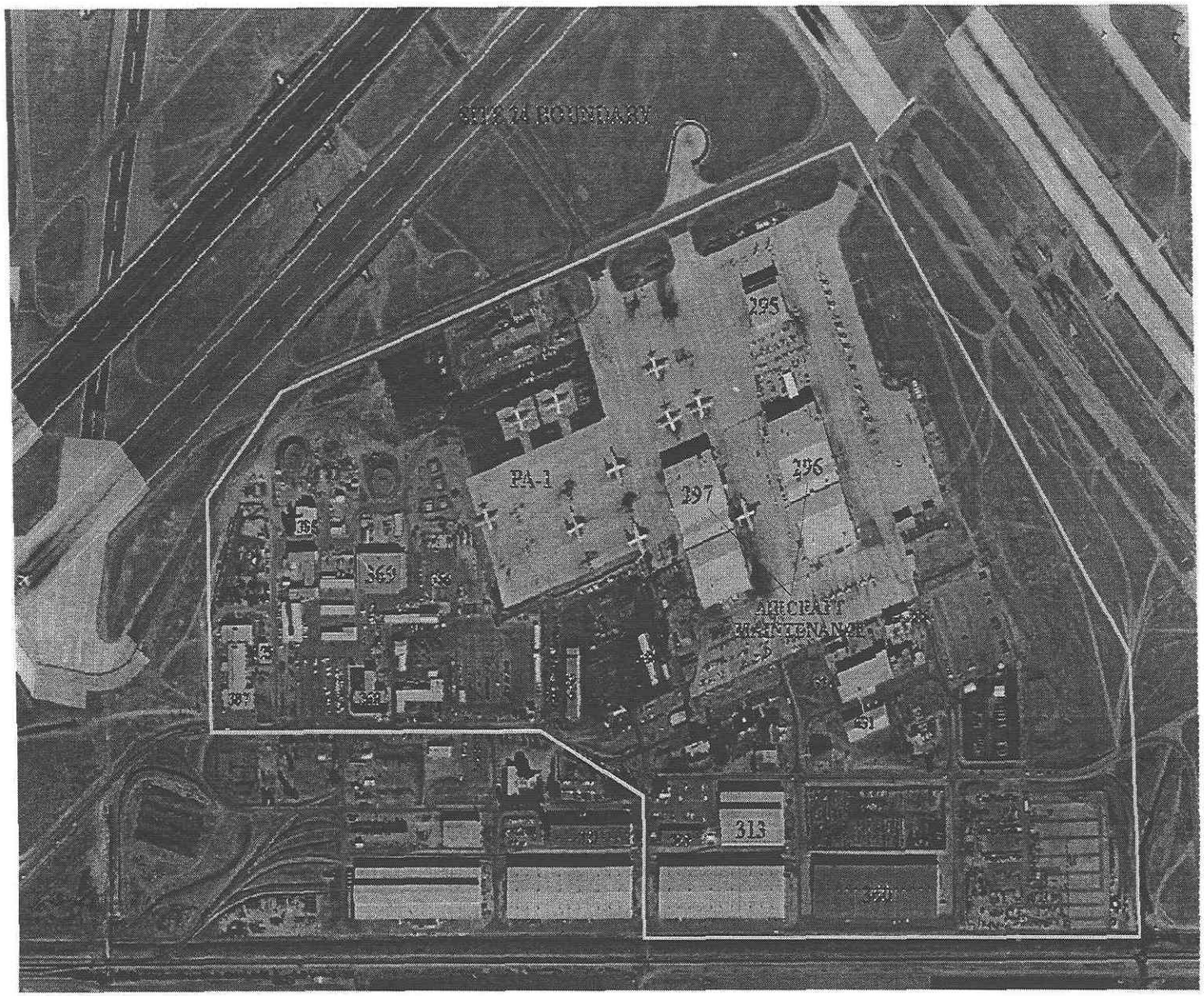
OU-1/Site 18 - Regional Groundwater Plume

- Area of groundwater contamination in the principal aquifer extending off-Station from the source area.
- Plume of VOC contamination extends approximately 3 miles to the west near Culver Drive in Irvine.

OU-2A/Site 24 - VOC Source Area

- Encompasses approximately 200 acres on-Station.
- Two large aircraft hangars (Bldgs. 296 & 297) were used for aircraft repair and maintenance.
- Includes the footprint of the VOC plume in the shallow groundwater unit, primary contaminant is TCE.

Site 24 Aerial Photograph



Remedial Investigation (RI) Conclusions - Sites18 and 24

- VOCs in soil and groundwater originate at Site 24.
- Trichloroethene or TCE is the predominant VOC present in soil and groundwater.
- VOCs, primarily TCE, have migrated from soil at Site 24 into the shallow groundwater unit and then into the principal aquifer.
- VOC plume extends approximately 3 miles west of the Station near Culver Drive in Irvine.

Purpose and Focus of Remedial Investigation

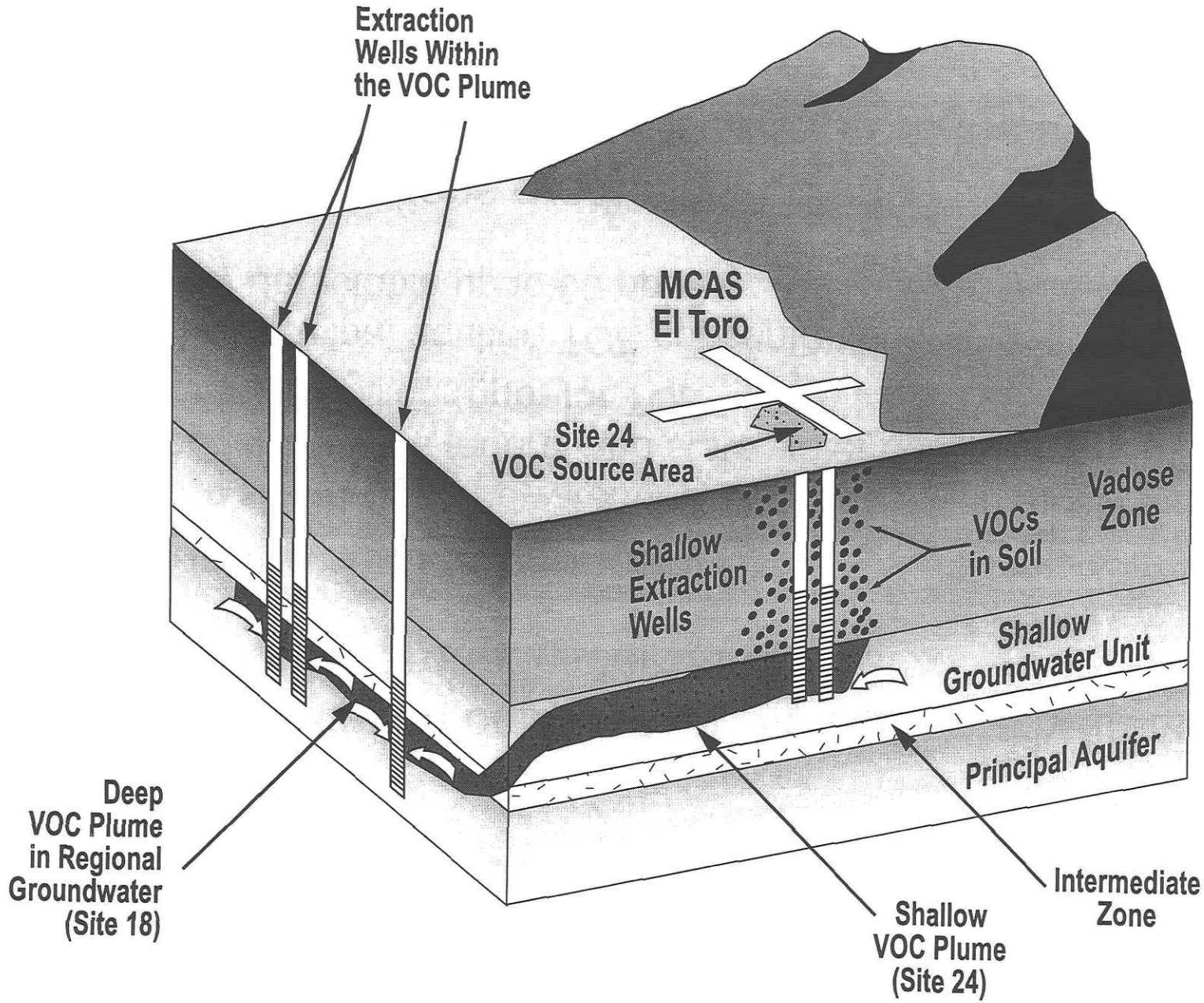
<u>Objective</u>: evaluate presence, nature and extent of contamination

- Initial investigation effort
- Extensive field investigation
- Baseline risk assessments performed

Remedial Investigation Conclusions (continued)

- Within the Station boundary, TCE is generally limited to the shallow groundwater unit.
- Outside the Station boundary -
  - In the shallow groundwater unit, water quality in most cases is better than the federal and state water quality standard of 5 parts per billion (ppb) for TCE.
  - In the principal aquifer, TCE concentrations range from barely detectable up to 50 ppb.
- TCE concentrations gradually decrease as the contamination moves farther away from the source area.

Underground View of the VOC Plume



What is Risk Assessment?

Risk Assessment:

"Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants."

- *Measurement of the likelihood of developing cancer or adverse health effects from exposure to site contaminants.*

Reasons for Conducting a Baseline Risk Assessment

- Key component of the remedial investigation
- To estimate potential adverse effects on human health and the environment at the sites
- To determine if cleanup is necessary

How a Baseline Risk Assessment is Done

- Determine contaminants of potential concern
- Determine who could be exposed and how exposure could occur
- Use contaminant concentration data in a mathematical model
- Conservative approach is applied to overestimate risk to provide a margin of safety

Determine Who Could be Exposed and How Exposure Could Occur

*Exposure can only occur if **four** of the following elements are present:*

1. A source of contamination (e.g., groundwater)
2. A release of the contaminants into the environment (e.g., erosion, wind)
3. A person or animal exposed to the contaminants
4. A way for the contaminants to enter the body (e.g., breathing, ingestion, dermal contact)

Risk Assessment Exposure Assumptions for Adults and Children (On-site Residents) Exposed to Groundwater

- Adult exposure was assumed for a total of 30 years, 6 years as a child and 24 years as an adult. Child exposure was assumed to be 6 years.
- Inhalation of groundwater was assumed to occur 24 hours a day, 350 days a year.
- A groundwater ingestion rate of 2 liters a day was assumed for a 154 pound (70-kilogram) adult and 1 liter a day for a 38 pound (15-kilogram) child (age 1-6 years), 350 days a year.
- For dermal exposure, it was assumed that all of the resident's skin was in contact with groundwater for 350 days a year.

Risk Ranges to Protect Human Health

Health Risks	Unacceptable Risks	Risk Management Range/ Generally Allowable Risks	Allowable Risks
Cancer	More than 1 additional cancer case in a population of 10,000 (greater than $1x10^{-4}$)	1 additional cancer case in a population of 10,000 to 1 additional cancer case in a population of 1,000,000 ($1x10^{-4}$ through $1x10^{-6}$)	Less than 1 additional cancer case in a population of 1,000,000 (less than or equal to $1x10^{-6}$)
Non-cancer	A hazard index greater than 1 should be evaluated further.	A hazard index of 1	A hazard index less than 1

Risk Assessment Results Residential Exposure to Untreated Groundwater

Residential cancer risk estimates

- **Principal aquifer - Site 18**
  - Generally between 10^{-6} and 10^{-4}
- **Shallow groundwater unit - Site 24**
  - Greater than 10^{-4}

Residential noncancer risk estimates

  - Hazard index exceeded "1" at principal aquifer and shallow groundwater unit

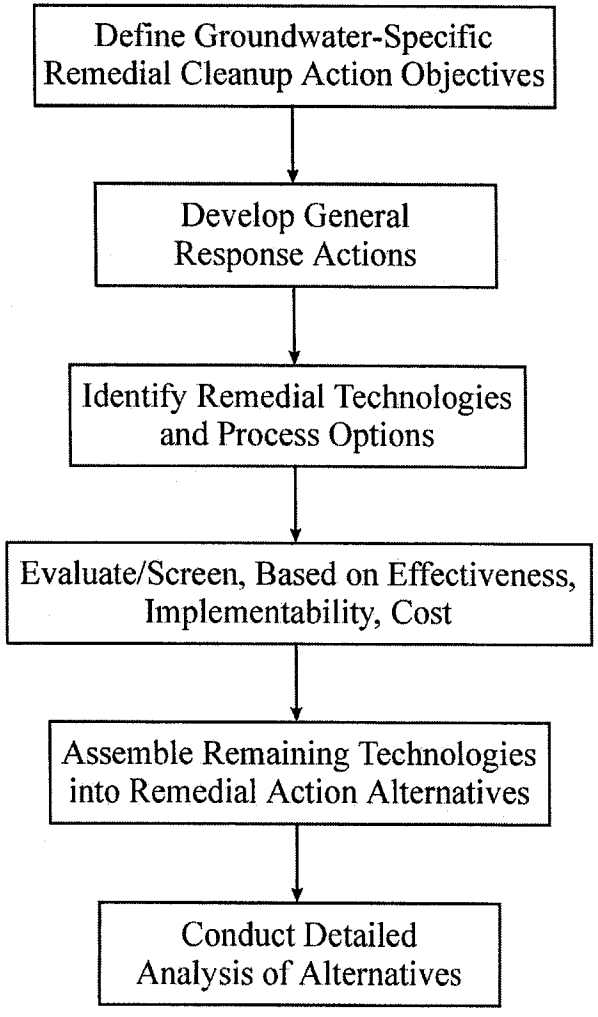
Risk Assessment Conclusions
Exposure to Untreated Groundwater

- Human health risks (cancer-causing and noncancer-causing) in the shallow groundwater unit are high enough to warrant remedial action.
- Human health risks in the principal aquifer are in the risk management range. VOCs exceed federal and state water quality standards and warrant remedial action.
- CERCLA remedial action is being taken in both areas. VOCs would be brought into compliance with water quality standards.

Purpose of Conducting Feasibility Studies (FS)

Objective:

Develop and evaluate remedial action alternatives to mitigate risks to human health.



Feasibility Studies (continued)

- MCAS El Toro groundwater-specific cleanup action objectives
  - Reduce concentrations of VOCs in groundwater to the more stringent of federal and state water quality standards
  - Control the migration of groundwater containing VOCs above cleanup levels

Feasibility Studies (continued)

- Identify remedial technologies and process options
  - Containment
  - Removal of contaminants
  - In-situ treatment (performed in place)
  - Ex-situ treatment (remove and treat above ground)
  - Discharge/use

Comparison of Operable Unit 1 Site 18 Alternatives

Alternative No. VOCs	Primary Purpose of Principal Aquifer Remediation	Where Principal Aquifer Groundwater Treated and by Whom	Reuse of Treated Groundwater	Estimated Remediation Time in Principal Aquifer (Years)	Estimated Total Mass of Removed in 20 Years (Pounds)
2A	Containment	Navy treats groundwater from the principal aquifer at off-Station treatment facility	Injected back into principal aquifer	43	12,540
6A	Mass removal and containment	IDP* joint treatment facility	Distributed to the public for domestic water purposes	49	13,750
7A	Monitored natural attenuation	No treatment of groundwater from the principal aquifer	None	60	11,830
7B	Monitored natural attenuation with containment after 10 years	After 10 years, Navy treats groundwater at an off-Station treatment facility	Injection after 10 years	54	11,750
8	Mass removal	IDP joint treatment facility	Distributed to the public for domestic water purposes	70	13,200
8A	Mass removal and containment	IDP joint treatment facility	Distributed to the public for recycled water purposes	95+	14,000

Comparison of Operable Unit 2A Site 24 Alternatives

Alternative No. VOCs	Primary Purpose of Shallow Groundwater Unit Remediation	Where Shallow Groundwater Treated and by Whom	Reuse of Treated Groundwater	Estimated Remediation Time in Shallow Ground-water Unit (Years)	Estimated Total Mass of Removed in 20 Years (Pounds)
9	Containment	Navy treats at on-Station facility	Injected back into shallow groundwater unit	44	4,870
10A	Containment	IDP joint treatment plant	Distributed to the public for domestic water purposes	80	4,570
10B	Mass removal	IDP joint treatment plant	Distributed to the public for recycled water purposes	19	4,630
11	Mass removal	Navy treats at on-Station facility	Injected back into shallow groundwater unit	38	4,800

Notes:

*IDP = Irvine Desalter Project

+ Computer modeling shows that Alternative 8A is the most effective alternative during the first 20 years of operation at removing the initial mass of VOC contamination. By further optimizing the well placement of the extraction wells in the remedial design phase, remediation time may be significantly shortened.

- A comparative Cost Estimate Summary of the OU-1 and OU-2 alternatives are presented on Table 4 on page 17.
- The No Action alternative, which is used as a baseline to evaluate other alternatives, is not listed above.

Feasibility Studies (continued)

Alternatives undergo detailed evaluation following nine U.S. EPA criteria --

1. *Overall protection of human health and the environment*
2. *Compliance with ARARs*
3. *Long-term effectiveness*
4. *Reduction of toxicity, mobility, volume of contaminants*
5. *Short-term effectiveness*
6. *Implementability*
7. *Cost*
8. *State acceptance*
9. *Community acceptance*

Comparative Analysis of Remedial Alternatives*

U.S. EPA Criteria	No Action 1	Site 18 Alternatives 2A	6A	7A	7B	8	8A	Site 24 Alternatives 9	10A	10B	11	Preferred Remedy 8A/ 10B'
1 Overall Protection of Human Health and the Environment	X	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
2 Compliance with Applicable or Relevant and Appropriate Requirements	N/A	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
3 Long-Term Effectiveness and Permanence	○	◕	●	◒	◒	●	●	●	◕	●	●	●
4 Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment	○	◕	●	◒	◒	●	●	●	◒	◕	●	●
5 Short-Term Effectiveness	○	●	●	◕	●	◒	◕+	◕	◒	●	◕	◕
6 Implementability	●	◒	NAF	◕	◕	NAF	●	◒	NAF	◕	◕	●
7 Cost	●	○	◒	◕	◒	◕	◕	◒	◒	◒	●	◕
8 State Acceptance – State concurs with the preferred remedy.												●
9 Community Acceptance – This criteria will be addressed in the Record of Decision.												

X – does not meet criteria ✔ – meets criteria N/A – not applicable

NAF – not administratively feasible

* In this analysis, remedial alternatives for each site are only evaluated against each other. Thus, Site 18 Alternatives are not to be compared with Site 24 Alternatives.

\+ By further optimizing the placement of extraction wells in the remedial design phase, remediation time may be significantly shortened.

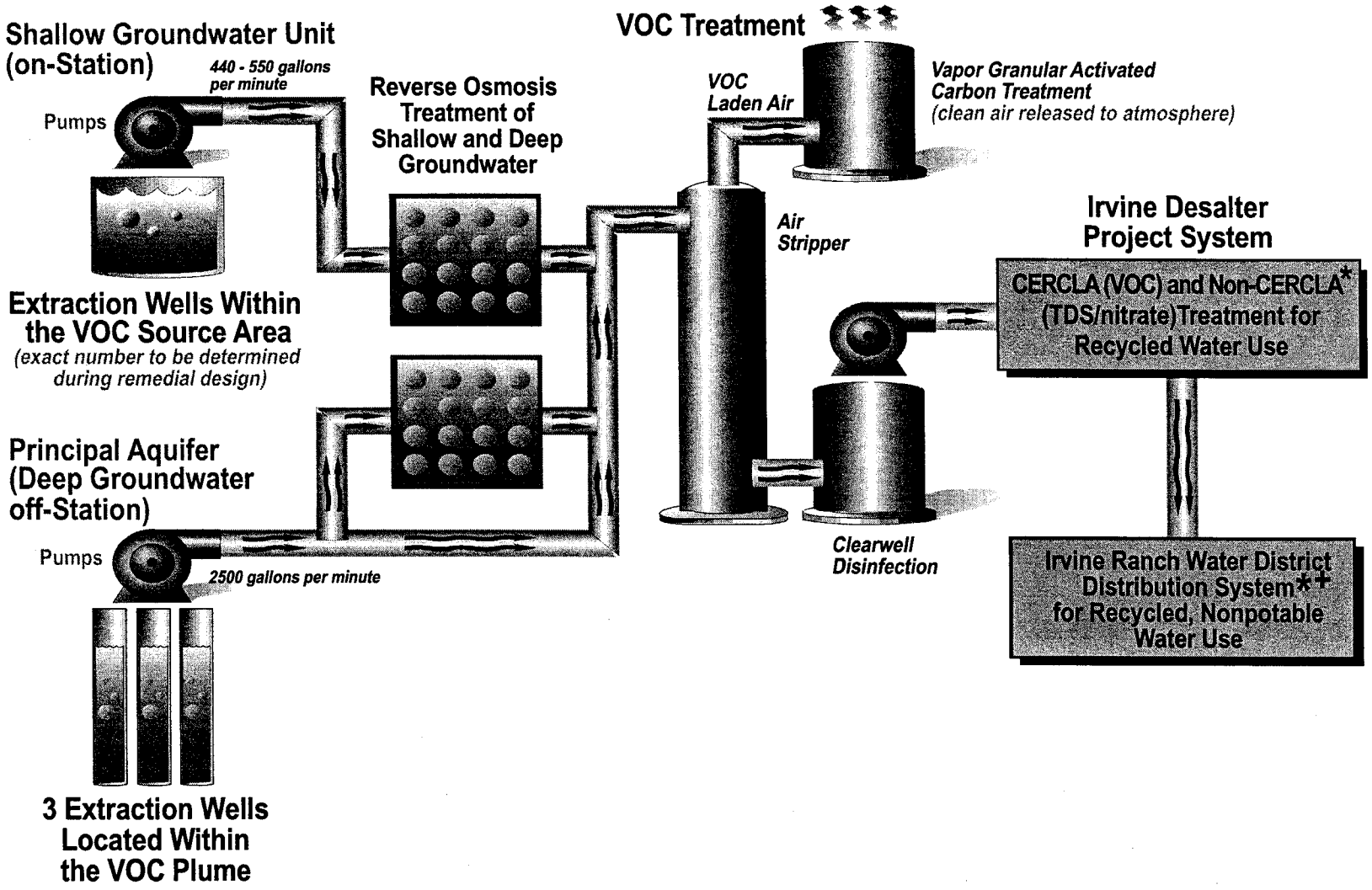
Relative Performance in Satisfying Criteria

○	◒	◕	●
Least Acceptable Performance	Fair Performance	Moderate Performance	Good Performance

Preferred Remedy

- Combination of Alternatives 8A and 10B'
  - Alternative 8A for cleanup of the principal aquifer
  - Alternative 10B' for cleanup of the shallow groundwater unit
- Optimal solution for addressing VOCs
- Satisfies requirements for CERCLA remedy
- Cost-effective - cost of combined Alternative 8A/10B' lower than other alternatives that actively remediate the principal aquifer
- IDP makes the preferred remedy technically feasible and readily implementable
- BRAC Cleanup Team members (U.S. EPA, Cal-EPA DTSC, and RWQCB) support the preferred remedy

Preferred Remedy Conceptual Design — Alternatives 8A and 10B' Combined



** Associated with local water supply. TDS/nitrate treatment is not a component of the CERCLA remedial action requirements. Non-CERCLA wells in the principal aquifer are not shown because they are not part of the CERCLA remedy.*

+ During periods of low recycled water demand, only shallow groundwater will be treated and either injected into an IDP injection well or stored in the IDP reservoir.

OCWD Perspective on the Irvine Desalter Project (IDP)

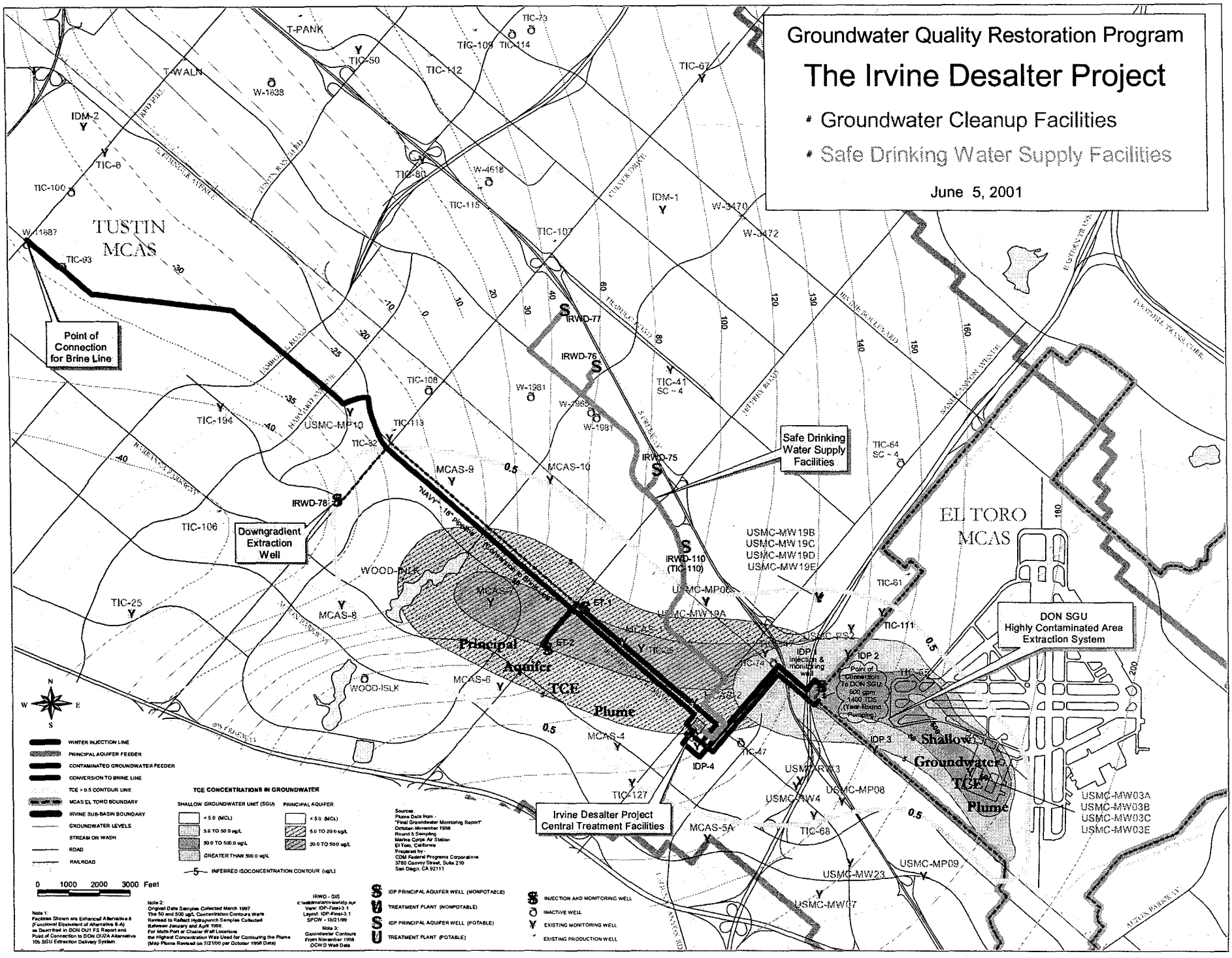
- OCWD is responsible for groundwater protection - “Groundwater Guardian”
- OCWD - independent monitoring authority
- The IDP removes contaminants that would spread to other areas of the basin
- Recovers valuable groundwater storage
  Next series of slides from IRWD

Two Projects in One

- **Nonpotable System -** Water from the plume will be extracted, treated and used only for recycled non-drinking purposes, i.e., landscape irrigation. Nonpotable system is part of Marine Corps' CERCLA remedy.
- **Potable System -** Water from outside the plume will be treated to remove salts and nitrates for use in IRWD's drinking water supply. The potable system is not part of the Marine Corps' CERCLA remedy.

IRWD Community Input

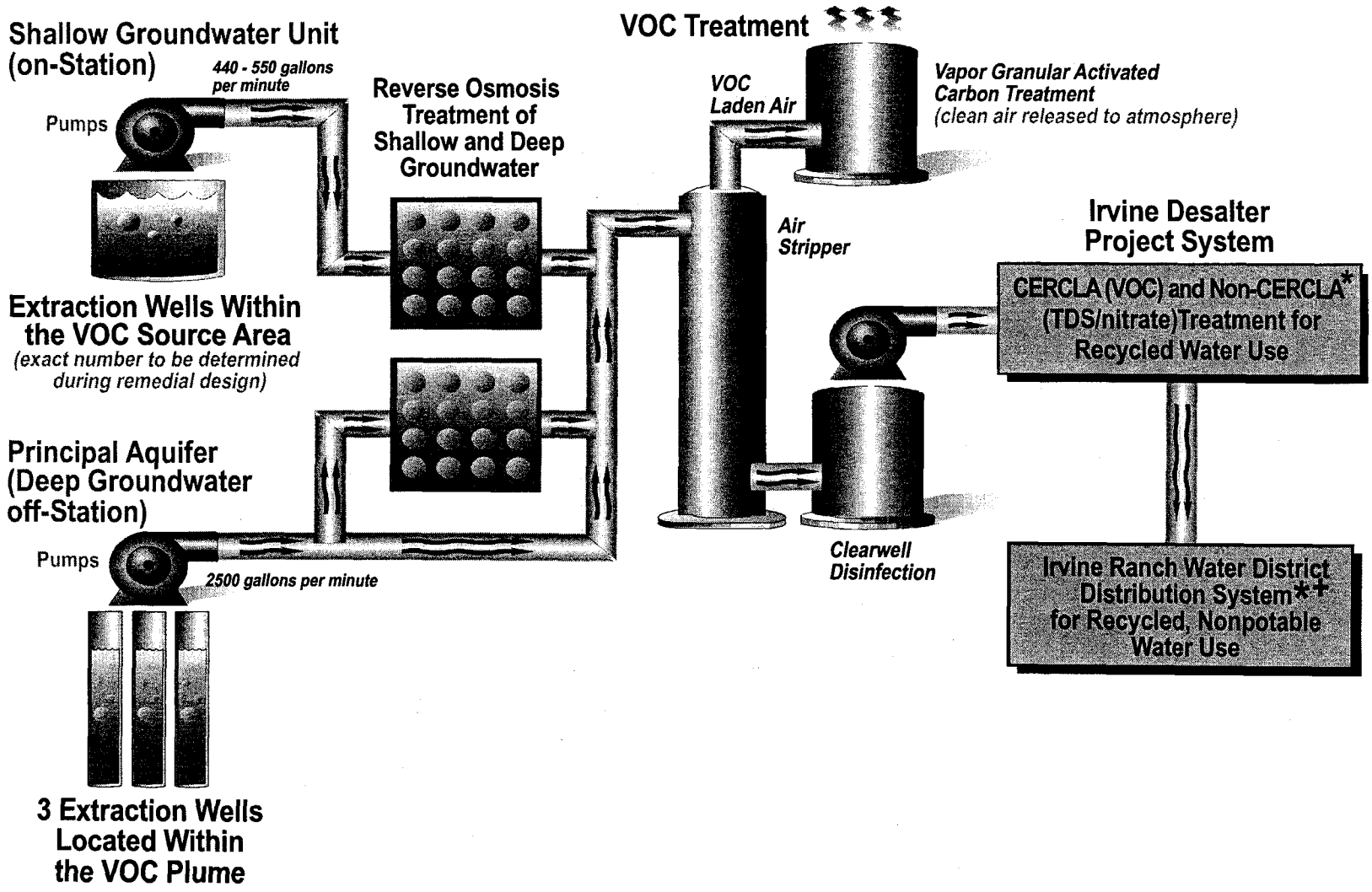
- IRWD conducted focus groups with customers and community leaders. Our community supports cleanup, but wants the treated water used for irrigation.
- Based on community input -- the project was split into two separate systems.
- Project does not affect ultimate use of the base.


Groundwater Quality Restoration Program
The Irvine Desalter Project
Groundwater Cleanup Facilities
Safe Drinking Water Supply Facilities
June 5, 2001
TUSTIN MCAS
EL TORO MCAS
Point of Connection for Brine Line
Downgradient Extraction Well
Safe Drinking Water Supply Facilities
DON SGU Highly Contaminated Area Extraction System
Irvine Desalter Project Central Treatment Facilities
Principal Aquifer TCE Plume
Shallow Groundwater TCE Plume
IRWD-77
IRWD-76
IRWD-75
IRWD-78
IRWD-110 (TIC-110)
USMC-MW19B
USMC-MW19C
USMC-MW19D
USMC-MW19E
USMC-MW03A
USMC-MW03B
USMC-MW03C
USMC-MW03E
IDP-1 injection & monitoring well
IDP 2
IDP 3
IDP-4
Point of Connection to DON SGU 600 gpm 1400 TDS (Year-Round Pumping)
ET-1
ET-2
WINTER INJECTION LINE
PRINCIPAL AQUIFER FEEDER
CONTAMINATED GROUNDWATER FEEDER
CONVERSION TO BRINE LINE
TCE > 0.5 CONTOUR LINE
MCAS EL TORO BOUNDARY
IRVINE SUB-BASIN BOUNDARY
GROUNDWATER LEVELS
STREAM OR WASH
ROAD
RAILROAD
TCE CONCENTRATIONS IN GROUNDWATER
SHALLOW GROUNDWATER UNIT (SGU)
< 5.0 (MCL)
5.0 TO 50.0 ug/L
50.0 TO 500.0 ug/L
GREATER THAN 500.0 ug/L
PRINCIPAL AQUIFER
< 5.0 (MCL)
5.0 TO 20.0 ug/L
20.0 TO 50.0 ug/L
INFERRED ISOCONCENTRATION CONTOUR (ug/L)
0 1000 2000 3000 Feet
IDP PRINCIPAL AQUIFER WELL (NONPOTABLE)
TREATMENT PLANT (NONPOTABLE)
IDP PRINCIPAL AQUIFER WELL (POTABLE)
TREATMENT PLANT (POTABLE)
INJECTION AND MONITORING WELL
INACTIVE WELL
EXISTING MONITORING WELL
EXISTING PRODUCTION WELL

Non-Potable System Treatment Process

- Reverse osmosis for desalting
- Packed aeration tower for air stripping VOC removal
- Activated carbon to remove VOC from air
- Disinfection

Preferred Remedy Conceptual Design — Alternatives 8A and 10B' Combined



** Associated with local water supply. TDS/nitrate treatment is not a component of the CERCLA remedial action requirements. Non-CERCLA wells in the principal aquifer are not shown because they are not part of the CERCLA remedy.*

+ During periods of low recycled water demand, only shallow groundwater will be treated and either injected into an IDP injection well or stored in the IDP reservoir.

Ensuring Public Health and Environmental Protection

- Extraction wells in the principal aquifer prevent the plume from being pulled toward drinking water wells
- All water to receive 100% air stripping
- 100% of the highly contaminated water to receive reverse osmosis
- No air emissions
- Brine disposal to regional sewer system

Ensuring Protection for the Drinking Water Project

- Enhanced groundwater basin monitoring
- Water monitored and tested throughout project life
- Reverse osmosis is a proven purification process widely used in the bottled water industry
- Salt and minerals removed to better than drinking water standards

Summary: Project Benefits

- Cleans and protects groundwater basin
- The IDP provides locally controlled, drought-resistant new high quality groundwater supplies for both potable and non-potable uses
- No impact on IRWD ratepayers
- Environmentally beneficial

Next Steps

- Public comment
- Record of Decision and Responsiveness Summary
- Remedial Design
- Remedial Action

MCAS EL TORO - PUBLIC COMMENT FORM
PROPOSED PLAN – GROUNDWATER CLEANUP
Operable Unit 1/Site 18 & Operable Unit 2A/Site 24

USE THIS FORM TO WRITE YOUR COMMENTS ***Date:*** _____

(Attach additional pages if you need more space.)

_____

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_____

_____

_____

Name: _____

Affiliation: _____

Address: _____

City: _____

State: _____ **Zip Code:** _____

Telephone: (___) _____

Mail written comments **postmarked no later than December 7, 2001** to: Mr. Dean Gould, Base Realignment and Closure (BRAC) Environmental Coordinator, Environmental Division, MCAS El Toro, P.O. Box 51718, Irvine, CA 92619-1718. Comments may also be faxed to (949) 726-6586 or sent via e-mail to GouldDA@efdsw.navfac.navy.mil **no later than December 7, 2001.**

Meeting Evaluation

MCAS EL TORO GROUNDWATER CLEANUP PUBLIC MEETING
Operable Unit 1/Site 18 & Operable Unit 2A/Site 24
November 13, 2001

Please take a few minutes to complete this evaluation and place it in the box by the court reporter. Your input will help shape future meetings and improve communication with the community.

1. **How did you learn about this meeting? Please check off ✓ all that apply.**

__ Newspaper ad – which paper? _____
__ Newspaper story – which paper? _____
__ TV/radio – which station? _____
__ Mailer – where did you receive the mailer? _____
__ Other – _____

2. **Please rate the items below using the following rating system by circling the corresponding number:**

1 – poor, 2 – fair, 3 – good, 4 – very good, 5 – excellent

a.	Were the efforts to announce this meeting satisfactory?	1	2	3	4	5
b.	How did the format of this meeting meet your information needs?	1	2	3	4	5
c.	Were the presentations informative?	1	2	3	4	5
d.	Were the handouts helpful?	1	2	3	4	5
e.	Did the meeting provide sufficient opportunity to discuss the issues with project staff?	1	2	3	4	5
f.	Were you satisfied with the various methods for providing public comments?	1	2	3	4	5

3. **Please make any additional comments or suggestions that will help enhance communication with the community at future public meetings. Use the back of this form if needed.**

_____
_____
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Thank you

11/13/01 MARINE CORPS AIR STATION EL TORO

HAHN & BOWERSOCK

Page 1 to Page 59

CONDENSED TRANSCRIPT AND CONCORDANCE
PREPARED BY:

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MARINE CORPS AIR STATION EL TORO

PROPOSED PLAN - PUBLIC MEETING -)
GROUNDWATER CLEANUP FOR)
OPERABLE UNITS 1 AND 2A AT)
MARINE CORPS AIR STATION EL TORO)
)

Date and Time: Tuesday, November 13, 2001
6:00 p.m. - 9:00 p.m.

Presentation/Question Session: 7:00 p.m.

Held at: Irvine Ranch Water District
15600 Sand Canyon
Irvine, California

(Pages 1 through 61)

PRESENTATIONS WERE MADE BY THE FOLLOWING SPEAKERS:

MR. DEAN GOULD
BRAC Environmental Coordinator, MCAS El Toro
Base Realignment and Closure
Southwest Division, Naval Facilities Engineering Command
MS. CONTENT ARNOLD
Remedial Project Manager
Southwest Division, Naval Facilities Engineering Command
DR. ANDREA TEMESHY
Risk Assessor
Bechtel National
MR. ANDY PISZKIN
Former Lead Remedial Project Manager
Southwest Division, Naval Facilities Engineering Command
MR. STEVE CONKLIN
Associate General Manager
Orange County Water District
MR. RICHARD BELL
Engineer
Irvine Ranch Water District
MS. NICOLE MOUTOUX
Project Manager
U.S. EPA Region IX
MS. TRISS CHESNEY
Project Manager
Cal-EPA, Department of Toxic
Substances Control

MS. PATRICIA HANNON
Project Manager
Cal-EPA, Regional Water Quality
Control Board

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IRVINE, CALIFORNIA; TUESDAY, NOVEMBER 13, 2001
7:02 p.m.

MR. GOULD: Good evening, and thank you all for coming. My name is Dean Gould. I am the BRAC Environmental Coordinator for Marine Corps Air Station El Toro.
Tonight we have the public meeting for the proposed plan for the groundwater cleanup for sites known as operable unit 1, which would be site 18, which is the off-station groundwater contamination, and operable unit 2A, site 24, somewhat informally known as the, quote, unquote, source area for that contamination.
I do sincerely thank you for being here this evening. I know there are a lot of competing interests. While we did hope the attendance would have been a little higher than what we have, I do see some faces I'm not accustomed to seeing in what we call restoration advisory board meetings, which is a meeting that we have every other month where we give an update on the environmental status of the base.
So I am encouraged to see the new faces, so thank you especially to you folks for coming.
Maybe one reason why folks did not come out in

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1 greater numbers tonight is because due to the ad that
2 ran in the paper. If you were to read it top to bottom,
3 it pretty much says it all. So maybe we don't need to
4 go on now.
5 It really is quite comprehensive. And in
6 addition to that, with the information that's set up at
7 the tables here and what we're going to give in the more
8 formal presentation, I think you'll have literally as
9 much information as you care to have on exactly what
10 we're doing, what we're proposing.
11 And we want to hear back from you too. This
12 is not meant to be strictly a one-way type of forum
13 here.
14 Let me go ahead and go over what the format
15 for tonight is. Believe it or not, we're actually
16 one-third of the way through now that we're just getting
17 into the more open-speaking portion.
18 The way this public meeting was set up and the
19 format that we're still working with, but I think is
20 probably the best for all concerned, at least as
21 appealing to the widest spectrum of people, would be to
22 have what we call a poster-board session where we have
23 the various stations set up, and we have respective
24 experts, if you will, for each of those stations.
25 We have regulatory agency representatives. We

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1 have people from the Navy staff. We have, in this
2 instance, water district representatives, community
3 relation specialists. Just about anybody that you would
4 need to go, to to get an answer to whatever you might
5 have a question on with regards to these particular
6 situation at El Toro are here tonight.
7 And so for that first hour, it was more of an
8 informal question-and-answer period, going through the
9 various phases of the program up to where we are
10 tonight, which is the proposed plan proposal, if you
11 will, to the community.
12 And this is what we're in right now which is called
13 the public comment period where for 30 days, we sent out
14 this proposed plan, and it is open for public comment.
15 And this meeting is meant to both solicit interest as
16 well as answer questions, get community feedback on the
17 alternative that we, the Navy, in concert with the water
18 districts, in this instance, are proposing.
19 So that was the first part of the meeting the informal
20 poster-board session.
21 Now we're going to go into a little bit more
22 of a prepared presentation, if you will. And I would
23 ask if you please hold off on comments until we're
24 completed with the presentation.
25 We're going to have a variety of speakers this

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1 evening going through all the different phases that are
2 on display here tonight. And then at the end, there
3 will be the opportunity for the public to provide formal
4 comments.
5 We have the good fortune of a formal court
6 reporter here. As you can see, very detailed notes are
7 being taken here this evening, and any comments that are
8 provided or questions that are provided will be
9 responded to. It is our job to respond in writing to
10 them, so we want to make sure that we obtain your names,
11 and we'll make sure that you get those responses in
12 writing to any comments that are provided to us this
13 evening.
14 And then the third portion would be after the
15 formal presentation, if you will, if anybody would then
16 like to still come forward and maybe privately go ahead
17 and offer input to the court reporter, it's certainly
18 your opportunity.
19 So you can either provide comments openly at
20 the end of the presentations, or afterwards, once the
21 presentation portion is concluded, feel free, by all
22 means, to go ahead and come up and provide them
23 to the court reporter in that manner.
24 We also have comment cards, if that's your
25 preference. You can go ahead and just fill them out in

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1 that manner. No shortage of opportunity to provide
2 input to us this evening.
3 So we'll go ahead if – I think we covered it
4 all, to go ahead and kick it off.
5 The purpose, I think we touched on that. We
6 want to present to you, the public, in a formal sense,
7 what the proposed plan is for these particular sites in
8 our overall CERCLA program.
9 Before we go too much farther, for those that
10 would – I think just about anybody would benefit from
11 it, but for those – especially the new members here
12 tonight, I would suggest three documents that you
13 should definitely have.
14 Hopefully everybody has a copy of the proposed
15 plan itself. That would be this document here. It's
16 very good because it really does say it all. In
17 addition, it has a glossary of all of the terms in the
18 back. That's one key document you should have.
19 Another would be an outline, really a copy of
20 all the slides we're going to be giving this evening. I
21 think we have those on a table. If anybody needs that,
22 we can take a brief recess, and you can grab one of
23 those to follow along and maybe take notes as we go
24 through the presentation.
25 And a third would be I see a color handout of

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1 the actual groundwater plume, over there. That would be
2 nice just to take with you later on for reference
3 purposes.
4 So definitely, if nothing else, I suggest that
you take those three documents. But in addition to
that, there is a whole table full of documents out there
7 out front, plus at the various stations here. So
8 please, by all means, help yourself. Plenty of
9 information to go around.
10 Specifically, as we talked about a little bit,
11 we're going to propose to you the remedial action for
12 the volatile organic compounds that have found their way
13 into the regional aquifer off-station at MCAS El Toro
14 into the regional groundwater, as it mentions there.
15 We want community input. This is not just
16 because it's a mandated requirement. We truly come up
17 with a better product by getting community input.
18 That's what we want and need this evening.
19 And then at the bottom there, opportunity for
20 the community to learn about, and you can see the
21 various bullet points. The contamination itself, how it
22 got there, how it's going to be cleaned up, how long
23 it's going it take, all those types of things.
24 Just to kind of summarize, tonight really is
25 to focus on the CERCLA remedy for these two particular

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1 sites. But we can't really go too much further without
2 at least acknowledging that how we got here was by way
3 of a settlement agreement that was just recently signed
4 by the Department of Justice on behalf of the Navy, in
5 addition to signatures by the local water districts, in
6 this instance, Orange County Water District and Irvine
7 Ranch Water District.
8 And certain people in the audience this
9 evening may have a little bit bigger smiles on their
10 face than others because that has been a very, very long
11 time coming, and a great deal of effort has been put
12 into it. And I'll give a little time line here in a
13 minute to show you a portion of how long it's taken.
14 So we're very, very excited about that. It's
15 a significant milestone in the program, and especially
16 for the ultimate cleanup of the base and the affected
17 off-station groundwater.
18 The settlement agreement that I mentioned is a
19 very, very complex agreement, and it did take quite a
20 bit of time to ultimately reach agreement on it.
21 And "agreement" really is the key word. It
22 was agreed upon by the local water districts and the
23 Department of Justice on behalf of the Navy, as I
24 mentioned, to identify what we feel is the implementable
25 remedy for this particular situation that we have, being

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1 the contaminated groundwater.
2 So it's something that we have over years and
3 extensive effort come to agreement on now, and we feel
4 it's a very good product for the community, as well as
5 for the agencies involved. So let's go ahead and get
6 into the time line a little bit.
7 Okay. The first block there, the Federal
8 Facilities Agreement was signed, it mentions, in
9 February of 1990. Or I'm sorry. It was placed on the
10 National Priorities list in February 1990.
11 The Federal Facilities Agreement is something
12 I have in my hand. And what this means is this
13 off-station groundwater was identified, and it was of a
14 significant enough extent that the base was placed on
15 something called a National Priorities list.
16 And once that is done, in this instance, the
17 Navy was obligated to enter into something called a Federal
18 Facilities Agreement, which was signed by a
19 representative of the Navy, as well as what are now the
20 Regional Water Quality Control Board, represented by
21 Patricia Hannon this evening, Department of Toxic
22 Substances Control with Triss Chesney here this evening,
23 and U.S. EPA with Nicole Moutoux here this evening.
24 So those are the four parties that signed this
25 agreement, and it's a legally binding document that says

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1 the Navy is committed in a very structured sense to
2 obtain a cleanup or complete follow-through through the
3 CERCLA process of those sites that are identified in
4 need of formal remediation.
5 And there's various schedules that needed to be
6 adhered to with direct oversight by the three agencies I
7 just mentioned. So for the first step, we're placed on
8 the list, and then we enter into an agreement.
9 Okay. Now, once the agreement's been reached
10 and we have a schedule to adhere to, the first step of
11 that schedule would be the RI phase of remedial
12 investigation. And you can see, looking at your
13 handouts, what happens during that phase.
14 As the name implies, it's an investigation.
15 We're trying to identify how much, where, when, how,
16 those types of things. Very detailed investigation as
17 to the source and the extent. And that was completed
18 between the two different sites right around the
19 1996-1997 time frame.
20 The next step would be the feasibility study.
21 And from the feasibility study stage, now we're looking
22 at ways to remedy those problems that were identified in
23 the RI phase. So we're looking at alternatives, and
24 we're looking for the preferred alternative, which is
25 what we're here presenting you tonight. And that two –

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1 those – those alternatives were published in the
2 feasibility study also right around the '96-'97 time
3 frame.
4 And then the publishing of proposed plan and
5 the holding of the public comment period 2001. What
6 happened? That's five years. What happened between then?
7 Well, what happened was very lengthy
8 discussion and negotiation between the parties that I've
9 mentioned just a little bit ago. Very complex, both
10 technically, physically, all those types of things, but
11 we have now reached agreement.
12 So it took a little bit longer than what we
13 would have hoped. The key thing is that we all are here
14 this evening with a signed agreement so we are now able
15 to move forward or continue on forward with our CERCLA
16 process, that being the public comment period of the
17 proposed plan phase.
18 Once this phase has been closed out, we've
19 solicited and responded to public comments, if, in fact,
20 after that input we do have public acceptance, and that
21 is one of the criteria that we need to consider, we can
22 move forward then with the publication of a ROD with
23 hopefully this still being the preferred alternative.
24 That would be the next step in the normal CERCLA
25 process.

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1 And then with the agreement that we do have,
2 we would continue to be move forward with the water
3 districts, in this instance, with the remedial design of
4 the remedy, and then move forward with the actual
5 treatment of the groundwater itself over the
6 long-term.
7 So that is the process– I won't say a nutshell
8 because that was kind of a big nutshell, wasn't it? But
9 that is the process and how we've gotten to where we are today.
10 All right. Now, the reason why I asked to be
11 sure that you have one of those color handouts that are
12 over on the table there, because looking at this one,
13 it's not quite as crisp, and plus, just to get it on
14 this elongated sheet, it's a little distorted, and that
15 handout is a little bit crisper. So if you like, feel
16 free to pick this up.
17 But this does give a pretty good feel for
18 the extent of the on- and off-station groundwater
19 contamination that did take place that we are now
20 responsible for providing a remedy for and ultimately
21 making sure that it is cleaned up.
22 Tonight I'll be serving essentially as a
23 facilitator for the discussion this evening. We do, as
24 I mentioned, have a variety of speakers, each presenting
25 a different portion of where we're at in the process.

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1 I'll turn it over now to Ms. Content Arnold.
2 She is the lead remedial project manager for El Toro.
3 She's with the Navy staff, working out of San Diego.
4 She's going to go ahead and start off with some of the
5 more technical aspects of some of this, getting into the
6 site descriptions and getting into the remedial
7 investigation.
8 MS. ARNOLD: Thanks, Dean.
9 As Dean said, I'd like to start off by giving
10 you a brief description of the two sites. Site 18 is
11 the regional groundwater plume, and it includes the area
12 of groundwater contamination in the principal aquifer
13 extending off-station from the source area. The Source
14 area is Site 24. The plume extends approximately
15 three miles west near Culver Avenue in Irvine.
16 Now, the principal aquifer varies from
17 approximately 200 to 450 feet below ground surface. The
18 primary chemical of concern is trichloroethene, or TCE
19 as I'll be referring to it this evening.
20 Site 24 is a VOC source area, and that
21 encompasses approximately 200 acres in the southwest
22 quadrant of the base. It also includes two large
23 hangars, buildings 296 and 297. Now, this is where
24 aircraft repair and maintenance took place on the
25 base.

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1 The footprint of site 24 includes the shallow
2 groundwater unit contamination, as well as the soil
3 contaminated within the area.
4 This evening we're not going to be
5 focusing on the soil because that was addressed in an
6 interim ROD back in 1997. We plan on having a final ROD
7 for the soil cleanup in the year 2002. So, like I said,
8 tonight we'll be focusing on the shallow groundwater
9 contamination for site 24.
10 Additionally, the shallow groundwater unit
11 varies from approximately 80 to 110 feet below ground
12 surface. And once again, the primary contaminant of
13 concern is TCE.
14 Now, I know this is difficult to see, so I
15 hope you have your handouts with you. But basically,
16 this is an aerial of site 24, and I'll be flipping back
17 to that map to put it in perspective for you.
18 But these are the two hangars over here, which
19 was the source of the contamination where the industrial
20 activities took place on the base. And the
21 contamination flowed off base in a westerly direction
22 like this.
23 To put it into perspective: here is Site
24 24, shallow groundwater contamination here, and then we
25 have just some landmarks that I'd like to point out:

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1 I-5 right here, the 405 over here, and then Culver Drive
2 over here. And you can see that the principal
3 contamination area extends off base approximately 3
4 miles, like I said.
As Dean mentioned, as part of the CERCLA
6 process, we completed a remedial investigation, or as we
7 commonly refer to it, an RI.
8 So what is an RI? Well, the objective of the
9 RI is to evaluate the presence, nature, and extent of
10 contamination. It includes three components primarily,
11 an initial investigation, an extensive field
12 investigation, and also a base-line risk assessment.
13 So what are the components of the initial
14 investigation? Well, this included document review,
15 aerial photo reviews, personal interviews, and an
16 initial soil gas investigation.
17 The extensive field investigation included
18 first developing a workplan. And this workplan was
19 reviewed by the BRAC Cleanup Team, and that includes
20 U.S. EPA, DTSC, as well as the Regional Water
21 Quality Control Board and the Navy.
22 And before going out into the field, we gained
23 concurrence from that regulatory group prior to
24 commencing field work. And once out in the field, we
25 did extensive soil, groundwater, and soil gas sampling.

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1 From this data that we gathered, we put it all
2 into a risk assessment, which Dr. Temeshy will be
3 touching on a little bit later on this evening.
4 This RI was conducted between 1992 and 1997,
5 and the conclusions basically confirmed the
6 following:
7 First of all, that VOCs in soil and
8 groundwater originated at site 24, the source area. The
9 highest concentrations of TCE were found beneath
10 building 296, that is, one of the hangars that we
11 previously looked at, and concentrations were 4,850
12 parts per billion.
13 TCE was also the predominant chemical of
14 concern, as we discussed, in both soil and groundwater
15 TCE is an industrial solvent that was used primarily
16 for cleaning, degreasing, and paint stripping.
17 Historically, it was common practice to use that.
18 VOCs have migrated from the soil at site 24 to
19 the shallow groundwater unit and then finally to the
20 principal aquifer. And also, as we've discussed, the
21 VOC plume extended three miles west of the station in
22 the principal aquifer near Culver Drive.
23 Within station boundaries, the TCE is limited
24 to the shallow groundwater unit, not the principal Groundwater
25 unit, and That's the shallower unit from 80 to 110 feet below

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1 ground surface. Outside the station boundary,
2 we have contamination in both the shallow and
3 the principal aquifer. And in the shallow groundwater
4 unit, water quality is better than the federal and state
5 water quality standard of 5 parts per billion for TCE.
6 In the principal groundwater unit, the concen-
7 trations range generally from barely detectable up to 50
8 parts per billion.
9 Finally, TCE concentrations gradually decrease
10 as you move away from the source area.
11 Now, this next figure here depicts the
12 migration of VOCs released from the surface. Over here,
13 if you can imagine, this is where the hangars are here.
14 We have a release of TCE to the soil, and you can see it
15 migrating to the shallow aquifer approximately 80 to
16 110 feet below ground surface.
17 As it travels downgradient, it eventually
18 migrates to the regional groundwater plume, which is
19 deeper,
20 approximately 200 feet below ground surface.
21 MR. GOULD: Thank you, Content.
22 Okay. As I outlined just previously, the next
23 step in the process would be the feasibility study
24 portion where we look at alternatives.
25 But in order to help us determine those

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1 alternatives, we need to know, with all the information
2 that we just gathered from the remedial investigation,
3 what threat is actually posed to human health and the
4 environment.
5 So Dr. Andrea Temeshy is going to go ahead and
6 speak to us tonight on that particular subject. She is
7 an employee with Bechtel National, and she is
8 outstanding in her field.
9 DR. TEMESHY: Well, thank you.
10 Before I go through what the results are on
11 the risk assessment, I want to briefly introduce the
12 concept of the risk assessment.
13 Basically, what the risk assessment
14 does is estimate what the potential hazard
15 to an individual exposed to the chemicals at a site are.
16 That is, are we going to have a potential for some
17 adverse health effect?
18 And when we talk about an adverse health
19 effect, we're talking about could this person develop
20 cancer, or chemicals also can elicit another type of
21 effect like non-cancer effects, which could range
22 anywhere from liver or kidney or systemic toxicity-type
23 effects.
24 So when we talk about the risks, what we're
25 doing is we are translating chemical concentrations into

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1 an estimate of hazard to human health.
2 So on that, we'll move on to why do we do a
3 risk assessment. As was stated before by Dean, it is an
4 integral part of the remedial investigation concept. So
5 as a first step, we have to be able to do it in
6 order to be in compliance with guidelines.
7 And again, it's to determine if we have
8 a problem as far as human health based on exposure to
9 the chemicals at a site?
10 How are the results of this assessment
11 used?, If we have a risk, then that will determine
12 if cleanup is going to be necessary or not at the site.
13 How the risk assessment is done. I'm going to
14 go through, the steps that I do in order to
15 quantify risks so that we know all the components that
16 are utilized.
17 And that is – the first thing is we have the
18 chemical contaminants, and those are at a certain
19 concentration. For example, we have TCE. We've got
20 concentrations of TCE, and we're going to be using that
21 in the risk assessment.
22 The next thing is we are going to determine
23 who's exposed. What is – what are the potential
24 receptors at a site? And looking into the future, could
25 we have a residential receptor at the site? That would

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1 be a very conservative scenario.
2 And how would exposure take place? What kind
3 of pathways? Is this person going to be drinking the
4 groundwater? And is he going to be using it as a
5 drinking water source? It's going to be also used for
6 bathing, so you have dermal contact.
7 And then you would also have the inhalation
8 because volatile organic chemicals will basically be
9 So then we have the chemicals and the
10 person exposed to them under different pathways.
11 All of this information is integrated into a
12 mathematical model. And within that mathematical model,
13 we also look at how toxic is this chemical. The
14 result of Integration would be the risk number.
15 When we talk about the risk number,
16 we have two different end points. We would have the
17 cancer end point, and we also have the non-cancer-type
18 effect. And when we calculate the risk, we're going to
19 address both end points.
20 Now, one thing to consider is when we're putting
21 all of this information together, we are going to be very
22 conservative in our assumptions. And I'm going to go
23 through an example as to what I mean by "conservative"
24 in the next slide.
25 We are not going to at any time underestimate the risk.

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1 We're always going to be erring in the overestimation of
2 it. That is, that way we are always protective of human
3 health. Therefore, the actual risk is always
4 going to be lower than the one that we are actually
5 estimating.
6 Now, this is just a quick overhead as to
7 showing that we've got several things that must occur in
8 order to quantify the risk.
9 That is, (a), we have to have chemical
10 contaminants, (b), we have to have a way to release the
11 chemicals from the media to an area where humans are
12 going to be exposed. If we have a residential receptor,
13 then – that person is going to be exposed to that
14 groundwater via use of that groundwater as a drinking
15 water source.
16 We need to have a person that is exposed to
17 chemical contaminants. If you don't have a person
18 exposed to, then you don't – you cannot quantify the risk.
19 And finally, you've got different exposure pathways for
20 these contaminants; that is, by eating it, by drinking it,
21 or by touching it. Now, we've said earlier that the risk
22 estimates are very conservative and overestimate
23 in the risk for protection of human health.
24 When we talk about residential exposure,
25 these are some of the assumptions that I want to present

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1 to you that show you how conservative these estimates
2 are.
3 We are assuming that a resident is basically
4 at a site exposed to groundwater, in this instance, for
5 a period of 30 years. And that means this person never
6 moves. It's there for 30 years, from birth to 30
7 years.
8 Also, basically, 24 hours a day for 350
9 days a year. Again, that means that this person does
10 not leave the house except for 15 days over that year.
11 So that's a very conservative assumption because this
12 person does not work, does not leave the house, and that
13 is very, very conservative.
14 Again, following this conservative
15 scenario, as far as drinking water, two liters of water
16 a day are consumed. All of these values, all of these
17 assumptions, are established by EPA, and we basically
18 implement them in our risk assessment.
19 So when we talk about the resultant risk numbers,
20 keep in mind that these are numbers that are based on
21 conservative assumptions.
22 Now, we've quantified risks, but what do they
23 mean as far as are they acceptable? Are they unacceptable?
24 We've got established criteria by which to
25 compare how acceptable or unacceptable these risk numbers

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1 are. For cancer risks, we've got a criteria
2 established by EPA, which means that if it's less than
3 one in a million, that is, one times 10 to the minus 6
4 1x10-6 for cancer risk, then the risks are considered
acceptable.
If they are within one in 10,000 to one in a
7 million or 10 to the minus 4 to 10 to the minus 6,
8 again, this is for the cancer risk, then it is within
9 the risk-management range, and they're in the generally
10 allowable risk range.
11 Now, what that means is that, at this point,
12 the stakeholders and the regulatory agencies, will get
13 together and will integrate with the results with other
14 factors.
15 For example, are the concentrations at the
16 site greater than drinking water standards?
17 All of these factors will be taken into consideration to
18 determine if remedial action has to be implemented at
19 the site.
20 If risks are greater than one in 10,000 or
21 greater than 10 to the minus 4, then that is considered
22 unacceptable. And at that point, cleanup is warranted.
23 Now, for the non-cancer risks,
24 there is a threshold of one. And if risks
25 are less than one, again, that is considered allowable.

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1 If they're greater than one, then there is a potential
2 for adverse health effects to develop.
3 And at that point, then, again, considerations
4 as to what the contaminant levels are like with respect
5 to MCLs, in this instance, would be considered as
6 far as the cleanup.
7 Now, I'm going to
8 briefly show you what the risk results are
9 under baseline conditions, that is, prior to any
10 remedial action. These results are for an individual,
11 that would be, in this case, a resident exposed to the
12 groundwater at both Site 18 and Site 24.
13 Site 18 is the principal aquifer, and Site 24
14 is the shallow groundwater unit. And again, we've got
15 two different end points. We have the cancer risk, and
16 we have the non-cancer portion of it.
17 For the cancer risks, under residential
18 conditions, the principal aquifer results are within the
19 10 to the minus 6 and 10 to the minus 4 risk range. And
20 if you flip back to the previous slide, so they are in
21 this area right here. That means that they're generally
22 allowable. And at that point, you would integrate other
23 criteria into whether cleanup is required or not.
24 Now, for the shallow groundwater, the risks
25 are greater than 10 to the minus 4, and the 10 to the

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1 minus 4 is the unacceptable risk range. Again, these
2 are residential risk results, which means that you've
3 got somebody exposed to the groundwater via drinking it,
4 dermal contact, while showering, for example, and then
5 through the inhalation portion of it while this
6 groundwater is being used as a potable water source.
7 Finally, the non-cancer health effects, since
8 we also have to address them. These results are greater
9 than one. So there is a likelihood of potential adverse
10 health effects for both the principal aquifer and the
11 shallow groundwater unit.
12 Now, that we have this information, then
13 the next step is what does it mean?
14 For human health risks that are in excess of 10 to the
15 minus 4, those are not acceptable, which means that they
16 warrant some sort of remedial action.
17 At the shallow groundwater unit, then,
18 since the risks are in excess of 10 to the minus 4,
19 again, these are residential risks, then a remedial action
20 will be implemented.
21 Now, at the principal aquifer, the risks are in the
22 10 to the minus 4 (10-4), 10 to the minus 6 (10-6) risk range.
23 So that is within the risk-management range.
24 However, the VOC concentrations exceed the
25 federal and state water quality standards, and then that

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1 leads towards remedial action.
2 So at both the shallow groundwater unit and the
3 principal aquifer, you have remedial action based on the
4 risk and also based on the exceedence of the VOCs for the
5 MCLs.
6 MR. GOULD: Thank you very much, Doctor. Good.
7 Good information.
8 Now, next step in the program I mentioned
9 previously is the feasibility study. That will be –
10 that and an introduction into the preferred remedy will
11 be briefed to you by Mr. Andy Piszkin, the former lead
12 remedial project manager for El Toro, but prior to Content
13 Arnold.
14 He was involved for some time through all the
15 investigation stages for a number of years, so he has a
16 great deal of technical knowledge and background on it.
17 So I think he's probably perfectly suited to give this
18 particular portion of the brief.
19 One clarification I want to point out. I
20 mentioned the signators on the settlement agreement.
21 There was one more representative on behalf of the Navy.
22 Department of Justice had negotiated for the Navy, but
23 we actually had a Navy signator on it. So there were
24 four signators.
25 So Andy, if you would, please.

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1 MR. PISZKIN: Good evening. My name is Andy
2 Piszkin. And like Dean says, I've been around quite a
3 while. I started as a remedial project manager in '91,
4 on El Toro. I feel like this is kind of homecoming night
5 for me.
6 I've been involved in a lot of the groundwater
7 studies as well as some of the negotiations for the
8 agreement that has been signed by the Department of Justice
9 and the water districts, as well as the Navy.
10 We use the EPA guidance on doing a remedial
11 investigation/feasibility study. This is what it is,
12 guidance, but it's got some real good stuff in it. And
13 that's where the objective of a feasibility study comes
14 in. It's different than what I have. You've seen
15 remedial investigation. That's "what's out there." A
16 risk assessment is "what does that mean?" and
17 "What does that matter?"
18 And if it matters, then some action has to be
19 taken, the feasibility study is, "what can you do about
20 it." And the preferred alternative that we're proposing
21 tonight for public comment here is what we think is the
22 best thing to be done because of the risk and because of
23 what we found.
24 So the feasibility study is trying to combine
25 a lot of the – what's the objective of our remedial

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1 action. RAOs Remedial Action Objectives is what I call them.
2 And first, you have to define the problem, what kind of response
3 actions you need, what kind of tools are out there in the
4 environment and industry that will help you solve those.
5 Do you have to get the groundwater out?
6 What do you do when you have it? How can you
7 treat it? Do you have to get it out? Can you treat it
8 down in the groundwater where it is 200 feet, 400 feet
9 below the ground surface?
10 How do you treat it? Do you heat it up? Do
11 you take it off to a landfill? What do you do with it?
12 So you look at all those possible
13 technologies, and you try to then piece them together in
14 some kind of a treatment train.
15 Okay. Well, maybe I'll pump it out first.
16 Then I have it, and I have to treat it somehow. And
17 I've got A, B, C, D, E way to treat it, and then I have
18 to do something – then it has to go somewhere else.
19 You know, what do you do with it?
20 So you – you look at all those technologies,
21 what are those process options, and you put them
22 together. You do some initial screening, which we have
23 done, and some things just don't fit for the scenario
24 that – of what we have found and what we have to do
25 with it. So those get kind of screened out being

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1 noneffective.
2 Then you conduct detailed analysis. And
3 under – it was ironic. Under the – the last one,
4 under the guidance, it says "Further define alternatives
5 as necessary."
6 Well, we spent a lot of time further defining
7 alternatives as necessary. Because one of the things
8 that has to happen, you can have the greatest
9 technology, but if it can't be implemented, it doesn't
10 go anywhere.
11 So one of the things and the only thing this
12 settlement agreement that has been signed by a bunch of
13 parties is that it makes the alternatives that are being
14 proposed as a joint project with the water districts as
15 implementable.
16 It will not be implemented unless the Record
17 of Decision selects Alternative 8A and 10B prime. If
18 that Record of Decision doesn't get to that point, that
19 agreement doesn't go any farther. It doesn't happen
20 even though it's all signed, it allowed us to be here
21 tonight to say we have a proposed plan that is actually
22 doable.
23 So the first thing is what's our objectives?
24 One thing that's not on this slide is prevent exposure
25 from nontreated water. That was actually our

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1 third objective. We want to contain it.
2 Don't let it go any farther, or at least minimize
3 the migration of any contaminated groundwater above
4 drinking water standards.
5 The second one is to reduce, you know, the
6 concentrations to below drinking water standards. And
7 the third, like I say, it's not on there, but it's to
8 prevent anybody from coming into contact with something
9 that's concentrated above the drinking water standard.
10 And, therefore, like the risk triangle, you
11 need somebody to be exposed, you need a toxin or a
12 concentration, and you need a pathway. If you can block
13 the pathway, you block the risk.
14 On page 9 of the proposed plan, it gives
15 you – it's actually table 2, it's a good list of some
16 of the alternatives that we considered early on like
17 hydraulic containment.
18 You can put wells in, extraction wells. You
19 can put in reinjection wells. You can put water into the
20 ground so the groundwater doesn't flow any farther. You
21 can install a slurry wall, but this technology. was
22 screened out early because it has to be installed too deep.
23 In such a large area, it would just be just impractical
24 and not cost-effective. So that's one of the alternatives
25 that this just doesn't fit with what we have to work with

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1 here.
2 You have some of the removals. You can –
3 well, you can, you know – extraction from groundwater
4 wells. Vacuum-enhanced groundwater is kind of doable.
That is,– put a vacuum on the extraction well.
You have some of the treatment that you can do
7 in place, and you have some of the treatment process
8 that you can do once you bring the groundwater up.
9 So this is what we had at our disposal, and we
10 went through some of these things, some of these
11 technologies in the feasibility study. And with the
12 scenario of how large and dilute the principal aquifer
13 plume is and the area and the concentration and the flow
14 of the shallow groundwater unit, we have a variety of
15 alternatives.
16 And we'll go to that next slide.
17 I must say I remember discussing a lot of the
18 discharge. What do you do with the water once it's
19 treated? Do you put it in the washes? Do you put it
20 in Agua Chinon or Bee Canyon Wash?
21 Do you just put it out in the middle of the
22 runway surface impoundment?
23 Do you reinject it? Do you use it for irrigation or
24 domestic use?
25 There's a lot of scenarios. There's probably

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1 like, you know, 12 scenarios that we dreamed up of let's
2 really think outside of the box. What can we do with
3 the water after we treat it? And that was – that was a
4 main issue on what's implementable.
5 So here we have – I believe this is page 14
6 in the proposed plan, and it really goes through the
7 alternatives that kind of met the – you know, passed
8 the ha-ha test, the ones that are kind of doable, and
9 they all go to kind of pump and treat.
10 Because of the environment, because there is
11 an Irvine Desalter Project that in the late 1980s, during
12 that decade it was on the books as a water supply project,
13 and I know Richard Bell and Steve Conklin both, or one of
14 them, will talk more about that after I sit down, but
15 looking through the alternatives, like alternative 8 –
16 or I'm sorry – 2A, that is a Navy stand-alone.
17 We looked at the Navy doing their own large
18 groundwater pump-and-treat project without the Desalter,
19 without the local water districts. If that – if Irvine
20 desalter project didn't happen, the Navy had to have
21 some alternatives that they could do on their own, and
22 that's what 2A is.
23 6A is a combination of using a joint project
24 with the local water districts. 7A – A and B are
25 alternatives that incorporated monitored natural

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1 attenuation and some of those results.
2 Well, let's go on to the next slide.
3 We took all those, and there are the nine
4 criteria of EPA. The first two are critical. They're
5 called threshold criteria. It's the protection of human
6 health and the environment, and it has to meet the
7 applicable laws. Those are the first two.
8 The next five, they're the balancing criteria.
9 That's the meat of how to – it's the majority of
10 criteria to help select a proposed alternative.
11 The last two are modifying criteria. If there
12 is – you know, we – we want state acceptance. We want
13 public acceptance. And those actually come after this
14 meeting today and the close of the public comment period
15 where we take the response – take the comments and in
16 the Record of Decision provide a responsiveness summary
17 to all the comments related to the proposed plan that
18 the Navy's putting out.
19 So next slide.
20 This is page 19 of the proposed plan, as I
21 term it, the meatball chart. And I'd have to look at
22 the other page, page 18. It's nice that they're right
23 together because page 18 goes through those nine
24 criteria very specifically. You know, it has italicized
25 font, which discusses what is looked at under that

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1 criteria.
2 For instance, "Short-term effectiveness.
3 Assesses how well human health and the environment will
4 be protected from impacts due to construction
5 implementation of a remedy. Also considers time to
6 reach cleanup goals."
7 I must admit on the previous slides, two back,
8 the alternative that we think is the best has one of the
9 longest time frames when it comes to cleaning up the
10 principal aquifer. It has 95-plus years. That's one
11 reason we have this little plus here is it's a little
12 bit of a misnomer. You have to look at the alternative
13 that we're proposing as a combination of alternative 8A
14 as well as 10B prime.
15 If you look at 10B, and prime is just a little
16 bit of a reduction in the flow, and we look at the
17 modeling – the groundwater modeling, it didn't have a
18 significant impact to the results.
19 10B cleans up the shallow groundwater in
20 roughly 20 years. That's a big thing because that's the
21 source of that large dilute regional plume. That's a
22 big priority for the Navy to get rid of the source as
23 soon as possible.
24 And so it's the combination of both 8A and 10B
25 prime is what we're acting on for overall short-term

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1 analysis. And like our little asterisks or our little
2 plus sign says, there's a lot of optimization that's
3 going to happen when we get into the design.
4 And the groundwater modeling is – really, the
5 main focus is comparative analysis. How does it compare
6 to the other alternatives?
7 There is lots of opportunities to optimize
8 well placement. And when you're running this thing for
9 many, many years, as it will be used as an irrigation
10 supply source, it's not going away, and it will be very
11 beneficial.
12 So we look at this meatball chart. We don't
13 have weighted averages. We don't have numbers. But you
14 can see where it's a full closed-in circle, a good performance.
15 (Note to Readers: Recommend referring to the
16 Comparative Analysis of Remedial Alternatives in the
17 Proposed Plan or the public meeting presentation handout.)
18 You can see the preferred alternative has
19 three – actually, we have Navy state acceptance in
20 there, which is nice – nice as a full circle, best
21 performance.
22 The big one, I have to say, is
23 implementability. You see these other three
24 alternatives. They are joint Navy/water district
25 projects. But they just – they did not make the cut,

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1 and they did not meet the settlement agreement.
2 So the settlement agreement on the 8A, 10B
3 prime is key to having something doable. So that's one
4 of the main reasons we prefer it.
5 Cost-effective, it's got long-term
6 effectiveness. It's great to be hooked up with a CERCLA
7 remedy with a long-term local water district because
8 they're here. They know how to run these things. You
9 know, it's their business and they're experts and it's
10 great to team up with them.
11 So here's some of the kudos or some of the
12 things that are the real benefit of our preferred
13 proposed remedy.
14 Optimal solution. Given all the factors, all
15 the technical factors, all the nuances that we've had
16 with the local water districts, with the regulatory
17 agencies over quite a many number years, we think it's
18 the best – it really is the best solution.
19 It does resolve or satisfy our CERCLA
20 requirements under the Navy and under our Federal
21 Facilities Agreement. And the cleanup team, the BRAC
22 cleanup team, they support it. They've been very
23 diligent, very patient with the Navy and the local water
24 districts on getting this settlement agreement that
25 allows our preferred alternative to be implementable.

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1 So next.
2 In the proposed plan, you do have some
3 schematics. They all start looking the same after a
4 while. But truly, this is different. And I do – like
5 Dean said, I would definitely support getting the
6 handout version of the map that we see over here.
7 It says "Irvine Desalter Project," where in
8 the kind of red – I'm not sure if that's mauve or I
9 don't know what color – our proposed alternative is.
10 The light blue line is not what the Navy's
11 proposing. That is the water district's drinking water,
12 potable water system, that's outside of our
13 VOC-contaminated plume.
14 So with that, I'm going to give it back to
15 Dean.
16 MR. GOULD: Thank you, Andy. Terrific.
17 Well, the evening certainly wouldn't be
18 balanced unless we had presentations by the water
19
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21
22
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1
2
3 districts that we're partnered with. And in just a
4 moment, we'll have Mr. Steve Conklin from the Orange
5 County Water District as well as Mr. Richard Bell from
6 the Irvine Ranch Water District come up and give their
7 perspective on the remedies being proposed and the
8 historical perspective of what has transpired to date
9 and offer a little more insight as far as the nuances to
10 the implementation of the remedy we've been talking
11 about so far.
12 If you would, Steve.
13 MR. CONKLIN: Thank you, Dean.
14 And good evening. My name is Steve Conklin
15 with the Orange County Water District, and I'm very
16 pleased to be here.
17 Andy said he started working on the project in
18 1991. I actually started working on it in 1989 when I
19 started with the water district over 12 years ago.
20 Roy Herndon, our district hydrogeologist with
21 the district, you started before I did.
22 MR. HERNDON: 1988.
23 MR. CONKLIN: 1988. So we have a long history
24 with this project.
25 So Roy, myself, and the water district board

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1 of directors are very pleased we've reached this point.
2 We're very supportive of the project and very anxious to
3 move forward with this very implementable and very
4 technologically sound project that will meet the needs
of ourselves, our partners, and the various regulatory
agencies.
7 The water district is the groundwater
8 guardian. We were created in 1933 by special action of
9 the state legislature to protect and preserve the Orange
10 County groundwater basin.
11 It's a very valuable resource. It's the water
12 that's under our feet right here. It's the water that
13 provides the needs of over 2 million people, that
14 stretches from Los Alamitos all the way down to Irvine,
15 from Anaheim and Fullerton.
16 That whole area there is – about 70 percent
17 of the water that those 2 million people use comes from
18 the ground. This water has to be protected. It's an
19 invaluable resource, and this project does protect this
20 very important resource for us.
21 The water district is an independent
22 monitoring authority. Our purpose is the groundwater
23 basin. And with that, whatever – whatever it takes,
24 that's our purpose – and our existence is to
25 protect the groundwater basin.

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1 The project, by treating the contaminants here
2 at the site, it prevents the contaminants from moving
3 farther downstream and potentially contaminating other
4 groundwater. This water has its natural movement,
5 more or less, from east to the west. It would be moving
6 from the Irvine area actually on through Santa Ana and
7 some of these other areas. And these areas are
8 underlain by groundwater. If this contaminant continued to
9 move it would contaminate that water as well.
10 So it's very important to pull the water out
11 here, treat it, and then be able to use it.
12 This project is very valuable in that it's
13 taking water, which is otherwise not usable, treating
14 it, and making it into a very valuable resource. It's
15 making us more water independent and not dependent so
16 much on Metropolitan Water District and from water from
17 out of the area. So it's making use of water right here
18 and making the water available for us and for our
19 children and for our children's children.
20 So with that, I'd like to turn it over to
21 Richard Bell, my partner in the project, from Irvine
22 Ranch Water District.
23 MR. BELL: Thank you, Steve.
24 It's a pleasure to be here tonight. I concur
25 with the comments Steve made.

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1 Both water districts' boards of directors back
2 in June, after many years of effort, support the project.
3 are very, Our districts are very enthusiastically behind
4 the project, and we have been working very diligently on
5 this project for many years.
6 I started with the district – since we're
7 giving a little history of each of our involvement with
8 this project, I started here four years ago and got very
9 involved with the project at that time. About half
10 my time is devoted in one way or another to this
11 project in negotiation and project
12 development.
13 A little side note, 20 years ago,
14 I was the regional manager for a Regional Water Quality
15 Management Program for Southern California back in the
16 late '70s when VOCs were first discovered in
17 groundwater. At that time, we knew
18 nothing about VOCs in the Irvine Area since this area was
19 agricultural.
20 (Interruption by reporter.)
21 MR. BELL:
22
23 One of the things that I'd like to talk about
24 is our perspective on the project and how we got here.
25

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1 The first slide is titled "Two Projects
2 in One." That's an important point to understand. The
3 project is both a nonpotable system, which is a CERCLA
4 remedy that Andy addressed, and we also have a potable
5 system.
6 And I'll show you them in a minute on the maps.
7 The nonpotable system basically takes water
8 from the VOC Contamination plume, which is extracted, treated,
9 and then would be used in a recycled nondrinking-water system
10 primarily for landscape irrigation, and other nonpotable
11 uses.
12 It is part of the CERCLA remedy.
13 The potable system are wells which are located
14 safely beyond the plume, outside the plume, and outside
15 upgradient of the influence of pumping from the plume.
16 This water will be treated to remove salts and
17 nitrates, for use in our drinking water system.
18 And we need to note that the potable project,
19 is separate and
20 not part of the CERCLA remedy.
21 Next slide.
22 It was very important early on in the process to
23 get our public involved. A few years ago, we
24 actually conducted some very extensive focus groups with
25 our customers and community leaders.

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1 And what we found from that process was
2 that our community and the leaders in the community
3 very much supported the cleanup of the project, but
4 they preferred that the treated water from the plume
5 be used forlandscape irrigation. And that's how the
6 project was basically configured. We developed the
7 project into two components at that time.
8 One thing we do like to make clear is
9 that the groundwater cleanup project and the
10 groundwater supply project do not affect the ultimate
11 use of MCAS El Toro. It really has no bearing on that
12 decision at all.
13 The plume that Andy showed in his picture
14 basically is the same as we show here in color.
15 This is the source area site 24 or the origin of
16 the VOCs. They spread basically in the shallow unit and
17 then dropped down into the principal, deeper aquifers
18 and have been detected out as far as Culver and Drive.
19 But we have designed a system that has two
20 wells here in the major – or the hottest spot of the
21 plume for extraction.
22 We also maintain a well here at the toe of the
23 plume to help provide containment of the plume so it doesn't
24 get beyond this point. We want to protect this area
25 downgradient of the plume. That's what Steve talked to earlier.

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1 The water would be pumped from these wells,
2 conveye by a pipeline to a central treatment plant here where
3 the water will be cleaned and then from that point will
4 be put into our nonpotable irrigation system.
5 We also have, which is separate from the –
6 the CERCLA remedy, is our potable system, which would be
7 outside the plume, would be some wells located along the
8 Southside of the Interstate 5 Freeway.
9 That water, as I mentioned earlier in this
10 Part of the basin has higher salts from past agricultural
11 activities and natural sources.
12 This water will be pumped from these wells to
13 the same treatment plant location, but into a separate
14 facility, where it will be desalted and disinfected
15 it and pumped it in the potable system.
16 Not part of CERCLA remedy.
17 The treatment system that will be used for the
18 nonpotable project will include primarily two types of
19 treatment processes. One is reverse osmosis, which will
20 desalt the water to levels where we can use it for irrigation
21 supply, and the second would be a packed aeration tower
22 for air stripping to remove the volatile organic
23 contaminants.
24 Those – processes are both the best
25 available technology. They're proven technology and

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1 been used in many different locations, and they're very
2 reliable processes.
3 The air that will be stripped out, which will
4 contain the VOCs will be further treated through a granular
5 activated carbon unit, to absorb all the VOCs in the air.
6 The treated air – will be free of contaminants so there will
7 be zero discharges from this facility to the environment.
8 And after this water is treated, it will be
9 disinfected and put into our system.
10 This is the same chart that's on the
11 proposed plan on page 16, I believe, that Andy
12 showed.
13 As basically he said, the water from the
14 shallow groundwater unit on base at site 24, contains
15 the high concentrations of contaminants.
16 The shallow groundwater unit will be pumped by
17 the Navy and conveyed to a pipeline, where we'll come over
18 in a pipeline. We'll take custody of that water. That water
19 will be treated by reverse osmosis and also go through
20 the air stripper, the off-gases will go through carbon
21 treatment, and the purified water will be disinfected and
22 put it into our irrigation system.
23 The deeper, is off base, water which has
24 lower concentrations of contaminants, will be partially
25 desalted And all that water will also be air stripped,

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1 and the vapor treated, and then the water will be
2 disinfected and put into our system.
3 So that basically gives you a picture of how
4 the flow streams are treated in the process.
5 One of the things that's very important is to explain
6 how we ensure both public health and environment
7 are protected And one of the key points is the extraction
8 wells in the principal aquifer prevent the plume from
9 being pulled towards the drinking water
10 wells.
11 We went through excessive groundwater modeling
12 studies to prove that point and to ensure ourselves
13 that that would be the case.
14 And as I mentioned earlier, all the water,
15 100 percent air stripped will be.
16 Then all the highly contaminated water will also
17 receive reverse osmosis.
18 Again, there will be no air emissions from the
19 project, and the wastewater brines from the treatment stages
20 or steps will be disposed to a brine-line system. We'll
21 convert a pipeline into a brine line that goes to the
22 regional wastewater collection system so it doesn't
23
24
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1 go into our reclamation system. Here, we reclaim our
2 water. It is important we need to keep excess salts out of
3 our reclaimed water sources and keep the water as pure as we can.
4 So the brine goes through a regional system.
5 Ensuring protection for the drinking water project is
6 done through several methods.
7 One, we will install an enhanced groundwater
8 monitoring program and network in the project area so
9 we can know in advance what's happening. Groundwater will be
10 monitored and tested throughout the project life and
11 in the plant on a continuous basis so we know exactly
12 how the plant is operating at all times.
13 As I mentioned, reverse osmosis is
14 a proven technology. It's used to purify bottled water.
15 It's widely known, and it's a safe process.
16 And another thing we make clear is that we
17 actually remove the salts and minerals for the drinking
18 water side to better than what's required for drinking
19 water standards. That's our goal, and that's what we plan
20 to do.
21 The last slide.
22 In summary, the project benefits, from the perspective
23 of a water supplier, can be summarized by four main points.
24 One, it cleans and protects the groundwater basin that's been
25 damaged over the years and is currently unusable for municipal uses.

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1 Second, it basically provides a new,
2 locally controlled drought-resistant
3 high-quality groundwater supply for both our potable and
4 our nonpotable systems. So we're getting the water
5 supply that we need, and it developes unused local supplies
6 and provides drought-protection benefits. By having our supply
7 here, it reduces our reliance on imported water.
8 The third point is there will be no impact on
9 our – on our ratepayers. Funding by the Navy the
10 nonpotable system and from the Metropolitan Water District on
11 the potable system will make the project feasible side.
12 This will keep our costs in line or less than what we
13 would pay for imported water.
14 And fourth, the project is environmentally
15 beneficial, as I mentioned earlier.
16 And that's basically all I have on – from the
17 Irvine Ranch Water District water perspective on the
18 project.
19 MR. GOULD: Thank you very much, Steve and
20 Richard. I appreciate it.
21 Before I provide closing remarks on this
22 particular portion, I want to afford the regulatory
23 representatives here tonight the opportunity to give
24 their agency's perspective on the preferred alternative
25 and the proposed plans that are being presented to you

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1 tonight.
2 So I'll start off asking Ms. Nicole Moutoux,
3 representing U.S. EPA, who is also the lead – lead
4 regulatory agency of what is known as the BRAC Cleanup
5 Team, the BCT for El Toro, if you would like to make
6 some comments.
7 MS. MOUTOUX: Yes.
8 My name is Nicole Moutoux. I work for the
9 Environmental Protection Agency.
10 Basically, EPA is in support of the Navy's
11 proposal for cleaning up the groundwater at sites 18 and
12 24 because it will be, once in place, protective of
13 human health in the environment, as well as restore the
14 beneficial uses of the groundwater.
15 And I've been on the team not as long as
16 everyone else, but we believe that it's time for this
17 cleanup to happen.
18 MR. GOULD: Thank you, Nicole.
19 Ms. Triss Chesney with DTSC.
20 MS. CHESNEY: My name is Triss Chesney, and I'm
21 with the California Environmental Protection Agency,
22 Department of Toxic Substances Control, also known at
23 DTSC.
24 DTSC concurs with the proposed remedy because
25 it addresses groundwater contamination by reducing the

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1 VOC concentrations to meet water quality standards,
2 controlling VOC migration, and preventing domestic use
3 of contaminated groundwater until cleanup goals are
4 achieved.
5 The proposed remedy is protective of human
6 health and the environment and meets state regulatory
7 requirements.
8 MR. GOULD: And the third regulatory agency
9 representative would be Ms. Patricia Hannon of the
10 Regional Water Quality Control Board.
11 MS. HANNON: My name is Patricia Hannon. I'm also
12 with California EPA, Regional Water Quality Control
13 Board, Santa Ana region. And we concur with the
14 proposed remedy.
15 We've been waiting a long time for this to
16 happen, and we're very thrilled that it's going to
17 work. It hopefully will work and restore beneficial
18 uses to this.
19 MR. GOULD: Thank you.
20 There's a couple of closing comments
21 before we open it up for comments.
22 Next step, public comment
23 period.
24 Okay. Well, certainly we're kicking that off
25 here tonight. But the formal comment period, if you're

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1 looking at page 2 in the proposed plan that's available,
2 you see that it talks about the public meeting being
3 tonight, November 13th. But there is a 30-day public
4 comment period ranging November 7th to December 7th.
5 That's an ominous day. During that period, we are
6 gladly receiving public comments on this preferred
7 alternative.
8 So I know there's a lot of information being
9 put out tonight. Maybe you need to go home and review
10 some of the documents or come up with some questions,
11 develop some questions for us, or perhaps share what
12 you've learned tonight with some people that you know,
13 coworkers, people in the community, anybody that you
14 would like to get their input on and bounce it off
15 them. By all means, you can then submit the comments to
16 me. I would be more than happy to receive those
17 comments.
18 As I mentioned, anybody who responds to us
19 with comments we'll gladly respond in writing formally
20 giving you a detailed response to the questions that you
21 may have. So I do encourage you to please take
22 advantage of that. And anyone you know that would be
23 interested in providing comment also, solicit them to do
24 the same.
25 Once the comment period is ended, and assuming

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1 that the proposed alternative that we've talked to you
2 about this evening is, in fact, the preferred
3 alternative that is ultimately selected, we'll go ahead
4 and put that into a Record of Decision and publish
5 that.
6 And once that is signed after review of the
7 regulatory agencies and our partners, we'll go ahead and
8 finalize that document, and then it becomes final. Then
9 this remedy is the one that we'll go ahead and move
10 forward with, and the remedial design will then take
11 place.
12 This is a little bit of a unique instance in
13 that remedial design will actually be produced by the
14 water districts. And then once a design is complete,
15 we'll move forward with the actual action, meaning the
16 treatment of the contaminated groundwater.
17 So that is essentially it as far as the formal
18 presentation goes.
19 So as I mentioned, I think you're going to get
20 the idea that we want comments. Here's at least the
21 second opportunity, aside from the informal session.
22 Here's a second part for you to go ahead right now, go
23 ahead and speak up, and we do have a microphone
24 available for anybody who would like to provide
25 comments.

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1 Now, there's a couple different ways we can do
2 this. You can go ahead and give them right now, if
3 that's your preference, or you can come up afterwards
4 and give them directly to the court reporter here. Or,
5 as I mentioned, you can submit them in writing tonight,
6 or you can just go home and think about it and submit
7 them in writing. That way, there's a lot of different
8 options.
9 We'll open it now. We can't provide responses
10 right now unless it's an administrative issue. But if
11 it's technical or things of that nature, we'll respond
12 in writing to those.
13 So is there anybody who would like to provide
14 a comment right now in this particular format?
15 MR. MILLER: I had a couple of questions.
16 MR. GOULD: Please state your name and spell it
17 out so our court reporter can get that, please.
18 MR. MILLER: Okay. My name is Mark Miller, and I
19 live in Mission Viejo. I got the notice in the paper
20 and came to the meeting tonight.
21 MR. GOULD: Terrific.
22 MR. MILLER: And I was just looking at the
23 proposed plan groundwater cleanup folder. And I notice
24 on the bottom of page 16 where it says "Preferred Remedy
25 Conceptual Design Alternatives 8A and 10B," on the

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1 bottom, it says "During low periods" – or "During
2 periods of low recycled water demand, only shallow
3 groundwater will be treated and either injected into an
4 IDP injection well or stored in the IDP reservoir."
5 And I was wondering if the greatest
6 contamination is in the – the deep aquifers, why they
7 wouldn't take the more contaminated water and treat it
8 instead of the water out of the shallow well.
9 MR. GOULD: Okay. Thank you.
10 MR. MILLER: And one other question I had –
11 MR. GOULD: Please.
12 MR. MILLER: – the plume is mapped out. And
13 they – they state there will be three deep extraction
14 wells and then one shallow groundwater unit on-station,
15 I guess, on the Marine base.
16 And I was curious with the scrubber that is
17 being designed to be in place, will there be any design
18 parameter if the plume should expand where other wells
19 could be added on and the scrubber would work to a
20 larger capacity or will be designed if – on that
21 contingency?
22 MR. GOULD: Very good. Thank you.
23 MR. MILLER: Thank you.
24 MR. GOULD: All right. Anyone else?
25 MR. STORIE: My name is Blake Storie. I'm a

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1 resident of Laguna Niguel, and I'm sure my wife is as
2 well in favor of any type of cleanup effort.
3 Just looking at table 3 on page 14 – you have
4 to understand we're very new to this this evening – the
estimated remedial time in shallow groundwater is the
quickest of the options you have there, which is good
7 news, I would think.
8 But the reverse on the estimated remediation
9 time of the principal aquifer, much – is the longest of
10 all the options. I'm just curious as to why that would
11 be, why you would select that.
12 MR. GOULD: That's a fair question. Thank you.
13 MRS. BOOT-STORIE: I had a couple questions.
14 My name is Carol Boot-Storie. I'm a resident.
15 I want to make a statement.
16 MR. GOULD: If you could just spell your last
17 name, please.
18 MRS. BOOT-STORIE: B-o-o-t, dash, S-t-o-r-i-e.
19 First of all, I just want to say thank you
20 all for being here. Sometimes you don't realize how
21 much people appreciate your efforts given the turnout
22 here. But thank you all for all your hard work, many,
23 many years of hard work put together here.
24 A couple of questions. On the 93 years, I
25 know that there was a mention of greater than 4800 parts

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1 per billion at one point. But in some of these cases,
2 you mentioned greater than 500 parts per billion.
3 Is there a time estimated that would say in 20
4 years, you would have the source down to 250 parts per
5 billion or down to 10 parts per billion? Is there a
6 time line, and how does that time line play out so that
7 90 – 90 percent is salt in 20 years, and the remainder
8 goes down from there? So that question.
9 And is there a location where the cost
10 associated with each of these alternatives is
11 presented? And so we can sort of look at that and see
12 if that's – okay. That's probably in there already.
13 And then just a general question. Is there
14 something that precipitated – I know five years is a
15 long time for the negotiations.
16 Is there something that precipitated a final
17 date for that, whether it be political or whether it be
18 a regulatory agency that made that determination? Could
19 that have happened sooner? I know there are some smiles
20 going on there. Is there something that said, "Here's
21 the date, and here's why there's the date"? I'm
22 interested in knowing that.
23 And I think that would probably do it for the
24 moment. Thank you.
25 MR. GOULD: Great. Thanks.

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1 Any others?
2 Okay. Well, certainly not the last
3 opportunity to provide public comments. As I mentioned,
4 please do speak to those perhaps in your neighborhood,
5 those you work with, and encourage them to provide
6 comments as well.
7 If that is it, then we'll go ahead and close
8 out this portion. We will still stick around for a
9 little bit just in case something else comes up in this
10 meeting, you have some other informal questions, or you
11 care to fill out one of the written forms here or you
12 just want to pick up some additional information.
13 But short of doing all that, on behalf of all
14 the speakers this evening, I definitely want to thank
15 those community members that did come here this evening,
16 especially the new faces.
17 It really is refreshing to see the new
18 interested folks coming out and spending their evening
19 here. Wish we would have had more. But short of that,
20 at least you folks chose to be involved. And we really
21 do appreciate that likewise.
22 So thank you very much for that. And let's
23 go ahead and close that out. Thank you.
24 (Whereupon, the presentation/question session
25 was concluded at 8:27 p.m.)

Look-See Concordance Report

UNIQUE WORDS: **1,444**
TOTAL OCCURRENCES: **4,256**
NOISE WORDS: **384**
TAL WORDS IN FILE: **11,426**

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CASE SENSITIVE

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INCLUDES ALL TEXT OCCURRENCES

DATES ON

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Navy and Marine Corps - Internet Access Environmental Web Sites

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NEW

Southwest Division Naval Facilities Engineering Command Web Site:

http://www.efdsw.navfac.navy.mil.environmental/envhome.htm

Department of Defense - Environmental Web Page

http://www.dtic.mil/environdod/

Department of Defense - Environmental BRAC Web Page

http://www.dtic.mil/environdod/envbrac.html

U.S. EPA Superfund Web Page

www.epa.gov/superfund/index.html

Administrative Record File

- Located at MCAS El Toro – BRAC Office, Marine Way, Building 368, 2nd floor
- Anyone is welcome to review documents in the file
- To view the documents, schedule an appointment by calling:
  - Mr. Dean Gould at (949) 726-5398 or (619) 532-0784
  - Ms. Ms. Marge Flesch at (949) 726-5398

See the backside for location of the Information Repository

Information Repository

- Located at Heritage Park Regional Library in Irvine
- Address: 14361 Yale Avenue, Irvine
- Hours: Monday-Thursday, 10 am to 9 pm
  Friday and Saturday, 10 am to 5 pm
  Sunday 12 pm to 5 pm
- Phone: (949) 551-7151

- Contains key Installation Restoration Program documents and complete materials from all RAB meetings (agendas, minutes, handouts)

- Anyone is welcome to review documents at the Library

Where To Get More Information:

Copies of Remedial Investigation reports, other key documents, and additional information relating to environmental cleanup activities at MCAS El Toro are available for public review at the following information repository:

Heritage Park Regional Library
14361 Yale Avenue
Irvine, CA
(949) 551-7151

Current hours:
Monday-Thursday 10am-9pm
Friday-Saturday 10am-5pm
Sunday 12pm-5pm

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INTRODUCTION SECTION

United States Marine Corps

Base Realignment and Closure Business Plan

For

Marine Corps Air Station El Toro, CA

March 2001

MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN

This BRAC Business Plan provides current summary information on the status of and strategies for the cleanup of the Marine Corps Air Station, El Toro. We, the BRAC Cleanup Team, with consideration of community and stakeholder advice, have cooperatively developed this plan to provide for safe, effective, timely, and cost-efficient environmental restoration and productive reuse of the closed DoD facility. This plan will be updated periodically to reflect new information regarding the environmental condition of property, reuse priorities, and availability of funds.

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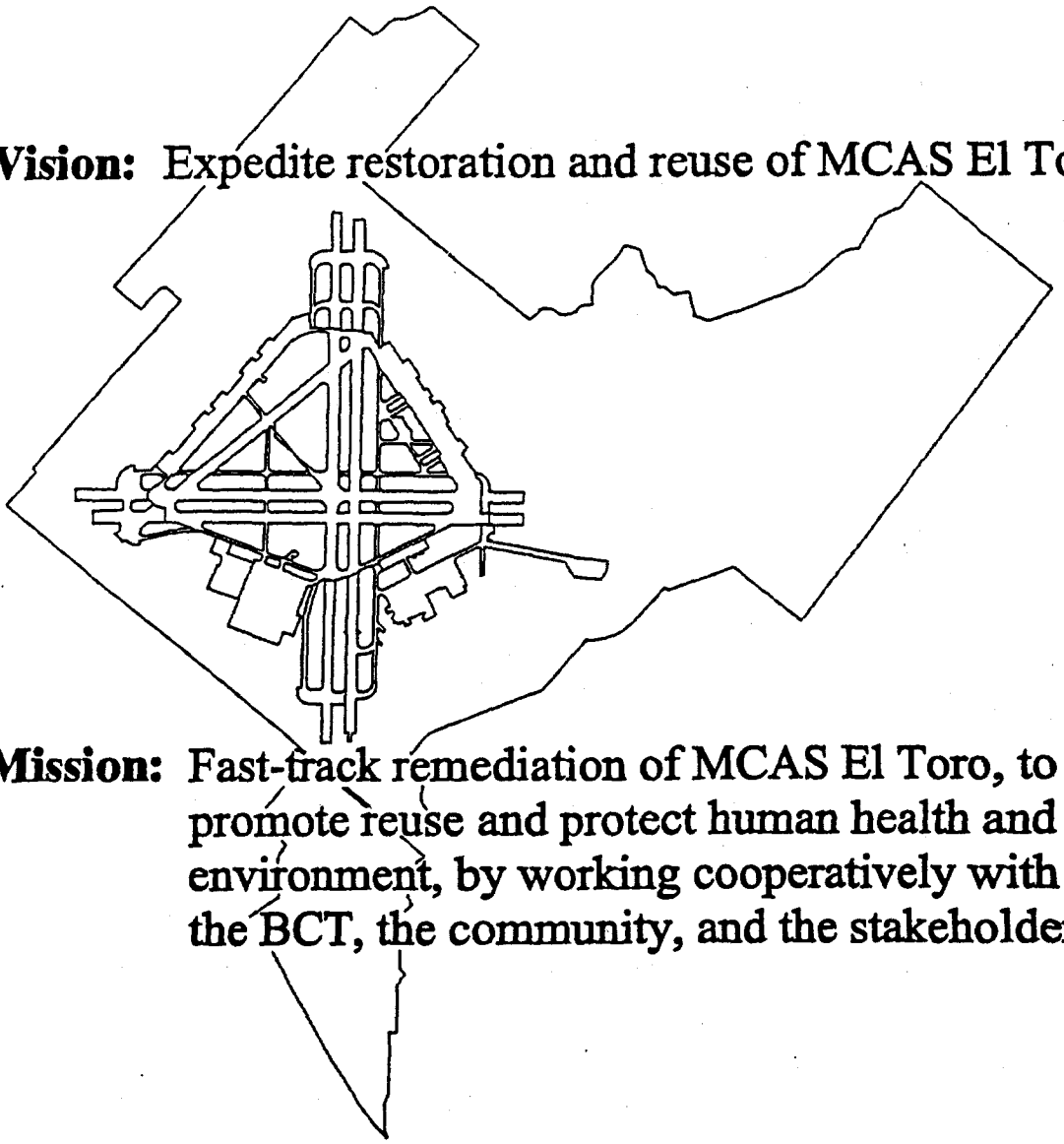
Vision and Mission Statements



Vision: Expedite restoration and reuse of MCAS El Toro.

Mission: Fast-track remediation of MCAS El Toro, to promote reuse and protect human health and the environment, by working cooperatively with the BCT, the community, and the stakeholders.

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INTRODUCTION SECTION

NOTE: The Introduction Section serves as an "Executive Summary" of the complete document. To look at tables, figures and attachments referenced in the Introduction, please consult the complete document. It is available at two locations: (1) the Administrative Record File, located at MCAS El Toro, Base Realignment and Closure Office, Building 368 – contact Ms. Charly Wiemart at (949) 726-2840 to arrange an appointment; (2) the MCAS El Toro Information Repository located at the Heritage Park Regional Library, 14361 Yale Avenue, Irvine, phone number (949) 551-7151.

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INTRODUCTION SECTION

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INTRODUCTION

The Department of the Navy (DoN) completed the realignment and closure of Marine Corps Air Station (MCAS) El Toro (Station) on 2 July 1999, in accordance with the Base Realignment and Closure Act (1993) (BRAC III). In 1993, the DoN organized a Base Realignment and Closure (BRAC) Cleanup Team (BCT) to manage and coordinate closure activities and to prepare an annual BRAC Cleanup Plan (BCP). The DoN published the initial BCP in 1994 and issued annual updates in 1995, 1996, 1997, 1998, and 1999. In 1999, the BCT agreed to publish a BRAC Business Plan (Business Plan) for the Year 2000 update. The DoN established the Business Plan, a ten to fifteen page document that is comparable to an extended executive summary, as an alternative to the BCP for installations with continuing environmental restoration programs. The Business Plan provides the status of, management and response strategies for, and action items related to the environmental restoration and compliance programs at MCAS El Toro. The Business Plan presents information available as of 31 December 2000, and describes the most significant environmental Locations of Concern, the acceleration initiatives implemented at MCAS El Toro, and BRAC projects under way. Exhibits, tables, and figures provide additional information pertaining to the environmental Locations of Concern.

The scope of the Business Plan considers the following regulatory mechanisms:

- BRAC III;
- National Environmental Policy Act (NEPA);
- Resource Conservation and Recovery Act (RCRA);
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act and the Community Environmental Response Facilitation Act (CERFA); and
- other applicable state and local laws.

MCAS El Toro was listed on the National Priorities List under CERCLA in February 1990, and the DoN, the United States Environmental Protection Agency, Region 9, the California Department of Health Services (part of which is now the California Department of Toxic Substances Control), and the California Regional Water Quality Control Board, Santa Ana Region entered into a Federal Facilities Agreement (FFA) which establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions. The Business Plan is a planning document; therefore, the information and assumptions presented may not have complete approval from the federal and state regulatory agencies. The Business Plan is a dynamic document that is updated regularly to reflect the current status of response actions and the changes in strategies or plans that affect the ultimate restoration and disposal of MCAS El Toro property. Comments from various sources, including major claimants, DoN activities, and federal and state regulatory agencies, were evaluated and considered for inclusion during the preparation of this Business Plan.

STATUS OF DISPOSAL, REUSE, AND INTERIM LEASE PROCESS

In March 1994, the County of Orange (County), along with the Cities of Irvine and Lake Forest, formed a joint powers authority to develop a reuse plan for MCAS El Toro. In January 1995, the County withdrew from the joint powers authority in response to the passage of Measure A, a countywide ballot initiative approved by Orange County voters in November 1994. Measure A anticipates that the principal feature of a County-adopted reuse plan for MCAS El Toro should be a commercial airport. Measure A also established the 13-member El Toro Airport Citizens Advisory Commission to advise the Board of Supervisors and Orange County Planning Commission on base reuse.

In April 1995, the Office of Economic Adjustment formally recognized the Orange County Board of Supervisors as the official Local Redevelopment Authority (LRA) for MCAS El Toro. As the recognized LRA, the Board of Supervisors was given sole responsibility for preparing a Community Reuse Plan (CRP) for submittal to the DoN. Eight Department of Defense (DoD) and federal agencies submitted formal applications for MCAS El Toro property during the federal screening process.

The LRA provided its recommendations on each of these requests to the Assistant Secretary of the Navy in early 1995. The LRA has endorsed requests by the Department of Interior (DOI) for the Habitat Reserve, the Federal Aviation Administration, and the California Air National Guard. The LRA recommended that the remaining requests be denied. No surplus property determination has been made. Currently, no transfer actions have been approved by the Assistant Secretary of the Navy.

In the March 1995 final Environmental Baseline Survey (EBS) Report (Jacobs Engineering Group, 1995), approximately 63 percent of the total 4,738 acres of real property at the Station was categorized as eligible under CERFA for transfer as uncontaminated property or Environmental Condition of Property (ECP) Type 1. ECP types are described in Exhibit 1.

Exhibit 1. Environmental Condition of Property (ECP) Types

ECP Type	Description
1	Areas where no release or disposal of hazardous substances or petroleum products (including migration) has occurred.
2	Areas where only release or disposal of petroleum products has occurred.
3	Areas of contamination below action levels.
4	Areas where all remedial action has been taken.
5	Areas of known contamination with removal and/or remedial action underway.
6	Areas of known contamination where required response actions have not been implemented.
7	Areas that are unevaluated or that require further evaluation.

Since the 1995 EBS, additional property has been categorized as area type 1. Property designated as area types 1 through 4 is environmentally suitable for transfer by deed. This property type now totals approximately 87 percent of the Station property. The remaining real property is identified as area types 5, 6, and 7. The real extent of land classified as area types 5,

6, and 7 is approximately 252 acres (5 percent), 323 acres (7 percent), and 3 acres (less than 1 percent), respectively.

In the fall of 1995, the LRA conducted the state/local and homeless provider screening process in accordance with the Base Closure Community Redevelopment and Homeless Assistance Act of 1994 and implementing regulations issued by the DoD and the U.S. Department of Housing and Urban Development (HUD) in August 1995.

The LRA prepared a final CRP and draft Environmental Impact Report (EIR), which evaluated three reuse alternatives for the Station. Reuse Alternative A - Commercial Passenger/Cargo Use (the proposed project) - provided for a full service commercial passenger and cargo airport and compatible non-aviation uses. Reuse Alternative B -Cargo/General Aviation Use - provided for a cargo and general aviation airport and compatible non-aviation uses. Reuse Alternative C - Non-aviation-provided for non-aviation uses including an educational campus, visitor-oriented attractions, research and development, and other uses.

In August 1996, the LRA issued the draft MCAS El Toro CRP, Homeless Assistance Submission (HAS) and draft EIR for a 67-day public review and comment period. The written public comment period ended on 15 October 1996. In the fall of 1996, the Orange County Airport Commission, the El Toro Airport Citizens Advisory Commission, and the Orange County Planning Commission conducted public meetings/hearings and adopted recommendations to the Board of Supervisors on the draft CRP, HAS and EIR.

On 11 December 1996, the Board of Supervisors adopted the final MCAS El Toro CRP (P&D Consultants Team, December 1996), which provides for a more detailed study of a full-service commercial passenger and cargo airport, as well as compatible non-aviation uses.

The final CRP also incorporates the LRA's previously transmitted recommendations on each of the DoD and federal agency requests for property at the base and the 47 Notice Of Interest applications submitted during the state/local and homeless provider screening process conducted by the LRA. The final CRP and HAS were submitted to the Assistant Secretary of the Navy and the Secretary of HUD on 13 December 1996.

The scheduling and prioritizing of parcels for reuse based on the final CRP was provided by the LRA in 1997. The closure programs summarized in this Business Plan are not anticipated to be adversely impacted by the LRA's parcel prioritization schedule.

The Bake Parkway/Interstate 5 public highway expansion project was completed and resulted in the transfer of approximately 25 acres of MCAS El Toro property in 1998.

In June 1999, Cooperative Agreement N68711-99-2-6504 for caretaker services to protect, secure, and maintain MCAS El Toro was executed with the County of Orange, extending through 31 August 2000. The expiration of the cooperative agreement for caretaker services was concurrent with the execution of a Master Lease, effective 31 August 2000.

DoN prepared a Finding of Suitability to Lease (FOSL) and entered into an interim lease with the County of Orange in July 1999 for post-closure use of the following areas: the Golf Course (approximately 225 acres); the Child Development Center (Buildings 656 and 873); the Officers' Club (Building 791); the Horse Stables (approximately 30 acres); the Recreational Vehicle (RV) Storage Area; the Indoor Training Pool (Building 839); and Building 83. The areas addressed in this lease were incorporated into the Master Lease that was executed on 31 August 2000. The Master Lease has a term of five (5) years beginning on 1 September 2000, and the terms and conditions of the Master Lease are identified in *the Interim Lease Between The United States of America and County of Orange, California For Property at Marine Corps Air Station, El Toro* dated 31 August 2000.

The County of Orange identified a detailed proposed reuse plan for MCAS El Toro in the Draft Environmental Impact Report (EIR 573) in December 1999, and the proposed future land uses are identified on Figure 2 of this Business Plan.

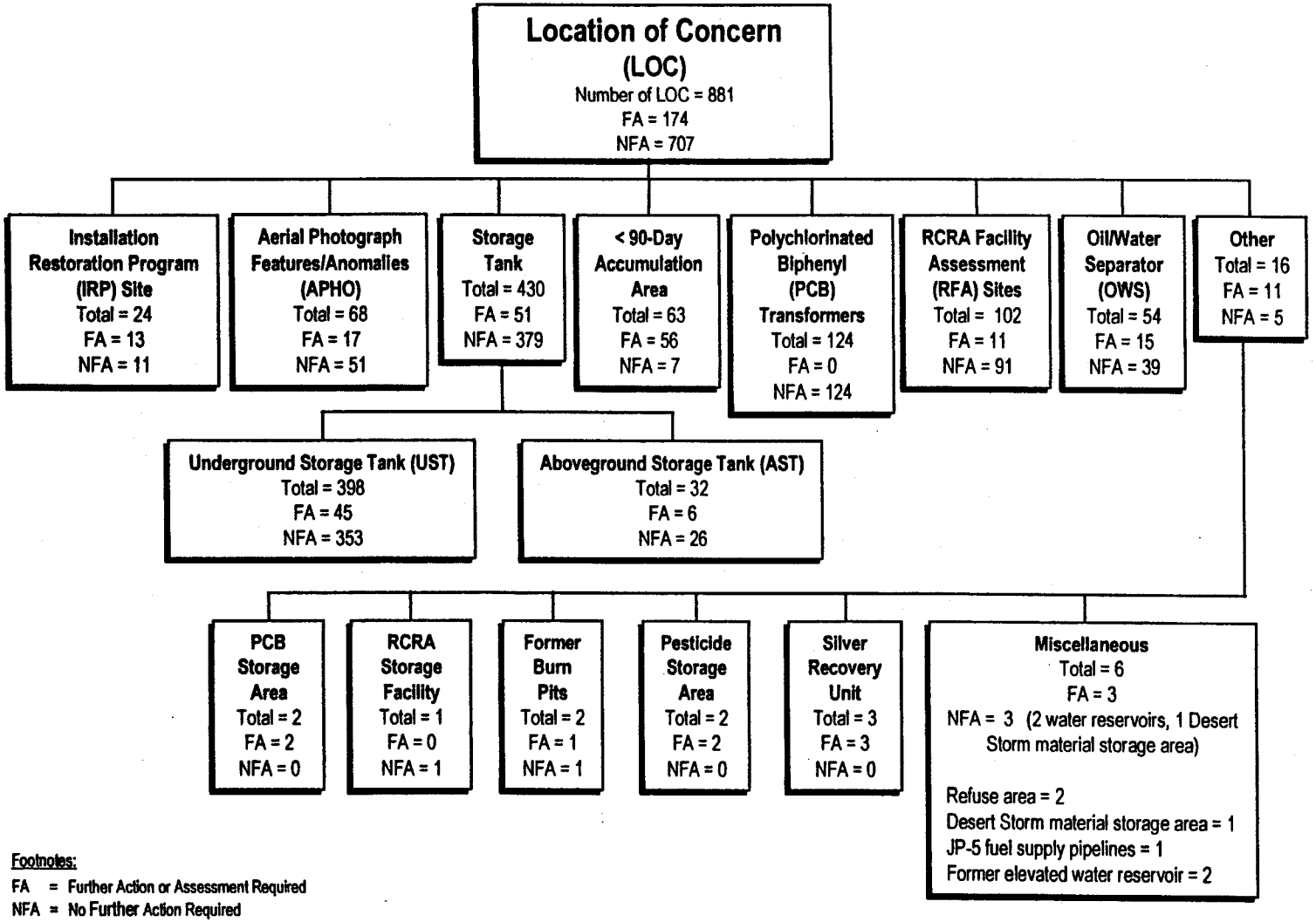
STATUS OF ENVIRONMENTAL RESTORATION PROGRAM

A total of 881 environmental Locations of Concern (LOCs), including twenty-four (24) Installation Restoration Program Sites (Sites), have been identified at MCAS El Toro. A LOC is defined as any identified location or area that is potentially contaminated or is a potential source of contamination. Several new LOCs were added to the program during 2000: Underground Storage Tank (UST) 324G, Above-ground Storage Tank (AST) 1, AST 730, AST 374A, AST 374B, AST 374C, AST 374D, and AST 374E.

Seven (7) LOCs were deleted from the program as phantom or non-existent LOCs. Record search activities, visual inspections, and cognizant regulatory agency concurrence were documented prior to deleting the LOCs from the program. Regulatory agency correspondence pertaining to the phantom LOCs has been placed in the Administrative Record. Deleted were the following LOCs: UST 473A, UST 374B, UST 5101, TAA 29A, TAA 29B, OWS 850, and OWS 851.

Exhibits 2, 3 and 4 summarize the types, numbers, and status of different LOCs at the Station.

Exhibit 2 - Location of Concern Distribution
(as of 31 December 2000)



Footnotes:
FA = Further Action or Assessment Required
NFA = No Further Action Required

Exhibit 3 – Distribution of 881 LOCs (as of 31 December 2000)

	IRP SITES	APHO SITES	STORAGE TANK SITES	<90-DAY ACCUMU-LATION AREAS (TAAs)	PCB TRANS-FORMERS	RFA SITES	OIL/WATER SEPARATOR SITES	OTHER
TOTAL	**24**	**68**	**430**	**63**	**124**	**102**	**54**	**16**
NFA	11	51	379	7	124	91	39	5
Further Action Required (includes LOCs with NFA Decision Documents in Review or In Development)	13	17	51	56	0	11	16	11

Exhibit 4 – New Sites Added during 2000 and Phantom Sites Deleted during 2000

Description	APHO SITES	UNDER-GROUND STORAGE TANKS	ABOVE-GROUND STORAGE TANKS	<90-DAY ACCUMU-LATION AREAS (TAAs)	RFA SITES	OIL/WATER SEPARATOR SITES
New Sites	**0**	**1**	**7**	**0**	**0**	**0**
Phantom Sites	0	3	0	2	0	2

Historical Environmental Program Highlights. The following accomplishments highlight the progress of environmental restoration activities at MCAS El Toro:

- Agency concurrence of a No Action Record of Decision (ROD) for eleven sites from OU-3 and OU-2A (Sites 4, 6, 9, 10, 13, 15, 19, 20, 21, 22, and 25) in September 1997 and agency concurrence on the ROD for Site 11 in September 1999;
- Agency concurrence on the OU-2A interim ROD for the vadose zone at Site 24 in September 1997;
- Agency concurrence on the OU-2B interim ROD for Sites 2 and 17 in July 2000;
- Agency approval of the polynuclear aromatic hydrocarbon (PAH) Reference Study (prepared by Bechtel National Incorporated in 1996) that allowed the recategorization of 448 acres of land from area type 7 to area type 3, thus allowing this land to be transferable by deed; and
- Completion of two time-critical removal actions at Sites 2 and 17 and one non-time-critical removal action at Site 19.

Installation Restoration Program. Currently, a total of 24 sites are being investigated in the Installation Restoration Program (IRP) at the Station (Sites 1 through 22, 24, and 25). Of these, 22 sites were evaluated during the Phase I RI, which was completed in May 1993. Two additional sites were established for investigation in Phase II, bringing the total number of IRP sites to 24. These sites are grouped into three OUs: OU-1, OU-2, and OU-3. The following is a brief summary of the site groupings, current status, and FFA schedule for each of the three OUs.

- OU-1 addresses contaminated groundwater on- and off-Station and consists of one IRP site (**Site 18**). The final interim RI/FS report for OU-1 was submitted in August 1996. The Interim Draft Final Proposed Plan was submitted to the BCT in August 2000.
- OU-2 consists of three subunits (OU-2A, OU-2B, and OU-2C) and addresses potential source areas of groundwater contamination.
  - **OU-2A:** OU-2A includes Site 24 (the Volatile Organic Compound (VOC) Source Area) and Site 25 (the Major Drainages). **Site 24**: RI and Draft Phase II FS Reports for Site 24 were submitted in June and August 1996, respectively. Site 24 – the Volatile Organic Compound (VOC) Source Area – encompasses approximately 200 acres in the southwestern section of the Station. The planned reuse for Site 24 is cargo storage. The VOCs at Site 24 may have come from solvents containing trichloroethene (TCE) or perchloroethene (PCE) that were used at Site 24 until approximately 1975. Primary sources include degreaser tanks, storm drains and industrial waste sewers, and washracks. Pilot studies utilizing portable soil vapor extraction (SVE) treatment units were conducted during the period from approximately 1996 through 1998. The interim ROD (vadose zone only) for Site 24 was signed in September 1997, implementation of the final remedy – SVE treatment - commenced in 1999, and confirmation sampling of the vadose zone was completed in 2000. The ROD for OU-2A and OU-1, which will finalize the remedial decision and will address groundwater, is scheduled to be prepared in the year 2001. **Site 25**: The Draft Final ROD for no action was signed in 1997.
  - **OU-2B**: OU-2B addresses inactive landfill **Site 2** (Magazine Road Landfill) and **Site 17** (Communication Station Landfill). Sites 2 and 17 are located in the northeastern section of the Station in an area designated for future use as a habitat reserve. The former operational landfill units at Site 2 encompass approximately 27 acres, and the former operational landfill unit at Site 17 encompasses approximately 11 acres. Solid wastes from MCAS El Toro were disposed of at Sites 2 and 17. Suspected types of wastes include construction debris, municipal-type waste from Station operations, and oils and fuels. TCE and PCE have been detected in the groundwater at Site 2. The Draft Final Phase II RI and draft FS Reports were both submitted in September 1996. Draft Final FS reports were submitted in September 1997,

and a Draft Proposed Plan was submitted to the BCT in November 1997. The Draft Proposed Plan identified the preferred remedy for the former operational landfill areas at Sites 2 and 17 - a four-foot thick single-layer soil cover. The preferred alternative is based upon U. S. EPA's presumptive remedy approach to landfills. The Proposed Plan was provided for public review in May 1998. The Draft ROD was submitted in October 1998 to the BCT for review, and the Final Interim ROD was signed in July 2000. The Final ROD, a future document, will address management of the VOC plumes at Site 2.

- **OU-2C**: OU-2C addresses inactive landfill **Site 3** (Original Landfill) and **Site 5** (Perimeter Road Landfill). Site 3 encompasses approximately 11 acres in the northeastern section of the Station. Site 5 encompasses approximately 1.8 acres in the southeastern section of the Station. Site 3 is designated for future reuse as a park, and Site 5 is designated for future reuse as a golf course. Reportedly, any waste generated on the Station could have been disposed of at these sites. The wastes are likely to have included municipal solid waste, fuels, and solvents. Site 3 included an incinerator, and incinerator ash was probably disposed of within the landfill. The Draft Final Phase II RI Reports were submitted in October 1996, and the Draft Final FS reports were submitted in September 1997. Based on BCT concurrence with the FS reports, a Draft Proposed Plan was submitted to the BCT in November 1997 and to the public in May 1998. The Proposed Plan identified the preferred remedy for the former operational landfill areas at Sites 3 and 5 - a four-foot thick single-layer soil cover. The preferred alternative is based upon U. S. EPA's presumptive remedy approach to landfills. Following the receipt of public comments, the preferred remedy was changed to a single-barrier cap with a two-foot foundation layer, a flexible membrane liner (FML), and a two-foot soil cover. The single-barrier cap design allows for future irrigation of the landfill cover. The Draft ROD was completed in March 1999, and the Draft Final ROD is expected to be completed in the year 2001.

- OU-3 addresses the remaining sites and information pertaining to the suspected types of wastes at each OU-3 site is presented in Tables 2 and 3. Portions of three sites (**Sites 15, 19, and 20**) are no longer part of the IRP; they have been withdrawn via the CERCLA petroleum exclusion and are managed with state or local environmental program oversight. **Sites 4, 6, 9, 10, 13, 15, 19, 20, 21, and 22** were addressed in the ROD for no action sites in 1997. **Site 1** is in the remedial investigation/feasibility study phase, and a draft Work Plan for the Phase II Remedial Investigation was completed in September 2000. A Proposed Plan recommending no action as the final remedy was issued for **Sites 7 and 14** (Operable Unit 3B) in September 2000, a Public Meeting was held in October 2000, and the Draft ROD was completed in November 2000. A Draft Final ROD for **Sites 8 and 12** is in development. **Site 11** is in the remedial design/remedial action phase. A pilot study for multi-phase extraction was initiated at **Site 16** in October 2000,

and the results of the pilot study will be incorporated into the Draft Final Feasibility Study for Site 16.

RCRA Facility Assessment Sites. A RCRA Facility Assessment (RFA) was performed at the Station between 1990 and 1993. The RFA included the investigation of 305 solid waste management units (SWMUs)/areas of concern (AOCs). However, 3 units were located at MCAS Tustin, 15 units were duplicates of other SWMUs/AOCs, and 4 SWMUs/AOCs were researched and identified as phantom sites. Of the remaining 283 SWMUs/AOCs, 140 were included in a sampling effort. The RFA report was approved by DTSC contingent upon performance of additional investigation at 14 SWMUs/AOCs. A final addendum to the RFA report was completed on 31 May 1996. The addendum presents results and recommendations for the 14 SWMUs/AOCs and recommends closure strategies for 73 temporary accumulation areas. The status of SWMUs/AOCs, as presented in the RFA documentation, is summarized as follows:

- 8 addressed in the IRP;
- 1 addressed in the PCB category of LOCs;
- 76 addressed as USTs;
- 30 addressed as OWSs;
- 66 addressed as Temporary Accumulation Areas (TAAs); and
- 102 addressed as RFA sites, of which 14 required further action or assessment.

The number of SWMUs/AOCs (283) is greater than the number of RFA sites indicated in Exhibit 2, because some LOCs have been designated as both SWMUs/AOCs and as other types of LOCs. For example, there are USTs that have been identified as SWMUs/AOCs and there are TAAs that have been identified as SWMUs/AOCs. Exhibit 2 refers to these SWMUs/AOCs as USTs or TAAs instead of as RFA sites.

Compliance Program Sites and Other LOCs. There are several compliance programs in progress at MCAS El Toro that involve different types of LOCs including USTs, less-than-90-day accumulation areas, polychlorinated biphenyl (PCB)-containing transformers, and oil/water separators. The status of each of these types of LOCs is summarized as follows:

Status of USTs (Total: 398 sites):
- 353 No Further Action sites (88%);
- 45 sites with work in progress (11%).

Status of ASTs (Total: 32 sites):
- 26 No Further Action sites (81%);
- 6 sites with work in progress (19%).

Status of Aerial Photograph Anomaly (APHO) Sites (Total: 68 sites):
- 51 No Further Action sites (75%);
- 17 sites with work in progress (25%).

Status of Less-Than-90-Day Accumulation Areas and Resource Conservation and Recovery Act Facility Assessment (RFA) Solid Waste Management Units (165):

- 98 No Further Action sites (59%);
- 67 sites with work in progress (41%).

Status of PCB-Containing Transformers: 124 No Further Action sites (100%).

Status of Oil/Water Separators (Total: 54 sites):

- 39 No Further Action sites (72%); and
- 15 sites with work in progress (28%).

The status of the remaining types of LOCs (PCB storage sites, burn pits, silver recovery units, JP-5 pipeline, pesticide storage sites, and other sites) is shown on Exhibit 2. Business Plan updates will continue to summarize both the number and status of all LOCs at MCAS El Toro.

INITIATIVES FOR ACCELERATING CLEANUP

The BCT conducted a "bottom up" review of the environmental programs at MCAS El Toro in accordance with DoD guidance on establishing BCTs (DoD 1993). During the review process, the following nine issues were addressed to identify opportunities for accelerating cleanup activities necessary to facilitate conveyance of real property at the Station.

1. **Technology Review.** Publications such as Treatment Technologies Applications Matrix for Base Closure Activities, prepared by the California Base Closure Environmental Committee, dated November 1994 (CBCEC 1994a) and the latest information from the United States and California Environmental Protection Agencies (U.S. EPA and Cal-EPA) and DoD will be reviewed as part of the evaluations performed in selecting technologies.

2. **Removal Actions.** A UST Tiger Team addressed compliance and closure issues related to USTs on-Station during the 1995-1997 time period, and the Tiger Team worked to identify USTs that could be taken out of service without adversely impacting Station operations. All tanks within the former Tank Farms 1, 2, 3, 4, 5, and 6 have been removed, and most of the tank sites have been closed by the regulatory oversight agencies. Soil vapor extraction (SVE) technology was utilized to remediate the vadose zone at Tank Farm 2, and the vadose zone release was closed by the Regional Water Quality Control Board, Santa Ana Region in March 2000. SVE systems were utilized to remediate vadose zone releases of petroleum hydrocarbons at Former UST Sites 651-1, 651-2, 651-3, and 651-4 (UST Group 651) and at Former UST Site 364A during 2000, and a bioventing pilot test was initiated at Tank Farm 555 during 2000.

   Two time-critical removal action memoranda were submitted for public review in

October 1996 for IRP Sites 2 and 17 (former landfills), for public safety and to abate erosion of landfill materials. The removal actions were completed in 1997. A non-time-critical action memorandum was also submitted for public review in October 1996 for IRP Site 19 (Unit 2). These removal actions were designed to reduce the risk to human health and the environment and to expedite cost-effective cleanup.

A pilot study utilizing multi-phase extraction for remediation of a combined petroleum hydrocarbon and chlorinated solvent release was initiated at Site 16 during October 2000.

3. **Clean Properties.** A basewide EBS for MCAS El Toro was submitted to the United States Environmental Protection Agency (U.S. EPA) and California Environmental Protection Agency (Cal-EPA) on 1 April 1995. The Navy, Marine Corps, and regulators have concurred on the designation of area type 1 parcels as Environmental Condition of Property, Category 1. The EBS designated approximately 3,088 acres of land as Environmental Condition of Property, Category 1. Review of information available since April 1995 indicates that approximately 3,175 acres of land are currently Environmental Condition of Property, Category 1. The BCT and the LRA will work together to determine how to transfer properties expeditiously.

4. **Overlapping Phases.** As an ongoing effort, the BCT will continue to identify phases of the cleanup process that can be overlapped to reduce the time required for completion. Areas of overlap at MCAS El Toro include the following:

- the RFA was conducted concurrently with the Phase I RI during the period from 1991 through 1994;
- Phase II RI/FS activities for the volatile organic compound (VOC) source area, landfills, and OU-3 sites were conducted simultaneously during the period from approximately 1995 through 1997;
- Integration of Comprehensive Long-Term Environmental Action Navy (CLEAN)/Remedial Action (RAC) and other contractors to facilitate the design and implementation of field work has occurred and continues to occur during the remediation of the vadose zone and groundwater at Site 24; and
- Planning for additional demonstration projects for groundwater remediation at Site 24 and other sites to facilitate site remediation during the development of the Records of Decision.

5. **Contracting Procedures.** SWDIV management of the CLEAN, RAC, and indefinite-quantity contracts has been based on a cooperative and interactive approach, and the following contractors have participated in environmental restoration and/or compliance program projects during 2000: ARINC; Bechtel National, Incorporated; CDM Federal Programs Corporation; Earth Tech; Foster

Wheeler; Geofon; Law-Crandall; The IT Group; and Roy F. Weston. Active participation by the Project Team results in a bias for action.

6. **Community Reuse Interface.** In an effort to carry out strategies for environmental restoration activities, while assuring proactive community involvement, the Station has adopted an approach to meet the needs of the public as well as the requirements of NEPA, CERCLA, CERFA, and the California Health and Safety Code Section 25356.1. The approach provides for a number of services to inform interested parties (e.g., the city of Irvine, the city of Lake Forest, and the County of Orange) of environmental restoration activities while maintaining a commitment for efficient and cost-effective cleanup at MCAS El Toro.

7. **Bias for Cleanup.** The BCT will continue to emphasize expedited remedial actions and attempt to avoid lengthy site characterization studies and prolonged RI/FS activities. As such, the BCT members will continue to collaborate in devising work plans, identifying cleanup criteria, and selecting remedial actions in an effort to aggressively pursue cleanup instead of studies and data collection. Acceleration of ongoing or future cleanup activities will continue to be in strict compliance with applicable rules, regulations, and public health and safety requirements. Remediation strategies and plans for cleanup activities have been shared with representatives from the known or anticipated reuse organizations including technical, operational, reuse, and administrative specialists.

8. **Presumptive Remedies.** Presumptive remedies are preferred technologies for common categories of sites, based on previous remedy selection and U.S. EPA scientific and engineering evaluation of performance data on technology implementation. The presumptive remedy approach is one tool used to accelerate cleanup under the Superfund Accelerated Cleanup Model. Presumptive remedies are expected to assure consistency in remedy selection and reduce time and cost required to clean up similar types of sites. Currently, presumptive remedies are recognized by U.S. EPA for VOC remedies and municipal and military landfill remedies. Presumptive remedies have been selected for the four landfill sites (Sites 2, 3, 5, and 17) and the VOC source area (Site 24).

9. **Partnering.** A partnering agreement among the Project Team is essential for efficient management of the base closure process. The following team charter agreement for MCAS El Toro was developed during a team-building seminar held in October 1994.

> "We, the MCAS El Toro partners, commit to effectively working together to maximize restoration and reuse of MCAS El Toro by 1999. We will accomplish this goal through teamwork, dedicated and focused participation, our ethics outlined below, and effective communication between all partners.

We want the project to be enjoyable to work on and will work together with trust and respect, and will ensure that all team members' interests impact decisions. Problems will be resolved quickly or escalated if appropriate by team members closest to the issue. As partners, we commit to communicating our mission and partnership goals to new project members and encourage them to embrace this partnership.

Our mutually agreed upon ethical standards are listed below.

CODE OF ETHICS

Integrity	Objectivity	Trust	Dependability
Leadership	Accountability	Sincerity	Credibility
Empathy	Candor	Responsibility	Honesty

Additionally, we will listen to and value others' opinions, honor diversity, model the behavior we expect from others, and have fun."

Through meetings and conference calls, the BCT has worked together as a team to discuss and resolve issues related to environmental restoration activities at MCAS El Toro with a focus on expediting reuse while protecting human health and the environment.

SUMMARY OF CURRENT AND PLANNED BCT ACTION ITEMS

The BCT has coordinated and managed a number of tasks relating to the BRAC cleanup activities at MCAS El Toro during the past year. A brief list of accomplishments for 2000 includes:

Environmental Program Highlights for 2000.

- Conducted six (6) Restoration Advisory Board (RAB) meetings addressing a vast array of issues of public interest and one public meeting for Sites 7 and 14 during 2000;
- Continued progress on an agreement between Orange County and Irvine Ranch Water Districts and the United States (represented by the Department of Justice (DOJ)) in support of a multipurpose project to remediate regional groundwater contaminated with volatile organic compounds;
- Conducted CERCLA groundwater monitoring activities and investigated perchlorates and radionuclides in groundwater;
- Signed the draft Final Interim ROD for Sites 2 and 17;
- Completed Final Historical Radiological Assessment (HRA) and the Draft Final Survey Plan for the Radiological Survey;
- Completed the vadose zone confirmation sampling activities at Site 24;
- Commenced operation of Soil Vapor Extraction (SVE) treatment systems at UST Group 651 and former UST Site 364A;
- Constructed bioventing well and monitoring points for pilot test and began pilot test at Tank Farm 555;

- Achieved regulatory closure of 38 USTs (353 USTs to date) and removed 19 inactive USTs during calendar year 2000;
- Conducted removal of inactive OWSs and ASTs and conducted cleaning, testing, and closure of primary JP-5 pipelines; and
- Conducted site verification sampling activities at UST sites, AST sites, OWS sites, and aerial photograph anomaly (APHO) sites, and completed closure documentation for more than 50 LOCs.

Planned Goals for Year 2001:

- Sign the agreement between Orange County and Irvine Ranch Water District and the DOJ in support of a multipurpose project to remediate regional groundwater contaminated with volatile organic compounds;
- Issue the Proposed Plan for Sites 18 and 24 for public comment;
- Issue the Draft ROD for Sites 18 and 24 for public comment;
- Issue the Proposed Plan for Site 16 for public comment;
- Issue the Draft ROD for Site 16 for public comment;
- Complete Draft Final RODs for Sites 3 and 5;
- Conduct radiological surveys;
- Initiate soil sampling activities for lead-based paint at the housing areas;
- Continue coordination with United States Fish and Wildlife Service, the LRA, and the BCT during the design of landfill covers for Sites 2 and 17;
- Procure services for the design of landfill covers for Sites 3 and 5;
- Continue groundwater monitoring activities and evaluation of groundwater data; and
- Conduct the site verification and/or remediation activities at UST, OWS, AST, fuel pipeline, and APHO sites.

Table 1 provides a list of recommendations and issues associated with the environmental restoration and compliance programs that require further evaluation and action by the BCT. The list covers key items identified during the course of the Business Plan preparation and includes the BCT activities relating to the base closure.

Tables 2 and 3 identify the status of each LOC as of 31 December 2000, and Table 4 identifies the buildings with known asbestos. The current reuse parcel identifier, for the Concept B Reuse Plan of 1999, is included for each LOC in Tables 2 and 3. Figures 1, 2, and 3 show the vicinity of the Station and information pertaining to the most current reuse plan (preferred land use plan (Concept B)). Figures 4 through 12 show each type of LOC, Figures 13 and 14 show the environmental condition of property, and Figure 15 shows the IRP Site boundaries with the preferred land use plan, and Figure 16 shows the radiological survey sites.

SCHEDULE/CRITICAL MILESTONES

The Installation Restoration Program milestones are identified in the Federal Facilities Agreement (FFA) for the Marine Corps Air Station, El Toro. The FFA schedule is usually revised or updated three or more times per year.

Critical milestones for the environmental restoration program are presented in Table 5. Historical information pertaining to the expenditures for each Installation Restoration Program Site and cost to complete estimates are presented in Table 6.

INTRODUCTION SECTION

NOTE: The Introduction Section serves as an "Executive Summary" of the complete document. To look at tables, figures and attachments referenced in the Introduction, please consult the complete document. It is available at two locations: (1) the Administrative Record File, located at MCAS El Toro, Base Realignment and Closure Office, Building 368 – contact Ms. Charly Wiemart at (949) 726-2840 to arrange an appointment; (2) the MCAS El Toro Information Repository located at the Heritage Park Regional Library, 14361 Yale Avenue, Irvine, phone number (949) 551-7151.

MEMBERSHIP APPLICATION

MARINE CORPS AIR STATION EL TORO
RESTORATION ADVISORY BOARD

Conditions for membership:

Restoration Advisory Board (RAB) members are expected to serve a two-year term and attend all RAB meetings or designate an alternate. The alternate must be jointly approved by the Department of Defense and Community Co-Chairpersons. If a member fails to attend two consecutive meetings without contacting the RAB, or at least one of the RAB Co-Chairs, or fulfill member responsibilities, which may include involvement with the subcommittee, the RAB Co-Chairs may ask the member to resign. Duties and responsibilities will include reviewing and commenting on technical documents and activities associated with the environmental restoration at **MARINE CORPS AIR STATION EL TORO.** Members will be expected to be available to community members and groups to facilitate the exchange of information and/or concerns between the community and the RAB.

RAB membership priority will be given to local residents that are impacted/affected by the closure of the installation. The number of RAB members is limited.

Name: _____

Address: _____
Street Suite/Apt. # City Zip

Phone: ( )_____ ( )_____ ( )_____
Daytime Home Fax

Group Affiliation: _____

1. Briefly state why you would like to be considered for membership on the Restoration Advisory Board (RAB).

_____

_____

_____

_____

_____

(continued on back side)

2. What has been your experience working as a member of a diverse group with common goals?

_____

_____

_____

_____

3 Please indicate if you are interested in being considered for the Community Co-Chairperson position on the RAB by checking the space below:

Yes, I would like to be considered. ___

4. Are you willing to serve a two (2) year term as a member of this RAB?

Yes, I am willing- to serve for two (2) years. ____

5. By submitting this signed application, you are aware of the time commitment that this appointment will require of you.

6. By submitting this signed application, you willingly agree to work cooperatively with other members of the committee to ensure efficient use of time for addressing community issues related to environmental restoration of the Station.

_____ _____

Applicant Signature Date

Please return your completed application to:

Dean Gould
BRAC Environmental Coordinator
Base Realignment and Closure, Environmental Division
P.O. Box 51718
Irvine, CA 92619-1718

(949) 726-5398
FAX (949) 726-6586

San Diego office: (619) 532-0784

MCAS El Toro -- Meeting Schedule
Restoration Advisory Board (RAB)
Full RAB and RAB Subcommittee Meetings

September 2001 – July 2002

RAB Meetings: The Conference and Training Center (CTC) at Irvine City Hall is being reserved for RAB meetings (full RAB) on the last Wednesday of the month, dates are listed below. **Time: 6:30 – 9:00 p.m.**

* Please note that due to the Yom Kippur holiday (begins on Sept. 26th at sundown), the September 2002 RAB meeting and Subcommittee will be on September 19th.

RAB Subcommittee Meetings: Subcommittee meetings will now be on the *SAME DAY* as the full RAB meeting from 5 to 6:00 p.m. in a smaller room. The preferred room is by the Council Chambers, Room L-104. **General Meeting Time: 5:00 – 6:00 p.m. (Room is available from 4:30 to 6:30 p.m.)**

RAB and Subcommittee Meeting Dates	RAB Meeting Room – Conference and Training Center (CTC) 6:30 – 9:00 p.m.	Subcommittee Meeting Room – Room L-104 5:00 – 6:00 p.m.
September 19, 2001	CTC	Room L-104
November 28, 2001	CTC	Room L-104
January 30, 2002	CTC	Room L-104
March 27, 2002	CTC	Room L-104
May 29, 2002	CTC	Room L-104
July 31, 2002	CTC	Room L-104

MCAS El Toro

Installation Restoration Program

MAILING LIST COUPON

If you would like to be on the mailing list to receive information about environmental restoration activities at MCAS El Toro, please complete the coupon below and mail to:

Base Realignment and Closure
Attn: Environmental, Ms. Marge Flesch
P.O. Box 51718
Irvine, CA 92619-1718

☐ Add me to the MCAS El Toro Installation Restoration Program mailing list.

☐ Send me information on Restoration Advisory Board membership.

Name _____

Street _____

City _____ State _____ Zip Code _____

Affiliation (optional) _____ Telephone _____

MARINE CORPS AIR STATION EL TORO
Installation Restoration Program
Restoration Advisory Board Mission Statement and Operating Procedures

This "Marine Corps Air Station (MCAS) El Toro, Installation Restoration Program, Restoration Advisory Board (RAB), Mission Statement and Operating Procedures," replaces the Revised Version dated January 31, 1996. This revised document contains a new section on the RAB Subcommittee, which replaces the old section. The new section is based on modifications made and approved by a majority vote of the RAB members present at the April 21, 1999 RAB meeting with further refinements made at the May 26, 1999 RAB meeting. Modifications incorporated resulted in revising the subcommittee structure so there is now only one RAB subcommittee. (Note: the original Mission Statement document was dated and signed on February 28, 1995.)

The Restoration Advisory Board (RAB) mission statement and operating procedures, herein referred to as "the mission statement and operating procedures", is entered into by the following parties; U. S. Marine Corps (USMC); U. S. Environmental Protection Agency (USEPA), Region 9; California Department of Toxic Substances Control (DTSC), Region 4; and the RAB. Marine Corps Air Station (MCAS) El Toro has developed a Community Relations Plan (CRP) which outlines the community involvement program. The RAB supplements the community involvement effort. A copy of the CPP is available at the information repository located at the Heritage Park Regional Library, 14361 Yale Avenue, Irvine, CA 92714.

I. Mission Statement of the RAB

a. The mission of the RAB is to promote community awareness and obtain timely constructive community review and comment on proposed environmental restoration actions to accelerate the cleanup and property transfer of MCAS El Toro. The RAB serves as a forum for the presentation of comments and recommendations to USMC, Remedial Project Managers (RPMS) of USEPA, and DTSC.

II. Basis and Authority for this Mission Statement and Operating Procedures

a. This mission statement and these operating procedures are consistent with the Department of Defense (DoD), USEPA Restoration Advisory Board Implementation Guidelines of September 27, 1994, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986, particularly Sections 120 (a), 120 (f), 121 (f), and 10 U.S.C. 2705, enacted by Section 211 of SARA, and September 9, 1993, DoD policy letter entitled, "Fast Track Cleanup at Closing Installations".

III. Operating Procedures

A. Membership

1. All RAB members must reside in or serve communities within Orange County.

2. Members shall serve without compensation. All expenses incidental to travel and review inputs shall be borne by the respective members or their organization.

3. If a member fails to attend two consecutive meetings without contacting the RAB, or at least one of the RAB co-chairs, or fulfill member responsibilities including involvement in a subcommittee, the RAB co-chairs may ask the member to resign.

4. Members unable to continue to fully participate shall submit their resignation in writing to either of the RAB co-chairs.

5. Total membership in the RAB shall not exceed 50 members.

6. Applications for RAB membership vacancies shall take place as such vacancies occur. Applications will be reviewed and approved by the Base Realignment and Closure (BRAC), Environmental Coordinator (BEC), USEPA, and DTSC along with consultation with the RAB community co-chair. Candidates will be notified of their selection in a timely manner.

7. Each RAB community member is considered equal whatever their position in the community, and has equal rights and responsibilities.

RAB Membership Responsibilities

a. Actively participate in a subcommittee and review, evaluate, and comment on technical documents and other material related to installation cleanup, all assigned tasks are to be completed within the designated deadline date.

b. Attend all RAB meetings.

c. Report to organized groups to which they may belong or represent, and to serve as a mediator for information to and from the community.

d. Serve in a voluntary capacity.

B. RAB Structure

1. The RAB shall be co-chaired by the MCAS El Toro BEC, and a community co-chair member. The BEC shall preside over the orderly administration of membership business.

2. A community co-chair will be selected by a majority vote of the RAB community members in attendance. Elected officials and government agency staff members of any legally constituted MCAS El Toro reuse groups are excluded from holding the community co-chair position. The community co-chair will be selected annually on the anniversary of the effective date of the agreement.

Community Co-Chair Responsibilities

a. Assure those community issues and concerns related to the environmental restoration/cleanup program are brought to the table.

b. Assist the USMC in assuring that technical information is communicated in understandable terms.

c. Coordinate with the BEC to prepare and distribute an agenda prior to each RAB meeting, and for the review and distribution of meeting minutes.

d. Assist subcommittees in coordinating and establishing meeting times/locations.

e. The community co-chair may be replaced by a majority vote of the RAB community members present at the meeting in which a vote is undertaken.

3. The RAB shall meet quarterly. More frequent meetings may be held if deemed necessary by the RAB co-chairs. The BEC will facilitate in the arrangement of the meetings and notify members of the time and location.

4. Agenda items will be compiled by the RAB co-chairs. Suggested topics should be given to the BEC or community co-chair no later than two (2) weeks prior to the meeting. The BEC shall be responsible for providing written notification to all RAB members of the upcoming agenda and supporting documents, at least two (2) weeks prior to the date, time, and place of scheduled RAB meeting.

5. The BEC shall be responsible for recording and distribution of meeting minutes. Also, the BEC shall collect a written list of attendees at each meeting, which will be incorporated into the meeting minutes. For quarterly meetings, the minutes will be distributed 30 days prior to the following meeting. For more frequent meetings, the minutes will be distributed as soon as possible.

6. A copy of the RAB meeting minutes will be sent to all RAB members. Supporting documents will be available for public review in the information repository and other repositories as identified.

7. RAB members will be asked to review and comment on various environmental restoration documents. Written comments may be submitted individually by a member, or by the RAB as a whole. Written comments will be submitted to the community co-chair on the subject documents within the schedule as provided for regulatory agency comments. The community

co-chair will consolidate comments from RAB members and provide all comments received to the BEC. The BEC will ensure that a written response is provided to the RAB in a timely manner.

RAB Subcommittee

8. On April 21, 1999, the RAB concurred that only one subcommittee is necessary to provide a concentrated focus on environmental cleanup issues. Therefore, the existing relevant subcommittees envisioned in the original "Mission Statement and Operating Procedures" dated February 28, 1995, have been dissolved, and incorporated into one subcommittee.

a. Membership on the subcommittee will be comprised of volunteers from the RAB, or may be selected by the BEC and the community co-chair.

b. The regular bimonthly RAB subcommittee meeting will continue to be scheduled for the last Wednesday of the month alternating with the regular meeting of the full RAB held at Irvine City Hall, Conference and Training Center, Irvine, California.

c. The subcommittee will set their own agendas and meetings and will be open to the public. The subcommittee chair will notify the BEC and community co-chair of all meeting times and places including additional subcommittee meetings other than the regularly scheduled bimonthly subcommittee meeting.

d. The subcommittee will elect a chair. The subcommittee membership may dismiss a subcommittee chair by a majority vote. Subcommittee chair removal is determined at the meeting where removal is addressed by majority vote of the RAB members present.

e. Membership on the subcommittee will include the RAB community co-chair.

f. Subcommittee status will be reviewed annually, in May, to determine if changes are needed or the continued existence is required.

g. The RAB subcommittee may establish ad hoc subcommittees for specific issues and purposes that would focus efforts on a short-term basis.

h. The subcommittee may request the participation, involvement, and advice of regulatory agency members.

9. MCAS El Toro has established an information repository for public documents relating to restoration activities at MCAS El Toro. The repository is located at the Heritage Park Regional Library, 14361 Yale Avenue, Irvine, CA 92714. RAB members, as well as the general public, are authorized access to any documents, studies or information, which have been placed in the repository or distributed at RAB meetings. The community co-chair will be provided one (1) copy of all draft documents. The subcommittee will be provided up to seven (7) copies of draft documents.

IV. Effective Date and Amendments

a. The effective date of this mission statement and operating procedures shall be the date that the last signatory signs this mission statement and operating procedures.

b. This mission statement and operating procedures may be amended by a majority vote of the RAB members present. Amendments must be consistent with the MCAS El Toro Federal Facility Agreement (FFA), and the statues stated in Part 11 of the mission statement and operating procedures, (Basis and Authority for this Mission Statement and Operating Procedures).

V. Terms and Conditions

a. The terms and conditions of this RAB mission statement and operating procedures, and DONs endorsement thereof, shall not be construed to create any legally enforceable rights, claims or remedies against DON or commitments or obligations on the part of DON, and shall be construed in a manner that is consistent with CERCLA, 10 U.S.C. Section 2705, and 40 CFR Part 300.

VI. Termination

a. This mission statement and operating procedures will be terminated upon completion of requirements as stated in the FFA. However, after implementation of the final remedial design, it may be terminated earlier upon a majority vote of the RAB membership.

VII. Signatories to the Membership Mission Statement and Operating Procedures

IN WITNESS WHEREOF, we have set our hand this _____ day of _____ 1995.

_____
MCAS El Toro BRAC Environmental Coordinator

_____
RAB Community Co-Chair

_____
U. S. Environmental Protection Agency RPM

_____
California Department of Toxic Substances Control RPM

The original "Mission Statement and Operating Procedures", dated February 28, 1995, is on file at Marine Corps Air Station (MCAS) El Toro, Environment and Safety. It was signed by Mr. Joseph Joyce, Base Realignment and Closure (BRAC), Environmental Coordinator (BEC), Ms. Marcia Rudolph, Restoration Advisory Board (RAB), Community Co-chair, Ms. Bonnie Arthur, Environmental Protection Agency (EPA), Remedial Project Manager, and Mr. Juan Jimenez, Department of Toxic Substances Control (DTSC), Remedial Project Manager.

Shown below is an excerpt from the original "Mission Statement and Operating Procedures", dated February 28, 1995 with signatures of the above-mentioned individuals.

VII. Signatories to the Membership Mission Statement and Operating Procedures

IN WITNESS WHEREOF, we have set our hand this 28th day of FEBRUARY 1995

Joseph Joyce
MCAS El Toro BRAC Environmental Coordinator

Marcia Rudolph
RAB Community Co-Chair

Bonnie A. Arthur
U.S. Environmental Protection Agency RPM

Juan Jimenez
California Department of Toxic Substances Control RPM

MCAS El Toro

Restoration Advisory Board

Acronyms and Glossary of Technical Terms

This handout has been prepared to provide Restoration Advisory Board (RAB) members and others with a better understanding of acronyms and technical terms used during Installation Restoration Program activities and other environmental programs underway at MCAS El Toro.

List of Acronyms

AB	Assembly Bill
accumulation areas	less-than-90-day accumulation areas
ACM	asbestos-containing materials
AC/S	Assistant Chief of Staff
AFB	Air Force Base
AOC	area of concern
AQMP	Air Quality Management Plan
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
ASN	Assistant Secretary of the Navy
AST	aboveground storage tank
Basin	the Los Angeles Basin
BCP	BRAC Cleanup Plan
BCT	BRAC Cleanup Team
BEC	BRAC Environmental Coordinator
BFI	Browning Ferris Industries
bgs	below ground surface
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
BRAC III	Base Closure and Realignment Act of 1993
CAC	Citizens Advisory Committee
Cal-EPA	California Environmental Protection Agency
CBCEC	California Base Closure Environmental Committee
CCR	*California Code of Regulations*
CDM Federal	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFR	*Code of Federal Regulations*
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMC	Commandant of the Marine Corps
COE	(United States) Army Corps of Engineers
COMCABWEST	Commander, Marine Corps Air Bases Western Area
COPC	chemical of potential concern
County	Orange County
CP	Compliance Program
CRP	Community Reuse Plan
CTO	Contract Task Order

D&M	Dames & Moore
DFSC	Defense Fuel Supply Center
the Districts	the County Sanitation Districts of Orange County
DoD	Department of Defense
DOI	Department of Interior
DoN	Department of the Navy
DRMO	Defense Reutilization and Marketing Office
DTSC	(Cal-EPA) Department of Toxic Substances Control
EBS	Environmental Baseline Survey
ECP	environmental condition of property
EE/CA	Engineering Evaluation/Cost Analysis
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EO	Environmental Office
EOD	explosive ordnance disposal
ETRPA	El Toro Reuse Planning Authority
°F	degrees Fahrenheit
FA	further action
FAA	Federal Aviation Administration
FDS	Federal Disposal Services
FFA	Federal Facility Agreement
FOSL	finding of suitability to lease
FOST	finding of suitability to transfer
FS	feasibility study
ft/day	feet per day
gal.	gallon
GIS	geographical information system
HAS	Homeless Assistance Submission
HRA	Historical Radiological Assessment
HUD	(United States Department of) Housing and Urban Development
IAFS	Interim Action Feasibility Study
IDW	investigation-derived waste
IRP	Installation Restoration Program
IRWD	Irvine Regional Water District
IT	International Technology Corporation
IWTP	industrial wastewater treatment plant
JMM	James M. Montgomery Engineers

LBP	lead-based paint
LDPE	low density polyethylene
LOC	location of concern
LRA	Local Redevelopment Authority
MAW	marine air wing
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
mg/L	milligrams per liter
MSL	mean sea level
NAVFAC	Naval Facilities
NAVFACENGCOM	Naval Facilities Engineering Command
NAVRAMP	Navy Radon Assessment and Mitigation Program
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEDTS	Navy Environmental Data Transfer Standards
NFA	no further action
NEPA	National Environmental Policy Act
NFI	no further investigation
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OCHCA	Orange County Health Care Agency
OCWD	Orange County Water District
OEA	Office of Economic Adjustment
OHM	OHM Remediation Services Corporation
OSHA	Occupational Safety and Health Administration
OU	operable unit
OWS	oil/water separator
PAH	polynuclear aromatic hydrocarbon
PBR	Permit by Rule
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PP	Proposed Plan
ppm	parts per million
PRG	preliminary remediation goal
Project Team	BRAC Project Team
PWC	Navy Public Works Center
QAPP	quality assurance project plan

RAB	Restoration Advisory Board
RAC	remedial action contract
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RECLAIM	Regional Clean Air Initiatives Market
RFA	RCRA Facility Assessment
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RWQCB	Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SCAQMD	South Coast Air Quality Management District
SPCC	Spill Prevention and Countermeasure Plan
Station	Marine Corps Air Station El Toro
STP	sewage treatment plant
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
SWMU	solid waste management unit
TAA	temporary accumulation area
TCRA	time-critical removal action
TDS	total dissolved solids
TRC	Technical Review Committee
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
UST	underground storage tank
VOC	volatile organic compound
WW	World War
XFMR	transformer

ACRONYMS/ABBREVIATIONS

Air SWAT	Air Quality Solid Waste Assessment Test
ASTM	American Society for Testing and Materials
BCT	BRAC Cleanup Team
BEIDMS	Bechtel Environmental Integrated Data Management System
bgs	below ground surface
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
°C	degrees Celsius
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	U.S. EPA Contract Laboratory Program
CNDDB	California Natural Diversity Data Base
COPC	chemical of potential concern
CPT	cone penetrometer test
CTO	Contract Task Order
DC	direct current
DCE	dichloroethene
Desalter	Irvine Desalter Project
DoD	Department of Defense
DON	Department of the Navy
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
EC	electrical conductivity
EOD	explosive ordnance disposal
°F	degrees Fahrenheit
FFA	Federal Facilities Agreement
FID	flame ionization detector
FS	Feasibility Study
FSP	Field Sampling Plan
ft/day	feet per day

ACRONYMS/ABBREVIATIONS (continued)

GC	gas chromatograph
gpm	gallons per minute
GPR	ground-penetrating radar
IAFS	Interim-Action Feasibility Study
IAS	Initial Assessment Study
ID	inside diameter
IDWMP	Investigation-Derived Waste Management Plan
IRP	Installation Restoration Program
L/min	liters per minute
µmhos/cm	micromhos per centimeter
MCAS	Marine Corps Air Station
MeCl	methylene chloride
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
MSL	mean sea level
NACIP	Navy Assessment and Control of Installation Pollutants
NEESA	Naval Energy and Environmental Support Activity
NFESC	Naval Facilities Engineering Service Center (formerly NEESA)
NFRAP	No Further Response Action Planned
NPL	National Priorities List
NTU	nephelometric turbidity units
OCWD	Orange County Water District
OD	outside diameter
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PRG	(U.S. EPA Region IX) Preliminary Remediation Goal
psi	per square inch
psig	per square inch gauge

ACRONYMS/ABBREVIATIONS (continued)

QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RWQCB	(California) Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCAQMD	South Coast Air Quality Management District
SIPOA	Site Inspection Plan of Action
SOP	Standard Operating Procedure
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
SWMU/AOC	solid waste management unit/area of concern
TCA	trichloroethane
TCE	trichloroethylene
TDS	total dissolved solids
TIC	The Irvine Company
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
USCS	Unified Soils Classification System
U.S. EPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound
v/v	volume per volume
WSA	waste staging area

ACRONYMS/ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
BCT	BRAC Cleanup Team
bgs	below ground surface
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
°C	degrees Celsius
Cal-EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (1980)
cfm	cubic feet per minute
CFR	*Code of Federal Regulations*
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm^3/g	cubic centimeters per gram
cm/s	centimeters per second
CPT	cone penetrometer test
CTO	Contract Task Order
DCA	dichloroethane
DCE	dichloroethene
DNAPL	dense nonaqueous-phase liquid
DON	Department of the Navy
DTSC	(Cal-EPA) Department of Toxic Substances Control
DWR	(California) Department of Water Resources
°F	degrees Fahrenheit
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft^3	cubic feet
ft/day	feet per day
ft^3/min	cubic feet per minute
GAC	granular activated carbon
gpm	gallons per minute
HQ	hazard quotient
IAFS	Interim-Action Feasibility Study
ICE	internal combustion engine
IRP	Installation Restoration Program

ACRONYMS/ABBREVIATIONS (continued)

IRWD	Irvine Ranch Water District
Irvine Subbasin	Irvine Groundwater Subbasin
JMM	James M. Montgomery Engineers, Inc.
LGAC	liquid-phase granular activated carbon
LNAPL	light nonaqueous-phase liquid
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSL	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NPL	National Priorities List
NPW	net present worth
OCWD	Orange County Water District
OU	operable unit
PCE	tetrachloroethene
PCO	photocatalytic oxidation
POTW	publicly owned treatment works
PVC	polyvinyl chloride
RACER	Remedial Action Cost Engineering Requirements
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RWQCB	(California) Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act of 1986
SCAQMD	South Coast Air Quality Management District
SHSO	Site Health and Safety Officer
SITE	(U.S. EPA) Superfund Innovative Technologies Evaluation
STLC	soluble threshold limit concentration

ACRONYMS/ABBREVIATIONS (continued)

SVE	soil vapor extraction
SWDIV	Southwest Division Naval Facilities Engineering Command
SWRCB	(California) State Water Resources Control Board
TAL	target analyte list
TBC	to be considered
TCA	trichloroethane
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
USGS	United States Geological Survey
U.S. EPA	United States Environmental Protection Agency
UV	ultraviolet
VGAC	vapor-phase granulated activated carbon
VES	vapor extraction system
VOC	volatile organic compound
WQCP	(Comprehensive) Water Quality Control Plan (for the Santa Ana Region)

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Terms Of Environment

Glossary, Abbreviations, And Acronyms

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Introduction

Terms Of Environment defines in non-technical language the more commonly used environmental terms appearing in EPA publications, news releases, and other Agency documents available to the general public, students, the media, and Agency employees. The definitions do not constitute the Agency's official use of terms and phrases for regulatory purposes, and nothing in this document should be construed to alter or supplant any other federal document. Official terminology may be found in the laws and related regulations as published in such sources as the Congressional Record, Federal Register, and elsewhere.

The terms selected for inclusion are derived from previously published lists, internal glossaries produced by various programs and specific suggestions made by personnel in many Agency offices. The chemicals and pesticides selected for inclusion are limited to those most frequently referred to in Agency publications or that are the subject of major regulatory or program activities.

Definitions or information about substances or program activities not included herein may be found in EPA libraries or scientific/technical reference documents, or may be obtained from various program offices.

Those with suggestions for future editions should write to the Editorial Services Division, Office of Communications, Education, and Public Affairs, A-107, USEPA, Washington DC 20460.

Abbreviation and acronymn list begins on page 31

A

A—Scale Sound Level: A measurement of sound approximating the sensitivity of the human ear, used to note the intensity or annoyance level of sounds.

Abandoned Well: A well whose use has been permanently discontinued or which is in a state of such disrepair that it cannot be used for its intended purpose.

Abatement: Reducing the degree or intensity of, or eliminating, pollution.

Accident Site: The location of an unexpected occurrence, failure or loss, either at a plant or along a transportation route, resulting in a release of hazardous materials.

Acclimatization: The physiological and behavioral adjustments of an organism to changes in its environment.

Acid Deposition: A complex chemical and atmospheric phenomenon that occurs when emissions of sulfur and nitrogen compounds and other substances are transformed by chemical processes in the atmosphere, often far from the original sources, and then deposited on earth in either wet or dry form. The wet forms, popularly called "acid rain," can fall as rain, snow, or fog. The dry forms are acidic gases or particulates.

Acid Rain: (See: acid deposition)

Action Levels: 1. Regulatory levels recommended by EPA for enforcement by FDA and USDA when pesticide residues occur in food or feed commodities for reasons other than the direct application of the pesticide. As opposed to "tolerances" which are established for residues occurring as a direct result of proper usage, action levels are set for inadvertent residues resulting from previous legal use or accidental contamination. 2. In the Superfund program, the existence of a contaminant concentration in the environment high enough to warrant action or trigger a response under SARA and the National Oil and Hazardous Substances Contingency Plan. The term is also used in other regulatory programs. (See: tolerances.)

Activated Carbon: A highly adsorbent form of carbon used to remove odors and toxic substances from liquid or gaseous emissions. In waste treatment it is used to remove dissolved organic matter from waste water. It is also used in motor vehicle evaporative control systems.

Activated Sludge: Product that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment, speeding the breakdown of organic matter in raw sewage undergoing secondary waste treatment.

Activator: A chemical added to a pesticide to increase its activity.

Active Ingredient: In any pesticide product, the component that kills, or otherwise controls, target pests. Pesticides are regulated primarily on the basis of active ingredients.

Activity Plans: Written procedures in a school's asbestos- management plan that detail the steps a Local Education Agency (LEA) will follow in performing the initial and additional cleaning, operation and maintenance-program tasks; periodic surveillance; and reinspections required by the Asbestos Hazard Emergency Response Act (AHERA).

Acute Exposure: A single exposure to a toxic substance which results in severe biological harm or death. Acute exposures are usually characterized as lasting no longer than a day, as compared to longer, continuing exposure over a period of time.

Acute Toxicity: The ability of a substance to cause poisonous effects resulting in severe biological harm or death soon after a single exposure or dose. Also, any severe poisonous effect resulting from a single short-term exposure to a toxic substance. (See: chronic toxicity, toxicity.)

Adaptation: Changes in an organism's structure or habits that help it adjust to its surroundings.

Add-on Control Device: An air pollution control device such as carbon absorber or incinerator that reduces the pollution in an exhaust gas. The control device usually does not affect the process being controlled and thus is "add-on" technology, as opposed to a scheme to control pollution through altering the basic process itself.

Adequately Wet: Asbestos containing material that is sufficiently mixed or penetrated with liquid to prevent the release of particulates.

Administrative Order On Consent: A legal agreement signed by EPA and an individual, business, or other entity through which the violator agrees to pay for correction of violations, take the required corrective or cleanup actions, or refrain from an activity. It describes the actions to be taken, may be subject to a comment period, applies to civil actions, and can be enforced in court.

Administrative Order: A legal document signed by EPA directing an individual, business, or other entity to take corrective action or refrain from an activity. It describes the violations and actions to be taken, and can be enforced in court. Such orders may be issued, for example, as a result of an administrative complaint whereby the respondent is ordered to pay a penalty for violations of a statute.

Administrative Procedures Act: A law that spells out procedures and requirements related to the promulgation of regulations.

Administrative Record: All documents which EPA considered or relied on in selecting the response action at a Superfund site, culminating in the record of decision for remedial action or, an action memorandum for removal actions.

Adsorption: An advanced method of treating waste in which activated carbon removes organic matter from wastewater

Adulterants: Chemical impurities or substances that by law do not belong in a food, or pesticide.

Adulterated: 1. Any pesticide whose strength or purity falls below the quality stated on its label. 2. A food,feed, or product that contains illegal pesticide residues.

Advanced Treatment: A level of wastewater treatment more stringent than secondary treatment; requires an 85-percent reduction in conventional pollutant concentration or a significant reduction in nonconventional pollutants.

Advanced Wastewater Treatment: Any treatment of sewage that goes beyond the secondary or biological water treatment stage and includes the removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. (See primary, secondary treatment.)

Advisory: A non-regulatory document that communicates risk information to those who may have to make risk management decisions.

Aerated Lagoon: A holding and/or treatment pond that speeds up the natural process of biological decomposition of organic waste by stimulating the growth and activity of bacteria that degrade organic waste.

Aeration: A process which promotes biological degradation of organic matter in water. The process may be passive (as when waste is exposed to air), or active (as when a mixing or bubbling device introduces the air).

Aeration Tank: A chamber used to inject air into water.

Aerobic Treatment: Process by which microbes decompose complex organic compounds in the presence of oxygen and use the liberated energy for reproduction and growth. (Such processes include extended aeration, trickling filtration, and rotating biological contactors.)

Aerobic: Life or processes that require, or are not destroyed by, the presence of oxygen. (See: anaerobic.)

Aerosol: A suspension of liquid or solid particles in a gas.

Affected Public: The people who live and/or work near a hazardous waste site.

Afterburner: In incinerator technology, a burner located so that the combustion gases are made to pass through its flame in order to remove smoke and odors. It may be attached to or be separated from the incinerator proper.

Agent Orange: A toxic herbicide and defoliant used in the Vietnam conflict, containing 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2-4 dichlorophenoxyacetic acid (2,4-D) with trace amounts of dioxin.

Agricultural Pollution: Farming wastes, including runoff and leaching of pesticides and fertilizers; erosion and dust from plowing; improper disposal of animal manure and carcasses; crop residues, and debris.

Agro-ecosystem: Land used for crops, pasture, and livestock; the adjacent uncultivated land that supports other vegetation and wildlife; and the associated atmosphere, the underlying soils, groundwater, and drainage networks.

AHERA Designated Person (ADP): A person designated by a Local Education Agency to ensure that the AHERA requirements for asbestos management and abatement are properly implemented.

Air Changes Per Hour (ACH): The movement of a volume of air in a given period of time; if a house has one air change per hour, it means that all of the air in the house will be replaced in a one-hour period.

Air Contaminant: Any particulate matter, gas, or combination thereof, other than water vapor. (See: air pollutant.)

Air Curtain: A method of containing oil spills. Air bubbling through a perforated pipe causes an upward water flow that slows the spread of oil. It can also be used to stop fish from entering polluted water.

Air Mass: A large volume of air with certain meteorological or polluted characteristics-e,g, a heat inversion or smogginess-while in one location. The characteristics can change as the air mass moves away.

Air Monitoring: (See: monitoring)

Air Plenum: Any space used to convey air in a building, furnace, or structure. The space above a suspended ceiling is often used as an air plenum.

Air Pollutant: Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combination thereof. Generally, they fall into two main groups: (1) those emitted directly from identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation. Exclusive of pollen, fog, and dust, which are of natural origin, about 100 contaminants have been identified and fall into the following categories: solids, sulfur compounds, volatile organic chemicals, nitrogen compounds, oxygen compounds, halogen compounds, radioactive compounds, and odors.

Air Pollution Episode: A period of abnormally high concentration of air pollutants, often due to low winds and temperature inversion, that can cause illness and death. (See: episode, pollution.)

Air Pollution Control Device: Mechanism or equipment that cleans emissions generated by an incinerator by removing pollutants that would otherwise be released to the atmosphere.

Air Pollution: The presence of contaminant or pollutant substances in the air that do not disperse properly and interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Criteria: The levels of pollution and lengths of exposure above which adverse health and welfare effects may occur.

Air Quality Control Region: An area-designated by the federal government-in which communities share a common air pollution problem, sometimes embracing several states.

Air Quality Standards: The level of pollutants prescribed by regulations that may not be exceeded during a given time in a defined area.

Air Stripping: A treatment system that removes volatile organic compounds (VOCs) from contaminated ground water or surface water by forcing an airstream through the water and causing the compounds to evaporate.

Air Toxics: Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e., excluding ozone, carbon monoxide, PM-10, sulfur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer, developmental effects, reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates: Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Airborne particulates include: windblown dust, emissions from industrial processes, smoke from the burning of wood and coal, and motor vehicle or non-road engine exhausts. exhaust of motor vehicles.

Airborne Release: Release of any chemical into the air.

Alachlor: A herbicide, marketed under the trade name Lasso, used mainly to control weeds in corn and soybean fields.

Alar: Trade name for daminozide, a pesticide that makes apples redder, firmer, and less likely to drop off trees before growers are ready to pick them. It is also used to a lesser extent on peanuts, tart cherries, concord grapes, and other fruits.

Aldicarb: An insecticide sold under the trade name Temik. It is made from ethyl isocyanate.

Algae: Simple rootless plants that grow in sunlit waters in proportion to the amount of available nutrients. They can affect water quality adversely by lowering the dissolved oxygen in the water. They are food for fish and small aquatic animals.

Algal Blooms: Sudden spurts of algal growth, which can affect water quality adversely and indicate potentially hazardous changes in local water chemistry.

Alternate Method: Any method of sampling and analyzing for an air pollutant that is not a reference or equivalent method but that has been demonstrated in specific cases-to EPA's satisfaction-to produce results adequate for compliance monitoring.

Alternative Remedial Contract Strategy Contractors: Government contractors who provide project management and technical services to support remedial response activities at National Priorities List sites.

Ambient Air Quality Standards: (See: Criteria Pollutants and National Ambient Air Quality Standards.)

Ambient Air: Any unconfined portion of the atmosphere: open air, surrounding air.

Anaerobic: A life or process that occurs in, or is not destroyed by, the absence of oxygen.

Anaerobic Decomposition: Reduction of the net energy level and change in chemical composition of organic matter caused by microorganisms in an oxygen-free environment.

Antarctic "Ozone Hole": Refers to the seasonal depletion of ozone in a large area over Antarctica.

Anti-Degradation Clause: Part of federal air quality and water quality requirements prohibiting deterioration where pollution levels are above the legal limit.

Applicable or Appropriate Requirements (ARARs): Any state or federal statute that pertains to protection of human life and the environment in addressing specific conditions or use of a particular cleanup technology at a Superfund site,

Aquifer: An underground geological formation, or group of formations, containing usable amounts of groundwater that can supply wells and springs.

Area of Review: In the UIC program, the area surrounding an injection well that is reviewed during the permitting process to determine if flow between aquifers will be induced by the injection operation.

Area Source: Any small source of non-natural air pollution that is released over a relatively small area but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities.

Aromatics: A type of hydrocarbon, such as benzene or toluene, added to gasoline in order to increase octane. Some aromatics are toxic.

Arsenicals: Pesticides containing arsenic.

Asbestos: A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. EPA has banned or severely restricted its use in manufacturing and construction.

Asbestos Abatement: Procedures to control fiber release from asbestos-containing materials in a building or to remove them entirely, including removal, encapsulation, repair, enclosure, encasement, and operations and maintenance programs.

Asbestos-Containing Waste Materials (ACWM): Mill tailings or any waste that contains commercial asbestos and is generated by a source covered by the Clean Air Act Asbestos NESHAPS.

Asbestosis: A disease associated with inhalation of asbestos fibers. The disease makes breathing progressively more difficult and can be fatal.

Asbestos Program Manager: A building owner or designated representative who supervises all aspects of the facility asbestos management and control program.

Ash: The mineral content of a product remaining after complete combustion.

Assessment: In the asbestos-in-schools program, the evaluation of the physical condition and potential for damage of all friable asbestos containing materials and thermal insulation systems.

Assimilation: The ability of a body of water to purify itself of pollutants.

Assimilative Capacity: The capacity of a natural body of water to receive wastewaters or toxic materials without deleterious effects and without damage to aquatic life or humans who consume the water.

Attainment Area: An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

Attenuation: The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

Attractant: A chemical or agent that lures insects or other pests by stimulating their sense of smell.

Attrition: Wearing or grinding down of a substance by friction. Dust from such processes contributes to air pollution.

Availability Session: Informal meeting at a public location where interested citizens can talk with EPA and state officials on a one-to-one basis.

B

Background Level: In air pollution control, the concentration of air pollutants in a definite area during a fixed period of time prior to the starting up or on the stoppage of a source of emission under control. In toxic substances monitoring, the average presence in the environment, originally referring to naturally occurring phenomena.

BACT-Best Available Control Technology: An emission limitation based on the maximum degree of emission reduction (considering energy, environmental, and economic impacts) achievable through application of production processes and available methods, systems, and techniques. BACT does not permit emissions in excess of those allowed under any applicable Clean Air Act provisions. Use of the BACT concept is allowable on a case by case basis for major new or modified emissions sources in attainment areas and applies to each regulated pollutant.

Bacteria: (Singular: bacterium) Microscopic living organisms that can aid in pollution control by metabolizing organic matter in sewage, oil spills or other pollutants. However, bacteria in soil, water or air can also cause human, animal and plant health problems.

Baffle Chamber: In incinerator design, a chamber designed to promote the settling of fly ash and coarse particulate matter by changing the direction and/or reducing the velocity of the gases produced by the combustion of the refuse or sludge.

Baghouse Filter: Large fabric bag, usually made of glass fibers, used to eliminate intermediate and large (greater than 20 microns in diameter) particles. This device operates like the bag of an electric vacuum cleaner, passing the air and smaller particles while entrapping the larger ones.

Baling: Compacting solid waste into blocks to reduce volume and simplify handling.

Ballistic Separator: A machine that sorts organic from inorganic matter for composting.

Band Application: The spreading of chemicals over, or next to, each row of plants in a field.

Banking: A system for recording qualified air emission reductions for later use in bubble, offset, or netting transactions. (See: emissions trading.)

Bar Screen: In wastewater treatment, a device used to remove large solids.

Barrier Coating(s): A layer of a material that obstructs or prevents passage of something through a surface that is to be protected, e.g. grout, caulk, or various sealing compounds; sometimes used with polyurethane membranes to prevent corrosion or oxidation of metal surfaces, chemical impacts on various materials, or, for example, to prevent radon infiltration through walls, cracks, or joints in a house.

Basal Application: In pesticides, the application of a chemical on plant stems or tree trunks just above the soil line.

Bed Load: Sediment particles resting on or near the channel bottom that are pushed or rolled along by the flow of water.

BEN: EPA's computer model for analyzing a violator's economic gain from not complying with the law.

Bench-scale Tests: Laboratory testing of potential cleanup technologies (See: treatability studies.)

Beryllium: An airborne metal hazardous to human health when inhaled. It is discharged by machine shops, ceramic and propellant plants, and foundries.

Best Available Control Measures (BACM): A term used to refer to the most effective measures (according to EPA guidance) for controlling small or dispersed particulates from sources such as roadway dust, soot and ash from woodstoves and open burning of rush, timber, grasslands, or trash.

Best Demonstrated Available Technology (BDAT): As identified by EPA, the most effective commercially available means of treating specific types of hazardous waste. The BDATs may change with advances in treatment technologies.

Best Management Practice (BMP): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

Bimetal: Beverage containers with steel bodies and aluminum tops; handled differently from pure aluminum in recycling.

Bioaccumulants: Substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. (See: biological magnification.)

Bioassay: Study of living organisms to measure the effect of a substance, factor, or condition by comparing before-and-after exposure or other data.

Biochemical Oxygen Demand (BOD): A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. The greater the BOD, the greater the degree of pollution.

Biodegradable: Capable of decomposing rapidly under natural conditions.

Biodiversity: Refers to the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different items and their relative frequencies. For biological diversity, these items are organized at many levels, ranging from complete ecosystems to the biochemical structures that are the molecular basis of heredity. Thus, the term encompasses different ecosystem, species, and genes.

Biological Control: In pest control, the use of animals and organisms that eat or otherwise kill or out-compete pests.

Biological Magnification: Refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain. (See: bioaccumulative.)

Biological Oxidation: Decomposition of complex organic materials by microorganisms. Occurs in self-purification of water bodies and in activated sludge wastewater treatment.

Biological Oxygen Demand (BOD): An indirect measure of the concentration of biologically degradable material present in organic wastes. It usually reflects the amount of oxygen consumed in five days by biological processes breaking down organic waste.

Biological Treatment: A treatment technology that uses bacteria to consume organic waste.

Biologicals: Vaccines, cultures and other preparations made from living organisms and their products, intended for use in diagnosing, immunizing, or treating humans or animals, or in related research.

Biomass: All of the living material in a given area; often refers to vegetation.

Biome: Entire community of living organisms in a single major ecological area. (See: biotic community.)

Biomonitoring: 1. The use of living organisms to test the suitability of effluents for discharge into receiving waters and to test the quality of such waters downstream from the discharge. 2. Analysis of blood, urine, tissues, etc., to measure chemical exposure in humans.

Bioremediation: Use of living organisms to clean up oil spills or remove other pollutants from soil, water, or wastewater; use of organisms such as non-harmful insects to remove agricultural pests or counteract diseases of trees, plants, and garden soil.

Biosphere: The portion of Earth and its atmosphere that can support life.

Biostabilizer: A machine that converts solid waste into compost by grinding and aeration.

Biota: The animal and plant life of a given region.

Biotechnology: Techniques that use living organisms or parts of organisms to produce a variety of products (from medicines to industrial enzymes) to improve plants or animals or to develop microorganisms to remove toxics from bodies of water, or act as pesticides.

Biotic Community: A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent. (See: biome.)

Blackwater: Water that contains animal, human, or food waste.

Blood Products: Any product derived from human blood, including but not limited to blood plasma, platelets, red or white corpuscles, and derived licensed products such as interferon.

Bloom: A proliferation of algae and/or higher aquatic plants in a body of water; often related to pollution, especially when pollutants accelerate growth.

BOD5: The amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter.

Bog: A type of wetland that accumulates appreciable peat deposits. Bogs depend primarily on precipitation for their water source, and are usually acidic and rich in plant residue with a conspicuous mat of living green moss.

Boom: 1. A floating device used to contain oil on a body of water. 2. A piece of equipment used to apply pesticides from a tractor or truck. (See: sonic boom.)

Botanical Pesticide: A pesticide whose active ingredient is a plant-produced chemical such as nicotine or strychnine. Also called a plant-derived pesticide.

Bottle Bill: Proposed or enacted legislation which requires a returnable deposit on beer or soda containers and provides for retail store or other redemption. Such legislation is designed to discourage use of throwaway containers.

Bottom Ash: The non-airborne combustion residue from burning pulverized coal in a boiler; the material which falls to the bottom of the boiler and is removed mechanically; a concentration of the non-combustible materials, which may include toxics.

Bottom Land Hardwoods: Forested freshwater wetlands adjacent to rivers in the southeastern United States, especially valuable for wildlife breeding, nesting and habitat.

Brine Mud: Waste material, often associated with well-drilling or mining, composed of mineral salts or other inorganic compounds.

Building Cooling Load: The hourly amount of heat that must be removed from a building to maintain indoor comfort (measured in British Thermal Units BTUs).

Broadcast Application: The spreading of pesticides over an entire area.

Bubble Policy: (See: emissions trading.)

Bubble: A system under which existing emissions sources can propose alternate means to comply with a set of emissions limitations; under the bubble concept, sources can control more than required at one emission point where control costs are relatively low in return for a comparable relaxation of controls at a second emission point where costs are higher.

Buffer Strips: Strips of grass or other erosion-resisting vegetation between or below cultivated strips or fields.

Bulk Sample: A small portion (usually thumbnail size) of a suspect asbestos-containing building material collected by an asbestos inspector for laboratory analysis to determine asbestos content.

Bulky Waste: Large items of waste materials, such as appliances, furniture, large auto parts, trees, stumps.

Burial Ground (Graveyard): A disposal site for radioactive waste materials that uses earth or water as a shield.

By-product: Material, other than the principal product, generated as a consequence of an industrial process.

C

Cadmium (Cd): A heavy metal element that accumulates in the environment.

Cancellation: Refers to Section 6 (b) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) which authorizes cancellation of a pesticide registration if unreasonable adverse effects to the environment and public health develop when a product is used according to widespread and commonly recognized practice, or if its labeling or other material required to be submitted does not comply with FIFRA provisions.

Cap: A layer of clay, or other impermeable material installed over the top of a closed landfill to prevent entry of rainwater and minimize leachate.

Capacity Assurance Plan: A statewide plan which supports a state's ability to manage the hazardous waste generated within its boundaries over a twenty year period.

Capture Efficiency: The fraction of organic vapors generated by a process that are directed to an abatement or recovery device.

Carbon Absorber: An add-on control device that uses activated carbon to absorb volatile organic compounds from a gas stream. (The VOCs are later recovered from the carbon.)

Carbon Adsorption: A treatment system that removes contaminants from ground water or surface water by forcing it through tanks containing activated carbon treated to attract the contaminants. contaminants.

Carbon Monoxide (CO): A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

Carboxyhemoglobin: Hemoglobin in which the iron is bound to carbon monoxide (CO) instead of oxygen.

Carcinogen: Any substance that can cause or aggravate cancer.

Carrier: The inert liquid or solid material added to an active ingredient in a pesticide.

Carrying Capacity: 1. In recreation management, the amount of use a recreation area can sustain without loss of quality. 2. In wildlife management, the maximum number of animals an area can support during a given period.

Cask: A thick-walled container (usually lead) used to transport radioactive material. Also called a coffin.

Catalytic Converter: An air pollution abatement device that removes pollutants from motor vehicle exhaust, either by oxidizing them into carbon dioxide and water or reducing them to nitrogen and oxygen.

Catalytic Incinerator: A control device that oxidizes volatile organic compounds (VOCs) by using a catalyst to promote the combustion process. Catalytic incinerators require lower temperatures than conventional thermal incinerators, thus saving fuel and other costs.

Categorical Exclusion: A class of actions which either individually or cumulatively would not have a significant effect on the human environment and therefore would not require preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act (NEPA).

Categorical Pretreatment Standard: A technology-based effluent limitation for an industrial facility discharging into a municipal sewer system. Analogous in stringency to Best Availability Technology (BAT) for direct dischargers.

Cathodic Protection: A technique to prevent corrosion of a metal surface by making it the cathode of an electrochemical cell.

Cells: 1. In solid waste disposal, holes where waste is dumped, compacted, and covered with layers of dirt on a daily basis. 2. The smallest structural part of living matter capable of functioning as an independent unit.

Cementitious: Densely packed and nonfibrous friable materials.

Central Collection Point: Location were a generator of regulated medical waste consolidates wastes originally generated at various locations in his facility. The wastes are gathered together for treatment on-site or for transportation elsewhere for treatment and/or disposal. This term could also apply to community hazardous waste collections, industrial and other waste management systems.

Centrifugal Collector: A mechanical system using centrifugal force to remove aerosols from a gas stream or to de-water sludge.

Channelization: Straightening and deepening streams so water will move faster, a marsh-drainage tactic that can interfere with waste assimilation capacity, disturb fish and wildlife habitats, and aggravate flooding.

Characteristic: Any one of the four categories used in defining hazardous waste: ignitability, corrosivity, reactivity, and toxicity.

Chemical Oxygen Demand (COD): A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water.

Chemical Treatment: Any one of a variety of technologies that use chemicals or a variety of chemical processes to treat waste.

Chemnet: Mutual aid network of chemical shippers and contractors that assigns a contracted emergency response company to provide technical support if a representative of the firm whose chemicals are involved in an incident is not readily available.

Chemosterilant: A chemical that controls pests by preventing reproduction.

Chemtrec: The industry-sponsored Chemical Transportation Emergency Center; provides information and/or emergency assistance to emergency responders.

Chilling Effect: The lowering of the Earth's temperature because of increased particles in the air blocking the sun's rays. (See: greenhouse effect.)

Chlorinated Hydrocarbons: These include a class of persistent, broad-spectrum insecticides that linger in the environment and accumulate in the food chain. Among them are DDT, aldrin, dieldrin, heptachlor, chlordane, lindane, endrin, mirex, hexachloride, and toxaphene. Other examples include TCE, used as an industrial solvent.

Chlorinated Solvent: An organic solvent containing chlorine atoms, e.g., methylene chloride and 1,1,1-trichloromethane, used in aerosol spray containers and in highway paint.

Chlorination: The application of chlorine to drinking water, sewage, or industrial waste to disinfect or to oxidize undesirable compounds.

Chlorinator: A device that adds chlorine, in gas or liquid form, to water or sewage to kill infectious bacteria.

Chlorine-Contact Chamber: That part of a water treatment plant where effluent is disinfected by chlorine.

Chlorofluorocarbons (CFCs): A family of inert, nontoxic, and easily liquified chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere they drift into the upper atmosphere where their chlorine components destroy ozone.

Chlorosis: Discoloration of normally green plant parts caused by disease, lack of nutrients, or various air pollutants.

Cholinesterase: An enzyme found in animals that regulates nerve impulses. Cholinesterase inhibition is associated with a variety of acute symptoms such as nausea, vomiting, blurred vision, stomach cramps, and rapid heart rate.

Chromium: (See: heavy metals.)

Chronic Effect: An adverse effect on a human or animal in which symptoms recur frequently or develop slowly over a long period of time.

Chronic Toxicity: The capacity of a substance to cause long-term poisonous human health effects. (See: acute toxicity.)

Clarification: Clearing action that occurs during wastewater treatment when solids settle out. This is often aided by centrifugal action and chemically induced coagulation in wastewater.

Clarifier: A tank in which solids settle to the bottom and are subsequently removed as sludge.

Clay Soil: Soil material containing more than 40 percent clay, less than 45 percent sand, and less than 40 percent silt.

Clean Coal Technology: Any technology not in widespread use prior to the Clean Air Act amendments of 1990. This Act will achieve significant reductions in pollutants associated with the burning of coal.

Clean Fuels: Blends or substitutes for gasoline fuels, including compressed natural gas, methanol, ethanol, liquified petroleum gas, and others.

Cleanup: Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term "cleanup" is sometimes used interchangeably with the terms remedial action, removal action, response action, or corrective action.

Clear Cut: Harvesting all the trees in one area at one time, a practice that can encourage fast rainfall or snowmelt runoff, erosion, sedimentation of streams and lakes, flooding, and destroys vital habitat.

Cloning: In biotechnology, obtaining a group of genetically identical cells from a single cell; making identical copies of a gene.

Closed-Loop Recycling: Reclaiming or reusing wastewater for non-potable purposes in an enclosed process.

Closure: The procedure a landfill operator must follow when a landfill reaches its legal capacity for solid waste: ceasing acceptance of solid waste and placing a cap on the landfill site.

Coagulation: Clumping of particles in wastewater to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.

Coastal Zone: Lands and waters adjacent to the coast that exert an influence on the uses of the sea and its ecology, or whose uses and ecology are affected by the sea.

Coefficient of Haze (COH): A measurement of visibility interference in the atmosphere.

Coke Oven: An industrial process which converts coal into coke, one of the basic materials used in blast furnaces for the conversion of iron ore into iron.

Cold Temperature CO: A standard for automobile carbon monoxide (CO) emissions to be met at a low temperature (i.e. 20 degrees Fahrenheit). Conventional automobile catalytic convertors are less efficient upon start-up at low temperatures.

Coliform Index: A rating of the purity of water based on a count of fecal bacteria.

Coliform Organism: Microorganisms found in the intestinal tract of humans and animals. Their presence in water indicates fecal pollution and potentially adverse contamination by pathogens.

Collector Sewers: Pipes used to collect and carry wastewater from individual sources to an interceptor sewer that will carry it to a treatment facility.

Combined Sewer Overflows: Discharge of a mixture of storm water and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms.

Combined Sewers: A sewer system that carries both sewage and storm-water runoff. Normally, its entire flow goes to a waste treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of storm water and sewage into receiving waters. Storm-water runoff may also carry toxic chemicals from industrial areas or streets into the sewer system.

Combustion: 1. Burning, or rapid oxidation, accompanied by release of energy in the form of heat and light. A basic cause of air pollution. 2. Refers to controlled burning of waste, in which heat chemically alters organic compounds, converting into stable inorganics such as carbon dioxide and water.

Combustion Chamber: The actual compartment where waste is burned in an incinerator.

Combustion Product: Substance produced during the burning or oxidation of a material.

Command Post: Facility located at a safe distance upwind from an accident site, where the on-scene coordinator, responders, and technical representatives make response decisions, deploy manpower and equipment, maintain liaison with news media, and handle communications.

Comment Period: Time provided for the public to review and comment on a proposed EPA action or rulemaking after publication in the Federal Register.

Commercial Waste Management Facility: A treatment, storage, disposal, or transfer facility which accepts waste from a variety of sources, as compared to a private facility which normally manages a limited waste stream generated by its own operations.

Commercial Waste: All solid waste emanating from business establishments such as stores, markets, office buildings, restaurants, shopping centers, and theaters.

Commingled Recyclables: Mixed recyclables that are collected together.

Comminuter: A machine that shreds or pulverizes solids to make waste treatment easier.

Comminution: Mechanical shredding or pulverizing of waste. Used in both solid waste management and wastewater treatment.

Community: In ecology, a group of interacting populations in time and space. Sometimes, a particular subgrouping may be specified, such as the fish community in a lake or the soil arthropod community in a forest.

Community Relations: The EPA effort to establish two-way communication with the public to create understanding of EPA programs and related actions, to assure public input into decision-making processes related to affected communities, and to make certain that the Agency is aware of and responsive to public concerns. Specific community relations activities are required in relation to Superfund remedial actions.

Community Water System: A public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Compaction: Reduction of the bulk of solid waste by rolling and tamping.

Compliance Coating: A coating whose volatile organic compound content does not exceed that allowed by regulation.

Compliance Monitoring: Collection and evaluation of data, including self-monitoring reports, and verification to show whether pollutant concentrations and loads contained in permitted discharges are in compliance with the limits and conditions specified in the permit.

Compliance Schedule: A negotiated agreement between a pollution source and a government agency that specifies dates and procedures by which a source will reduce emissions and, thereby, comply with a regulation.

Composite Sample: A series of water samples taken over a given period of time and weighted by flow rate.

Compost: The relatively stable humus material that is produced from a composting process in which bacteria in soil mixed with garbage and degradable trash break down the mixture into organic fertilizer.

Composting: The controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composting include mechanical mixing and aerating, ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost in piles out in the open air and mixing it or turning it periodically.

Conditional Registration: Under special circumstances, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) permits registration of pesticide products that is "conditional" upon the submission of additional data. These special circumstances include a finding by the EPA Administrator that a new product or use of an existing pesticide will not significantly increase the risk of unreasonable adverse effects. A product containing a new (previously unregistered) active ingredient may be conditionally registered only if the Administrator finds that such conditional registration is in the public interest, that a reasonable time for conducting the additional studies has not elapsed, and the use of the pesticide for the period of conditional registration will not present an unreasonable risk.

Conditionally Exempt Generators (CE): Persons or enterprises which produce less than 220 pounds of hazardous waste per month. Exempt from most regulation, they are required merely to determine whether their waste is hazardous, notify appropriate state or local agencies, and ship it by permitted facility for proper disposal. (See :an authorized transporter to a small quantity generator.)

Cone of Depression: A depression in the water table that develops around a pumped well.

Confined Aquifer: An aquifer in which ground water is confined under pressure which is significantly greater than atmospheric pressure.

Consent Decree: A legal document, approved by a judge, that formalizes an agreement reached between EPA and potentially responsible parties (PRPs) through which PRPs will conduct all or part of a cleanup action at a Superfund site; cease or correct actions or processes that are polluting the environment; or otherwise comply with EPA initiated regulatory enforcement actions to resolve the contamination at the Superfund site involved. The consent decree describes the actions PRPs will take and may be subject to a public comment period.

Conservation: Preserving and renewing, when possible, human and natural resources. The use, protection, and improvement of natural resources according to principles that will assure their highest economic or social benefits.

Construction and Demolition Waste: Waste building materials, dredging materials, tree stumps, and rubble resulting from construction, remodeling, repair, and demolition of homes, commercial buildings and other structures and pavements. May contain lead, asbestos, or other hazardous substances.

Contact Pesticide: A chemical that kills pests when it touches them, instead of by ingestion. Also, soil that contains the minute skeletons of certain algae that scratch and dehydrate waxy-coated insects.

Contaminant: Any physical, chemical, biological, or radiological substance or matter that has an adverse affect on air, water, or soil.

Contingency Plan: A document setting out an organized, planned, and coordinated course of action to be followed in case of a fire, explosion, or other accident that releases toxic chemicals, hazardous waste, or radioactive materials that threaten human health or the environment. (See: National Oil and Hazardous Substances Contingency Plan.)

Continuous Discharge: A routine release to the environment that occurs without interruption, except for infrequent shutdowns for maintenance, process changes, etc.

Contour Plowing: Soil tilling method that follows the shape of the land to discourage erosion.

Contract Labs: Laboratories under contract to EPA, which analyze samples taken from waste, soil, air, and water or carry out research projects.

Control Technique Guidelines (CTG): A series of EPA documents designed to assist states in defining reasonable available control technology (RACT) for major sources of volatile organic compounds (VOC).

Controlled Reaction: A chemical reaction under temperature and pressure conditions maintained within safe limits to produce a desired product or process.

Conventional Pollutants: Statutorily listed pollutants understood well by scientists. These may be in the form of organic waste, sediment, acid, bacteria, viruses, nutrients, oil and grease, or heat.

Conventional Systems: Systems that have been traditionally used to collect municipal wastewater in gravity sewers and convey it to a central primary or secondary treatment plant prior to discharge to surface waters.

Conventional Tilling: Tillage operations considered standard for a specific location and crop and that tend to bury the crop residues; usually considered as a base for determining the cost effectiveness of control practices.

Cooling Electricity Use: Amount of electricity used to meet the building cooling load. (See: building cooling load.)

Cooling Tower: A structure that helps remove heat from water used as a coolant; e.g., in electric power generating plants.

Cooperative Agreement: An assistance agreement whereby EPA transfers money, property, services or anything of value to a state for the accomplishment of CERCLA-authorized activities or tasks.

Core: The uranium-containing heart of a nuclear reactor, where energy is released.

Core Program Cooperative Agreement: An assistance agreement whereby EPA supports states or tribal governments with funds to help defray the cost of non-item-specific administrative and training activities.

Corrosion: The dissolution and wearing away of metal caused by a chemical reaction such as between water and the pipes, chemicals touching a metal surface, or contact between two metals.

Corrosive: A chemical agent that reacts with the surface of a material causing it to deteriorate or wear away.

Cost-Effective Alternative: An alternative control or corrective method identified after analysis as being the best available in terms of reliability, performance, and cost. Although costs are one important consideration, regulatory and compliance analysis does not require EPA to choose the least expensive alternative. For example, when selecting a method for cleaning up a site on the Superfund National Priorities List, the Agency balances costs with the long-term effectiveness of the methods proposed.

Cost Recovery: A legal process by which potentially responsible parties who contributed to contamination at a Superfund site can be required to reimburse the Trust Fund for money spent during any cleanup actions by the federal government.

Cover Material: Soil used to cover compacted solid waste in a sanitary landfill.

Cover: Vegetation or other material providing protection as ground cover.

Cradle-to-Grave or Manifest System: A procedure in which hazardous materials are identified and followed as they are produced, treated, transported, and disposed of by a series of permanent, linkable, descriptive documents (e.g., manifests). Commonly referred to as the cradle-to-grave system.

Criteria Pollutants: The 1970 amendments to the Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead, and nitrogen oxide. The term, "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised.

Criteria: Descriptive factors taken into account by EPA in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. When issued by EPA, the criteria provide guidance to the states on how to establish their standards.

Crop Consumptive Use: The amount of water transpired during plant growth plus what evaporated from the soil surface and foliage in the crop area.

Cubic Feet Per Minute (CFM): A measure of the volume of a substance flowing through air within a fixed period of time. With regard to indoor air, refers to the amount of air, in cubic feet, that is exchanged with indoor air in a minute's time, i.e., the air exchange rate.

Cullet: Crushed glass.

Cultural Eutrophication: Increasing rate at which water bodies "die" by pollution from human activities.

Cultures and Stocks: Infectious agents and associated biologicals including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; waste from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures. (See: regulated medical waste.)

Cumulative Working Level Months (CWLM): The sum of lifetime exposure to radon working levels expressed in total working level months.

Curbside Collection: Method of collecting recyclable materials at homes, community districts or businesses.

Cutie-Pie: An instrument used to measure radiation levels.

Cyclone Collector: A device that uses centrifugal force to pull large particles from polluted air.

D

Data Call-In: A part of the Office of Pesticide Programs (OPP) process of developing key required test data, especially on the long-term, chronic effects of existing pesticides, in advance of scheduled Registration Standard reviews. Data Call-In from manufacturers is an adjunct of the Registration Standards program intended to expedite re-registration.

DDT: The first chlorinated hydrocarbon insecticide chemical name: Dichloro-Diphenyl-Trichloroethane). It has a half-life of 15 years and can collect in fatty tissues of certain animals. EPA banned registration and interstate sale of DDT for virtually all but emergency uses in the United States in 1972 because of its persistence in the environment and accumulation in the food chain.

Decay Products: Degraded radioactive materials, often referred to as "daughters" or "progeny"; radon decay products of most concern from a public health standpoint are polonium-214 and polonium-218.

Dechlorination: Removal of chlorine from a substance by chemically replacing it with hydrogen or hydroxide ions in order to detoxify a substances.

Decomposition: The breakdown of matter by bacteria and fungi, changing the chemical makeup and physical appearance of materials.

Decontamination: Removal of harmful substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings, or the exterior environment.

Deep-Well Injection: Deposition of raw or treated, filtered hazardous waste by pumping it into deep wells, where it is contained in the pores of permeable subsurface rock.

Deflocculating Agent: A material added to a suspension to prevent settling.

Defoliant: An herbicide that removes leaves from trees and growing plants.

Delegated State: A state (or other governmental entity such as a tribal government) that has received authority to administer an environmental regulatory program in lieu of a federal counterpart. As used in connection with NPDES, UIC, and PWS programs, the term does not connote any transfer of federal authority to a state.

Delist: Use of the petition process to have a facility's toxic designation rescinded.

Demand-side Waste Management: Prices whereby consumers use purchasing decisions to communicate to product manufacturers that they prefer environmentally sound products packaged with the least amount of waste, made from recycled or recyclable materials, and containing no hazardous substances.

Denitrification: The anaerobic biological reduction of nitrate to nitrogen gas.

Depletion Curve: In hydraulics, a graphical representation of water depletion from storage-stream channels, surface soil, and groundwater. A depletion curve can be drawn for base flow, direct runoff, or total flow.

Depressurization: A condition that occurs when the air pressure inside a structure is lower that the air pressure outside. Depressurization can occur when household appliances such as fireplaces or furnaces, that consume or exhaust house air, are not supplied with enough makeup air. Radon may be drawn into a house more rapidly under depressurized conditions.

Dermal Toxicity: The ability of a pesticide or toxic chemical to poison people or animals by contact with the skin. (See: contact pesticide.)

DES: A synthetic estrogen, diethylstilbestrol is used as a growth stimulant in food animals. Residues in meat are thought to be carcinogenic.

Desalination: [Desalinization] (1) Removing salts from ocean or brackish water by using various technologies. (2) Removal of salts from soil by artificial means, usually leaching.

Desiccant: A chemical agent that absorbs moisture; some desiccants are capable of drying out plants or insects, causing death.

Design Capacity: The average daily flow that a treatment plant or other facility is designed to accommodate.

Designated Pollutant: An air pollutant which is neither a criteria nor hazardous pollutant, as described in the Clean Air Act, but for which new source performance standards exist. The Clean Air Act does require states to control these pollutants, which include acid mist, total reduced sulfur (TRS), and fluorides.

Designated Uses: Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act. Uses can include cold water fisheries, public water supply, irrigation, etc.

Designer Bugs: Popular term for microbes developed through biotechnology that can degrade specific toxic chemicals at their source in toxic waste dumps or in ground water.

Destination Facility: The facility to which regulated medical waste is shipped for treatment and destruction, incineration, and/or disposal.

Destroyed Medical Waste: Regulated medical waste that has been ruined, torn apart, or mutilated through thermal treatment, melting, shredding, grinding, tearing, or breaking, so that it is no longer generally recognized as medical waste, but has not yet been treated (excludes compacted regulated medical waste.)

Destruction and Removal Efficiency (DRE): A percentage that represents the number of molecules of a compound removed or destroyed in an incinerator relative to the number of molecules entered the system (e.g., a DRE of 99.99 percent means that 9,999 molecules are destroyed for every 10,000 that enter; 99.99 percent is known as "four nines." For some pollutants, the RCRA removal requirement may be a stringent as "six nines.")

Destruction Facility: A facility that destroys regulated medical waste by mashing or mutilating it.

Desulfurization: Removal of sulfur from fossil fuels to reduce pollution.

Detectable Leak Rate: The smallest leak (from a storage tank), expressed in terms of gallons-or liters-per-hour, that a test can reliably discern with a certain probability of detection or false alarm.

Detection Criterion: A predetermined rule to ascertain whether a tank is leaking or not. Most volumetric tests use a threshold value as the detection criterion. (See: volumetric tank tests.)

Detergent: Synthetic washing agent that helps to remove dirt and oil. Some contain compounds which kill useful bacteria and encourage algae growth when they are in wastewater that reaches receiving waters.

Development Effects: Adverse effects such as altered growth, structural abnormality, functional deficiency, or death observed in a developing organism.

Diatomaceous Earth (Diatomite): A chalk-like material (fossilized diatoms) used to filter out solid waste in wastewater treatment plants, also used as an active ingredient in some powdered pesticides.

Diazinon: An insecticide. In 1986, EPA banned its use on open areas such as sod farms and golf courses because it posed a danger to migratory birds. The ban did not apply to agricultural, home lawn or commercial establishment uses.

Dibenzofurans: A group of highly toxic organic compounds.

Dicofol: A pesticide used on citrus fruits.

Diffused Air: A type of aeration that forces oxygen into sewage by pumping air through perforated pipes inside a holding tank.

Digester: In wastewater treatment, a closed tank; in solid-waste conversion, a unit in which bacterial action is induced and accelerated in order to break down organic matter and establish the proper carbon to nitrogen ratio.

Digestion: The biochemical decomposition of organic matter, resulting in partial gasification, liquefaction, and mineralization of pollutants.

Dike: A low wall that can act as a barrier to prevent a spill from spreading.

Diluent: Any liquid or solid material used to dilute or carry an active ingredient.

Dilution Ratio: The relationship between the volume of water in a stream and the volume of incoming water. It affects the ability of the stream to assimilate waste.

Dinocap: A fungicide used primarily by apple growers to control summer diseases. EPA proposed restrictions on its use in 1986 when laboratory tests found it caused birth defects in rabbits.

Dinoseb: A herbicide that is also used as a fungicide and insecticide. It was banned by EPA in 1986 because it posed the risk of birth defects and sterility.

Dioxin: Any of a family of compounds known chemically as dibenzo-p-dioxins. Concern about them arises from their potential toxicity and contaminants in commercial products. Tests on laboratory animals indicate that it is one of the more toxic man-made compounds.

Direct Discharger: A municipal or industrial facility which introduces pollution through a defined conveyance or system such as outlet pipes; a point source.

Disinfectant: A chemical or physical process that kills pathogenic organisms in water. Chlorine is often used to disinfect sewage treatment effluent, water supplies, wells, and swimming pools.

Dispersant: A chemical agent used to break up concentrations of organic material such as spilled oil.

Disposables: Consumer products, other items, and packaging used once or a few times and discarded.

Disposal: Final placement or destruction of toxic, radioactive, or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous materials from removal actions or accidental releases. Disposal may be accomplished through use of approved secure landfills, surface impoundments, land farming, deep-well injection, ocean dumping, or incineration.

Dissolved Oxygen (DO): The oxygen freely available in water, vital to fish and other aquatic life and for the prevention of odors. DO levels are considered a most important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced waste treatment are generally designed to ensure adequate DO in waste-receiving waters.

Dissolved Solids: Disintegrated organic and inorganic material in water. Excessive amounts make water unfit to drink or use in industrial processes.

Distillation: The act of purifying liquids through boiling, so that the steam condenses to a pure liquid and the pollutants remain in a concentrated residue.

Diversion: A channel with a supporting ridge on the lower side constructed across a slope to divert water at a non-erosive velocity to sites where it can be used or disposed of through a stable outlet.

Diversion Rate: The percentage of waste materials diverted from traditional disposal such as landfilling or incineration to be recycled, composted, or re-used.

DNA Hybridization: Use of a segment of DNA, called a DNA probe, to identify its complementary DNA; used to detect specific genes.

Dose Response: How a biological organism's response to a toxic substance quantitatively shifts as its overall exposure to the substance changes (e.g., a small dose of carbon monoxide may cause drowsiness; a large dose can be fatal.)

DOT Reportable Quantity: The quantity of a substance specified in U.S. Department of Transportation regulation that triggers labelling, packaging and other requirements related to shipping such substances.

Draft Permit: A preliminary permit drafted and published by EPA; subject to public review and comment before final action on the application.

Dredging: Removal of mud from the bottom of water bodies. This can disturb the ecosystem and causes silting that kills aquatic life. Dredging of contaminated muds can expose biota to heavy metals and other toxics. Dredging activities may be subject to regulation under Section 404 of the Clean Water Act.

Drop-off: Recyclable materials collection method in which individuals bring them to a designated collection site.

Dump: A site used to dispose of solid waste without environmental controls.

Dustfall Jar: An open container used to collect large particles from the air for measurement and analysis.

Dystrophic Lakes: Acidic, shallow bodies of water that contain much humus and/or other organic matter; contain many plants but few fish.

E

Ecological Impact: The effect that a man-made or natural activity has on living organisms and their non-living (abiotic) environment.

Ecology: The relationship of living things to one another and their environment, or the study of such relationships.

Ecological Indicator: A characteristic of the environment that, when measured, quantifies magnitude of stress, habitat characteristics, degree of exposure to a stressor, or ecological response to exposure. The term is a collective term for response, exposure. The term is a collective term for response, exposure, habitat, and stressor indicators.

Ecological Risk Assessment: The application of a formal framework, analytical process, or model to estimate the effects of human actions(s) on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose-response assessments, and risk characterization.

Economic Poisons: Chemicals used to control pests and to defoliate cash crops such as cotton.

Ecosphere: The "bio-bubble" that contains life on earth, in surface waters, and in the air. (See: biosphere.)

Ecosystem: The interacting system of a biological community and its non-living environmental surroundings.

Ecosystem Structure: Attributes related to instantaneous physical state of an ecosystem; examples include species population density, species richness or evenness, and standing crop biomass.

Ecotone: A habitat created by the juxtaposition of distinctly different habitats; an edge habitat; or an ecological zone or boundary where two or more ecosystems meet.

Effluent: Wastewater-treated or untreated-that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Effluent Guidelines: Technical EPA documents which set effluent limitations for given industries and pollutants.

Effluent Limitation: Restrictions established by a State or EPA on quantities, rates, and concentrations in wastewater discharges.

Effluent Standard: (See effluent limitation.)

Electrodialysis: A process that uses electrical current applied to permeable membranes to remove minerals from water. Often used to desalinize salty or brackish water.

Electrostatic Precipitator (ESP): A device that removes particles from a gas stream (smoke) after combustion occurs. The ESP imparts an electrical charge to the particles, causing them to adhere to metal plates inside the precipitator. Rapping on the plates causes the particles to fall into a hopper for disposal.

Eligible Costs: The construction costs for waste-water treatment works upon which EPA grants are based.

EMAP Data: Environmental monitoring data collected under the auspices of the Environmental Monitoring and Assessment Program. All EMAP data share the common attribute of being of known quality, having been collected in the context of explicit data quality objectives (DQOs) and a consistent quality assurance program.

Emergency (Chemical): A situation created by an accidental release or spill of hazardous chemicals that poses a threat to the safety of workers, residents, the environment, or property.

Emergency Episode: (See: air pollution episode.)

Emergency Response Values: Concentrations of chemicals, published by various groups, defining acceptable levels for short-term exposures in emergencies.

Emission: Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, or aircraft exhausts.

Emission Factor: The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory: A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Emission Standard: The maximum amount of air polluting discharge legally allowed from a single source, mobile or stationary.

Emissions Trading: EPA policy that allows a plant complex with several facilities to decrease pollution from some facilities while increasing it from others, so long as total results are equal to or better than previous limits. Facilities where this is done are treated as if they exist in a bubble in which total emissions are averaged out. Complexes that reduce emissions substantially may "bank" their "credits" or sell them to other industries. **Encapsulation:** The treatment of asbestos-containing material with a liquid that covers the surface with a protective coating or embeds fibers in an adhesive matrix to prevent their release into the air.

Enclosure: Putting an airtight, impermeable, permanent barrier around asbestos-containing materials to prevent the release of asbestos fibers into the air.

Endangered Species: Animals, birds, fish, plants, or other living organisms threatened with extinction by man-made or natural changes in their environment. Requirements for declaring a species endangered are contained in the Endangered Species Act.

Endangerment Assessment: A study to determine the nature and extent of contamination at a site on the National Priorities List and the risks posed to public health or the environment. EPA or the state conduct the study when a legal action is to be taken to direct potentially responsible parties to clean up a site or pay for it. An endangerment assessment supplements a remedial investigation.

Energy Recovery: Obtaining energy from waste through a variety of processes (e.g., combustion.)

Enforceable Requirements: Conditions or limitations in permits issued under the Clean Water Act ,Section 402 or 404 that, if violated, could result in the issuance of a compliance order or initiation of a civil or criminal action under federal or applicable state laws. If a permit has not been issued, the term includes any requirement which, in the Regional Administrator's judgement, would be included in the permit when issued. Where no permit applies, the term includes any requirement which the RA determines is necessary for the best practical waste treatment technology to meet applicable criteria.

Enforcement: EPA, state, or local legal actions to obtain compliance with environmental laws, rules, regulations, or agreements and/or obtain penalties or criminal sanctions for violations. Enforcement procedures may vary, depending on the requirements of different environmental laws and related implementing regulations. Under CERCLA, for example, EPA will seek to require potentially responsible parties to clean up a Superfund site, or pay for the cleanup, whereas under the Clean Air Act the agency may invoke sanctions against cities failing to meet ambient air quality standards that could prevent certain types of construction or federal funding. In other situations, if investigations by EPA and state agencies uncover willful violations, criminal trials and penalties are sought.

Enforcement Decision Document (EDD): A document that provides an explanation to the public of EPA's selection of the cleanup alternative at enforcement sites on the National Priorities List. Similar to a Record of Decision.

Enhanced Inspection and Maintenance (I&M): An improved automobile inspection and maintenance program—aimed at reducing automobile emissions—that contains, at a minimum, more vehicle types and model years, tighter inspection, and better management practices. It may also include annual computerized or centralized inspections, under-the-hood inspection- for signs of tampering with pollution control equipment, and increased repair waiver cost.

Enrichment: The addition of nutrients (e.g., nitrogen, phosphorus, carbon compounds) from sewage effluent or agricultural runoff to surface water, greatly increases the growth potential for algae and other aquatic plants.

Environment: The sum of all external conditions affecting the life, development and survival of an organism.

Environmental Assessment: An environmental analysis prepared pursuant to the National Environmental Policy Act to determine whether a federal action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Audit: An independent assessment of the current status of a party's compliance with applicable environmental requirements or of a party's environmental compliance policies, practices, and controls.

Environmental Impact Statement: A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.

Environmental Indicator: A measurement, statistic or value that provides a proximate gauge or evidence of the effects of environmental management programs or of the state or condition of the environment.

Environmental Response Team: EPA experts located in Edison, N.J., and Cincinnati, OH, who can provide around-the-clock technical assistance to EPA regional offices and states during all types of hazardous waste site emergencies and spills of hazardous substances.

Epidemiology: Study of the distribution of disease, or other health-related states and events in human populations, as related to age, sex, occupation, ethnic, and economic status in order to identify and alleviate health problems and promote better health.

Epilimnion: Upper waters of a thermally stratified lake subject to wind action.

Episode (Pollution): An air pollution incident in a given area caused by a concentration of atmospheric pollutants under meteorological conditions that may result in a significant increase in illnesses or deaths. May also describe water pollution events or hazardous material spills.

Equilibrium: In relation to radiation, the state at which the radioactivity of consecutive elements within a radioactive series is neither increasing nor decreasing.

Equivalent Method: Any method of sampling and analyzing for air pollution which has been demonstrated to the EPA Administrator's satisfaction to be, under specific conditions, an acceptable alternative to normally used reference methods.

Erosion: The wearing away of land surface by wind or water, intensified by land-clearing practices related to farming, residential or industrial development, road building, or logging.

Estuary: Regions of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife. (See: wetlands.)

Ethylene Dibromide (EDB): A chemical used as an agricultural fumigant and in certain industrial processes. Extremely toxic and found to be a carcinogen in laboratory animals, EDB has been banned for most agricultural uses in the United States.

Eutrophic Lakes: Shallow, murky bodies of water with concentrations of plant nutrients causing excessive production of algae. (See: dystrophic lakes.)

Eutrophication: The slow aging process during which a lake, estuary, or bay evolves into a bog or marsh and eventually disappears. During the later stages of eutrophication the water body is choked by abundant plant life due to higher levels of nutritive compounds such as nitrogen and phosphorus. Human activities can accelerate the process.

Evaporation Ponds: Areas where sewage sludge is dumped and dried.

Evapotranspiration: The loss of water from the soil both by evaporation and by transpiration from the plants growing in the soil.

Exceedance: Violation of the pollutant levels permitted by environmental protection standards.

Exclusion: In the asbestos program, one of several situations that permit a Local Education Agency (LEA) to delete one or more of the items required by the Asbestos Hazard Emergency Response Act (AHERA), e.g., records of previous asbestos sample collection and analysis may be used by the accredited inspector in lieu of AHERA bulk sampling.

Exclusionary Ordinance: Zoning that excludes classes of persons or businesses from a particular neighborhood or area.

Exempt Solvent: Specific organic compounds not subject to requirements of regulation because are deemed by EPA to be of negligible photochemical reactivity.

Exempted Aquifer: Underground bodies of water defined in the Underground Injection Control program as aquifers that are potential sources of drinking water though not being used as such, and thus exempted from regulations barring underground injection activities.

Exotic Species: A species that is not indigenous to a region.

Experimental Use Permit: Obtained by manufacturers for testing new pesticides or uses of thereof whenever they conduct experimental field studies to support registration on 10 acres or more on land or one acre or more of water.

Explosive Limits: The amounts of vapor in the air that form explosive mixtures; limits are expressed as lower and upper limits and give the range of vapor concentrations in air that will explode if an ignition source is present.

Exposure: The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.

Exposure Indicator: A characteristic of the environment measured to provide evidence of the occurrence or magnitude of a response indicator's exposure to a chemical or biological stress.

Extraction Procedure (E P Toxic): Determining toxicity by a procedure which simulates leaching; if a certain concentration of a toxic substance can be leached from a waste, that waste is considered hazardous, i.e., "E P Toxic."

Extremely Hazardous Substances: Any of 406 chemicals identified by EPA as toxic, and listed under SARA Title III. The list is subject to periodic revision.

F

Fabric Filter: A cloth device that catches dust particles from industrial emissions.

Facilities Plans: Plans and studies related to the construction of treatment works necessary to comply with the Clean Water Act or RCRA. A facilities plan investigates needs and provides information on the cost effectiveness of alternatives, a recommended plan, an environmental assessment of the recommendations, and descriptions of the treatment works, costs, and a completion schedule.

Facility Emergency Coordinator: Representative of a facility covered by environmental law (e.g, a chemical plant) who participates in the emergency reporting process with the Local Emergency Planning Committee (LEPC).

Feasibility Study: 1. Analysis of the practicability of a proposal; e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List. The feasibility study usually recommends selection of a cost-effective alternative. It usually starts as soon as the remedial investigation is underway; together, they are commonly referred to as the "RI/FS". 2. A small-scale investigation of a problem to ascertain whether a proposed research approach is likely to provide useful data.

Fecal Coliform Bacteria: Bacteria found in the intestinal tracts of mammals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens.

Federal Implementation Plan: Under current law, a federally implemented plan to achieve attainment of air quality standards, used when a state is unable to develop an adequate plan.

Feedlot: A confined area for the controlled feeding of animals. Tends to concentrate large amounts of animal waste that cannot be absorbed by the soil and, hence, may be carried to nearby streams or lakes by rainfall runoff.

Fen: A type of wetland that accumulates peat deposits. Fens are less acidic than bogs, deriving most of their water from groundwater rich in calcium and magnesium. (See: wetlands.)

FIFRA Pesticide Ingredient: An ingredient of a pesticide that must be registered with EPA under the Federal Insecticide, fungicide, and Rodenticide Act. Products making pesticide claims mst register under FIFRA and may be subject to labeling and use requirements.

Filling: Depositing dirt, mud or other materials into aquatic areas to create more dry land, usually for agricultural or commercial development purposes, often with ruinous ecological consequences.

Filter Strip: Strip or area of vegetation used for removing sediment, organic matter, and other pollutants from runoff and waste water.

Filtration: A treatment process, under the control of qualified operators, for removing solid (particulate) matter from water by means of porous media such as sand or a man-made filter; often used to remove particles that containing pathogens.

Financial Assurance for Closure: Documentation or proof that an owner or operator of a facility such as a landfill or other waste repository is capable of paying the projected costs of closing the facility and monitoring it afterwards as provided in RCRA regulations.

Finding of No Significant Impact: A document prepared by a federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require preparation of an Environmental Impact Statement. An FNSI is based on the results of an environmental assessment.

First Draw: The water that comes out when a tap is first opened, likely to have the highest level of lead contamination from plumbing materials.

Flare: A control device that burns hazardous materials to prevent their release into the environment; may operate continuously or intermittently, usually on top a stack.

Floc: A clump of solids formed in sewage by biological or chemical action.

Flocculation: Process by which clumps of solids in water or sewage aggregate through biological or chemical action so they can be separated from water or sewage.

Floor Sweep: Capture of heavier-than-air gases that collect at floor level.

Flow Rate: The rate, expressed in gallons- or liters-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Flowmeter: A gauge indicating the velocity of wastewater moving through a treatment plant or of any liquid moving through various industrial processes.

Flue Gas Desulfurization: A technology that employs a sorbent, usually lime or limestone, to remove sulfur dioxide from the gases produced by burning fossil fuels. Flue gas desulfurization is current state-of-the art technology for major SO_2 emitters, like power plants.

Flue Gas: The air coming out of a chimney after combustion in the burner it is venting. It can include nitrogen oxides, carbon oxides, water vapor, sulfur oxides, particles and many chemical pollutants.

Fluidized Bed Incinerator: An incinerator that uses a bed of hot sand or other granular material to transfer heat directly to waste. Used mainly for destroying municipal sludge.

Flume: A natural or man-made channel that diverts water.

Fluorides: Gaseous, solid, or dissolved compounds containing fluorine that result from industrial processes. Excessive amounts in food can lead to fluorosis.

Fluorocarbons (FCs): Any of a number of organic compounds analogous to hydrocarbons in which one or more hydrogen atoms are replaced by fluorine. Once used in the United States as a propellant for domestic aerosols, they are now found mainly in coolants and some industrial processes. FCs containing chlorine are called chlorofluorocarbons (CFCs). They are believed to be modifying the ozone layer in the stratosphere, thereby allowing more harmful solar radiation to reach the Earth's surface.

Flush: 1. To open a cold-water tap to clear out all the water which may have been sitting for a long time in the pipes. In new homes, to flush a system means to send large volumes of water gushing through the unused pipes to remove loose particles of solder and flux. 2. To force large amounts of water through liquid to clean out piping or tubing, storage or process tanks.

Fly Ash: Non-combustible residual particles expelled by flue gas.

Fogging: Applying a pesticide by rapidly heating the liquid chemical so that it forms very fine droplets that resemble smoke or fog. Used to destroy mosquitoes, black flies, and similar pests.

Food Chain: A sequence of organisms, each of which uses the next, lower member of the sequence as a food source.

Formaldehyde: A colorless, pungent, and irritating gas, CH20, used chiefly as a disinfectant and preservative and in synthesizing other compounds like resins.

Formulation: The substances comprising all active and inert ingredients in a pesticide.

Fresh Water: Water that generally contains less than 1,000 milligrams-per-liter of dissolved solids,

Friable Asbestos: Any material containing more than one percent asbestos, and that can be crumbled or reduced to powder by hand pressure. (May include previously non-friable material which becomes broken or damaged by mechanical force.)

Friable: Capable of being crumbled, pulverized, or reduced to powder by hand pressure.

Fuel Economy Standard: The Corporate Average Fuel Economy Standard (CAFE) effective in 1978. It enhanced the national fuel conservation effort imposing a miles-per-gallon floor for motor vehicles.

Fugitive Emissions: Emissions not caught by a capture system.

Fume: Tiny particles trapped in vapor in a gas stream.

Fumigant: A pesticide vaporized to kill pests. Used in buildings and greenhouses.

Functional Equivalent: Term used to describe EPA's decision-making process and its relationship to the environmental review conducted under the National Environmental Policy Act (NEPA). A review is considered functionally equivalent when it addresses the substantive components of a NEPA review.

Fungi: (Singular: Fungus) Molds, mildews, yeasts, mushrooms, and puffballs, a group organisms lacking in chlorophyll (i.e., are not photosynthetic) and which are usually non-mobile, filamentous, and multicellular. Some grow in soil, others attach themselves to decaying trees and other plants whence they obtain nutrients. Some are pathogens, others stabilize sewage and digest composted waste.

Fungicide: Pesticides which are used to control, deter, or destroy fungi.

Fungistat: A chemical that keeps fungi from growing.

Furrow Irrigation: Irrigation method in which water travels through the field by means of small channels between each row or groups of rows.

Future Liability: Refers to potentially responsible parties' obligations to pay for additional response activities beyond those specified in the Record of Decision or Consent Decree.

G

Game Fish: Species like trout, salmon, or bass, caught for sport. Many of them show more sensitivity to environmental change than "rough" fish.

Garbage: Animal and vegetable waste resulting from the handling, storage, sale, preparation, cooking, and serving of foods.

Gas Chromatograph/Mass Spectrometer: Highly sophisticated instrument that identifies the molecular composition and concentrations of various chemicals in water and soil samples.

Gasification: Conversion of solid material such as coal into a gas for use as a fuel.

Gasoline Volatility: The property of gasoline whereby it evaporates into a vapor. Gasoline vapor is a volatile organic compound.

General Permit: A permit applicable to a class or category of dischargers.

General Reporting Facility: A facility having one or more hazardous chemicals above the 10,000 pound threshold for planning quantities. Such facilities must file MSDS and emergency inventory information with the SERC and LEPC and local fire departments.

Generator: 1. A facility or mobile source that emits pollutants into the air or releases hazardous waste into water or soil. 2. Any person, by site, whose act or process produces regulated medical waste or whose act first causes such waste to become subject to regulation. In a case where more than one person (e.g., doctors with separate medical practices) is located in the same building, each business entity is a separate generator.

Genetic Engineering: A process of inserting new genetic information into existing cells in order to modify any organism for the purpose of changing one of its characteristics.

Geographic Information System (GIS): A computer system designed for storing, manipulating, analyzing, and displaying data in a geographic context.

Germicide: Any compound that kills disease-causing microorganisms.

Glovebag: A polyethylene or polyvinyl chloride bag-like enclosure affixed around an asbestos-containing source (most often thermal system insulation) permitting the material to be removed while minimizing release of airborne fibers in the surrounding atmosphere.

Grain Loading: The rate at which particles are emitted from a pollution source. Measurement is made by the number of grains per cubic foot of gas emitted.

Granular Activated Carbon Treatment: A filtering system often used in small water systems and individual homes to remove organics. GAC can be highly effective in removing elevated levels of radon from water.

Grassed Waterway: Natural or constructed watercourse or outlet that is shaped or graded and established in suitable vegetation for the disposal of runoff water without erosion.

Gray Water: Domestic wastewater composed of wash water from kitchen, bathroom, and laundry sinks, tubs, and washers.

Greenhouse Effect: The warming of the Earth's atmosphere attributed to a build-up of carbon dioxide or other gases; some scientists think that this build-up allows the sun's rays to heat the Earth, while infra-red radiation makes the atmosphere opaque to a counterbalancing loss of heat.

Grinder Pump: A mechanical device that shreds solids and raises sewage to a higher elevation through pressure sewers.

Ground Cover: Plants grown to keep soil from eroding.

Ground Water: The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

Ground-Water Discharge: Ground water entering near coastal waters which has been contaminated by landfill leachate, deep well injection of hazardous wastes, septic tanks, etc.

Gully Erosion: Severe erosion in which trenches are cut to a depth greater than 30 centimeters (a foot). Generally, ditches deep enough to cross with farm equipment are considered gullies.

H

Habitat: The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living.

Habitat Indicator: A physical attribute of the environment measured to characterize conditions necessary to support an organism, population, or community in the absence of pollutants, e.g., salinity of estuarine waters or substrate type in streams or lakes.

Half-Life: 1. The time required for a pollutant to lose half its affect on the environment. For example, the biochemical half-life of DDT in the environment is 15 years of Radium. 1,580 years. 2. The time required for half of the atoms of a radioactive element to undergo self-transmutation or decay. 3. The time required for the elimination of one half a total dose from the body.

Halon: Bromine-containing compounds with long atmospheric lifetimes whose breakdown in the stratosphere causes depletion of ozone. Halons are used in fire-fighting.

Hammermill: A high-speed machine that uses hammers and cutters to crush, grind, chip, or shred solid waste.

Hard Water: Alkaline water containing dissolved salts that interfere with some industrial processes and prevent soap from sudsing.

Hauler: Garbage collection company that offers complete refuse removal service; many also will also collect recyclables.

Hazard Communication Standard: An OSHA regulation that requires chemical manufacturers, suppliers, and importers to assess the hazards of the chemicals that they make, supply, or import, and to inform employers, customers, and workers of these hazards through MSDS sheets.

Hazardous Air Pollutants: Air pollutants which are not covered by ambient air quality standards but which, as defined in the Clean Air Act, may reasonably be expected to cause or contribute to irreversible illness or death. Such pollutants include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides, and vinyl chloride.

Hazardous Chemical: An EPA designation for any hazardous material requiring an MSDS under OSHA's Hazard Communication Standard. Such substances are capable of producing fires and explosions or adverse health effects like cancer and dermatitis. Hazardous chemicals are distinct from hazardous waste.(See: Hazardous Waste.)

Hazardous Ranking System: The principle screening tool used by EPA to evaluate risks to public health and the environment associated with abandoned or uncontrolled hazardous waste sites. The HRS calculates a score based on the potential of hazardous substances spreading from the site through the air, surface water, or ground water, and on other factors such as density and proximity of human population. This score is the primary factor in deciding if the site should be on the National Priorities List and, if so, what ranking it should have compared to other sites on the list.

Hazardous Substance: 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. 2. Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or if otherwise released into the environment.

Hazardous Waste: By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

Hazardous Waste Landfill: An excavated or engineered site where hazardous waste is deposited and covered.

Hazards Analysis: Procedures used to (1) identify potential sources of release of hazardous materials from fixed facilities or transportation accidents; (2) determine the vulnerability of a geographical area to a release of hazardous materials; and (3) compare hazards to determine which present greater or lesser risks to a community.

Hazards Identification: Providing information on which facilities have extremely hazardous substances, what those chemicals are, how much there is at each facility, how the chemicals are stored, and whether they are used at high temperatures.

Health Assessment: An evaluation of available data on existing or potential risks to human health posed by a Superfund site. The Agency for Toxic Substances and Disease Registry (ATSDR) of the Department of Health and Human Services (DHHS) is required to perform such an assessment at every site on the National Priorities List.

Heat Island Effect: A "dome" of elevated temperatures over an urban area caused by structural and pavement heat fluxes, and pollutant emissions.

Heavy Metals: Metallic elements with high atomic weights, e.g., mercury, chromium, cadmium, arsenic, and lead; can damage living things at low concentrations and tend to accumulate in the food chain.

Heptachlor: An insecticide that was banned on some food products in 1975 and all of them 1978. It was allowed for use in seed treatment until 1983. More recently it was found in milk and other dairy products in Arkansas and Missouri where dairy cattle were illegally fed treated seed.

Herbicide: A chemical pesticide designed to control or destroy plants, weeds, or grasses.

Herbivore: An animal that feeds on plants.

Heterotrophic Organisms: Species that are dependent on organic matter for food.

High-Density Polyethylene: A material used to make plastic bottles and other products that produces toxic fumes when burned.

High-Level Radioactive Waste (HLW): Waste generated in core fuel of a nuclear reactor, found at nuclear reactors or by nuclear fuel reprocessing; is a serious threat to anyone who comes near the waste without shielding. (See: low-level radioactive waste.)

High-Level Nuclear Waste Facility: Plant designed to handle disposal of used nuclear fuel, high-level radioactive waste, and plutonium waste.

Holding Pond: A pond or reservoir, usually made of earth, built to store polluted runoff.

Homeowner Water System: Any water system which supplies piped water to a single residence.

Homogeneous Area: In accordance with Asbestos Hazard and Emergency Response Act (AHERA) definitions, an area of surfacing materials, thermal surface insulation, or miscellaneous material that is uniform in color and texture.

Hood Capture Efficiency: Ratio of the emissions captured by a hood and directed into a control or disposal device, expressed as a percent of all emissions.

Host: 1. In genetics, the organism, typically a bacterium, into which a gene from another organism is transplanted. 2. In medicine, an animal infected or parasitized by another organism.

Household Waste (Domestic Waste): Solid waste, composed of garbage and rubbish, which normally originated in a private home or apartment house. Domestic waste may contain a significant amount of toxic or hazardous waste.

Hydraulic Gradient: In general, the direction of groundwater flow due to changes in the depth of the water table.

Hydrocarbons (HC): Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulfide (HS): Gas emitted during organic decomposition. Also a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Hydrogeology: The geology of ground water, with particular emphasis on the chemistry and movement of water.

Hydrology: The science dealing with the properties,distribution, and circulation of water.

Hypolimnion: Bottom waters of a thermally stratified lake., The hypolimnion of a eutrophic lake is usually low or lacking in oxygen.

I

Identification Code or EPA I.D. Number: The unique code assigned to each generator, transporter, and treatment, storage, or disposal facility by regulating agencies to facilitate identification and tracking of chemicals or hazardous waste.

Ignitable: Capable of burning or causing a fire.

Immediately Dangerous to Life and Health (IDLH): The maximum level to which a healthy individual can be exposed to a chemical for 30 minutes and escape without suffering irreversible health effects or impairing symptoms. Used as a "level of concern." (See: level of concern.)

Impoundment: A body of water or sludge confined by a dam, dike, floodgate, or other barrier.

Incident Command Post: A facility located at a safe distance from an emergency site, where the incident commander, key staff, and technical representatives can make decisions and deploy emergency manpower and equipment.

Incident Command System (ICS): The organizational arrangement wherein one person, normally the Fire Chief of the impacted district, is in charge of an integrated, comprehensive emergency response organization and the emergency incident site, backed by an Emergency Operations Center staff with resources, information, and advice.

Incineration: A treatment technology involving destruction of waste by controlled burning at high temperatures, e.g., burning sludge to remove the water and reduce the remaining residues to a safe, non-burnable ash that can be disposed of safely on land, in some waters, or in underground locations.

Incineration at Sea: Disposal of waste by burning at sea on specially-designed incinerator ships.

Incinerator: A furnace for burning waste under controlled conditions.

Incompatible Waste: A waste unsuitable for mixing with another waste or material because it may react to form a hazard.

Indicator: In biology, an organism, species, or community whose characteristics show the presence of specific environmental conditions, good or bad.

Indirect Discharge: Introduction of pollutants from a non-domestic source into a publicly owned waste-treatment system. Indirect dischargers can be commercial or industrial facilities whose wastes enter local sewers.

Indoor Air: The breathing air inside a habitable structure or conveyance.

Indoor Air Pollution: Chemical, physical, or biological contaminants in indoor air.

Indoor Climate: Temperature, humidity, lighting, and noise levels in a habitable structure or conveyance. Indoor climate can affect indoor air pollution.

Industrial Pollution Prevention: Combination of industrial source reduction and toxic chemical use substitution

Industrial Source Reduction: Practices that reduce the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment; Also reduces the threat to public health and the environment associated with such releases. Term includes equipment or technology modifications, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control.

Industrial Waste: Unwanted materials from an industrial operation; may be liquid, sludge, solid, or hazardous waste.

Inert Ingredient: Pesticide components such as solvents, carriers, dispersants,and surfactants that are not active against target pests. Not all inert ingredients are innocuous.

Inertial Separator: A device that uses centrifugal force to separate waste particles.

Infectious Agent: Any organism, such as a virus or bacterium, that is pathogenic and capable of being communicated by invasion and multiplication in body tissues.

Infectious Waste: Hazardous waste with infectious characteristics, including: contaminated animal waste; human blood and blood products; isolation waste, pathological waste; and discarded sharps (needles, scalpels or broken medical instruments.)

Infiltration: 1. The penetration of water through the ground surface into sub-surface soil or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls. 2. The technique of applying large volumes of waste water to land to penetrate the surface and percolate through the underlying soil. (See: percolation.)

Infiltration Rate: The quantity of water than can enter the soil in a specified time interval.

Inflow: Entry of extraneous rain water into a sewer system from sources other than infiltration, such as basement drains, manholes, storm drains, and street washing.

Influent: Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment plant.

Information File: In the Superfund program, a file that contains accurate, up-to-date documents on a Superfund site. The file is usually located in a public building (school, library, or city hall) convenient for local residents.

Injection Well: A well into which fluids are injected for purposes such as waste disposal, improving the recovery of crude oil, or solution mining.

Injection Zone: A geological formation receiving fluids through a well.

Innovative Technologies: New or inventive methods to treat effectively hazardous waste and reduce risks to human health and the environment.

Inoculum: 1. Bacterium placed in compost to start biological action. 2. A medium containing organisms that is introduced into cultures or living organisms.

Inorganic Chemicals: Chemical substances of mineral origin, not of basically carbon structure.

Insecticide: A pesticide compound specifically used to kill or prevent the growth of insects.

Inspection and Maintenance (I/M): 1. Activities to assure that vehicles' emissions-controls work properly. 2. Also applies to wastewater treatment plants and other anti-pollution facilities and processes.

Instream Use: Water use taking place within a stream channel, e.g., hydro-electric power generation, navigation, water quality improvement, fish propagation, recreation.

In-Situ Stripping: Treatment system that remove or "strips" volatile organic compounds from contaminated ground or surface water by forcing an airstream through the water and causing the compounds to evaporate.

Integrated Pest Management (IPM): A mixture of chemical and other, non-pesticide, methods to control pests.

Integrated Waste Management: Using a variety of practices to handle municipal solid waste; can include source reduction, recycling, incineration, and landfilling.

Interceptor Sewers: Large sewer lines that, in a combined system, control the flow of sewage to the treatment plant. In a storm, they allow some of the sewage to flow directly into a receiving stream, thus keeping it from overflowing onto the streets. Also used in separate systems to collect the flows from main and trunk sewers and carry them to treatment points.

Interim (Permit) Status: Period during which treatment, storage and disposal facilities coming under RCRA in 1980 are temporarily permitted to operate while awaiting a permanent permit. Permits issued under these circumstances are usually called "Part A" or "Part B" permits.

Interstate Carrier Water Supply: A source of water for drinking and sanitary use on planes, buses, trains, and ships operating in more than one state. These sources are federally regulated.

Interstate Commerce Clause: A clause of the U.S. Constitution which reserves to the federal government the right to regulate the conduct of business across state lines. Under this clause, for example, the U.S. Supreme Court has ruled that states may not inequitably restrict the disposal out-of-state wastes in their jurisdictions.

Interstate Waters: Waters that flow across or form part of state or international boundaries, e.g., the Great Lakes, the Mississippi River, or coastal waters.

Interstitial Monitoring: The continuous surveillance of the space between the walls of an underground storage tank.

Inventory (TSCA): Inventory of chemicals produced pursuant to Section 8 (b) of the Toxic Substances Control Act.

Inversion: A layer of warm air preventing the rise of cooling air and pollutants trapped beneath it. Can cause an air pollution episode.

Ion: An electrically charged atom that can be drawn from waste water during electrodialysis.

Ion Exchange Treatment: A common water-softening method often found on a large scale at water purification plants that remove some organics and radium by adding calcium oxide or calcium hydroxide to increase the ph to a level where the metals will precipitate out.

Ionization Chamber: A device that measures the intensity of ionizing radiation.

Ionizing Radiation: Radiation that can strip electrons from atoms, i.e., alpha, beta, and gamma radiation.

Irradiated Food: Food subject to brief radioactivity, usually gamma rays, to kill insects, bacteria, and mold, and to permit storage without refrigeration.

Irradiation: Exposure to radiation of wavelengths shorter than those of visible light (gamma, x-ray, or ultraviolet), for medical purposes, to sterilize milk or other foodstuffs, or to induce polymerization of monomers or vulcanization of rubber.

Irrigation: Applying water or wastewater to land areas to supply the water and nutrient needs of plants.

Irrigation Efficiency: The amount of water stored in the crop root zone compared to the amount of irrigation water applied.

Irrigation Return Flow: Surface and subsurface water which leaves the field following application of irrigation water.

Irritant: A substance that can cause irritation of the skin, eyes, or respiratory system. Effects may be acute from a single high level exposure, or chronic from repeated low-level exposures to such compounds as chlorine, nitrogen dioxide, and nitric acid.

Isotope: A variation of an element that has the same atomic number of protons but a different weight because of the number of neutrons. Various isotopes of the same element may have different radioactive behaviors, some are highly unstable..

K

Karst: A geologic formation of irregular limestone deposits with sinks, underground streams, and caverns.

Kinetic Rate Coefficient: A number that describes the rate at which a water constituent such as a biochemical oxygen demand or dissolved oxygen rises or falls.

L

Lagoon: 1. A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storage of wastewater or spent nuclear fuel rods. 2. Shallow body of water, often separated from the sea by coral reefs or sandbars.

Land Application: Discharge of wastewater onto the ground for treatment or reuse. (See: irrigation.)

Land Ban: Phasing out of land disposal of most untreated hazardous wastes, as mandated by the 1984 RCRA amendments.

Land Farming (of waste): A disposal process in which hazardous waste deposited on or in the soil is degraded naturally by microbes.

Landfills: 1. Sanitary landfills are disposal sites for non-hazardous solid wastes spread in layers, compacted to the smallest practical volume, and covered by material applied at the end of each operating day. 2. Secure chemical landfills are disposal sites for hazardous waste, selected and designed to minimize the chance of release of hazardous substances into the environment.

Landscape: The traits, patterns, and structure of a specific geographic area, including its biological composition, its physical environment, and its anthropogenic or social patterns. An area where interacting ecosystems are grouped and repeated in similar form.

Landscape Characterization: Documentation of the traits and patterns of the essential elements of the landscape.

Landscape Ecology: The study of the distribution patterns of communities and ecosystems, the ecological processes that affect those patterns, and changes in pattern and process over time.

Landscape Indicator: A measurement of the landscape, calculated from mapped or remotely sensed data, used to describe spatial patterns of land use and land cover across a geographic area. Landscape indicators may be useful as measures of certain kinds of environmental degradation such as forest fragmentation.

Large Quantity Generator: Person or facility generating more than 2200 pounds of hazardous waste per month. Such generators produce about 90 percent of the nation's hazardous waste, and are subject to all RCRA requirements.

Lateral Sewers: Pipes that run under city streets and receive the sewage from homes and businesses, as opposed to domestic feeders and main trunk lines.

LC50/Lethal Concentration: Median level concentration, a standard measure of toxicity. It tells how much of a substance is needed to kill half of a group of experimental organisms in a given time. (See: LD50.)

LD 50/ Lethal Dose: The dose of a toxicant that will kill 50 percent of the test organisms within a designated period. The lower the LD 50, the more toxic the compound.

Leachate: Water that collects contaminants as it trickles through wastes, pesticides or fertilizers. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil.

Leachate Collection System: A system that gathers leachate and pumps it to the surface for treatment.

Leaching: The process by which soluble constituents are dissolved and filtered through the soil by a percolating fluid. (See: leachate.)

Lead (Pb): A heavy metal that is hazardous to health if breathed or swallowed. Its use in gasoline, paints, and plumbing compounds has been sharply restricted or eliminated by federal laws and regulations. (See: heavy metals.)

Level of Concern (LOC): The concentration in air of an extremely hazardous substance above which there may be serious immediate health effects to anyone exposed to it for short periods **Lift:** In a sanitary landfill, a compacted layer of solid waste and the top layer of cover material.

Lifting Station: (See: pumping station.)

Limestone Scrubbing: Use of a limestone and water solution to remove gaseous stack-pipe sulfur before it reaches the atmosphere.

Limited Degradation: An environmental policy permitting some degradation of natural systems but terminating at a level well beneath an established health standard.

Limiting Factor: A condition whose absence or excessive concentration, is incompatible with the needs or tolerance of a species or population and which may have a negative influence on their ability to thrive. survive.

Limnology: The study of the physical, chemical, hydrological, and biological aspects of fresh water bodies.

Liner: 1. A relatively impermeable barrier designed to keep leachate inside a landfill. Liner materials include plastic and dense clay. 2. An insert or sleeve for sewer pipes to prevent leakage or infiltration.

Lipid Solubility: The maximum concentration of a chemical that will dissolve in fatty substances. Lipid soluble substances are insoluble in water. They will very selectively disperse through the environment via uptake in living tissue.

Liquefaction: Changing a solid into a liquid.

Liquid Injection Incinerator: Commonly used system that relies on high pressure to prepare liquid wastes for incineration breaking them up into tiny droplets to allow easier combustion.

List: Shorthand term for EPA list of violating facilities or firms debarred from obtaining government contracts because they violated certain sections of the Clean Air or Clean Water Acts. The list is maintained by The Office of Enforcement and Compliance Monitoring.

Listed Waste: Wastes listed as hazardous under RCRA but which have not been subjected to the Toxic Characteristics Listing Process because the dangers they present are considered self-evident.

Litter: The highly visible portion of solid waste carelessly discarded outside the regular garbage and trash collection and disposal system.

Local Education Agency (LEA): In the asbestos program, an educational agency at the local level that exists primarily to operate schools or to contract for educational services, including primary and secondary public and private schools. A single, unaffiliated school can be considered an LEA for AHERA purposes.

Local Emergency Planning Committee (LEPC): A committee appointed by the state emergency response commission, as required by SARA Title III, to formulate a comprehensive emergency plan for its jurisdiction.

Low NO^x Burners: One of several combustion technologies used to reduce emissions of Nitrogen Oxides (NO^x.)

Low-Level Radioactive Waste (LLRW): Wastes less hazardous than most of those associated with nuclear reactor; generated by hospitals, research laboratories, and certain industries. The Department of Energy, Nuclear Regulatory Commission, and EPA share responsibilities for managing them. (See: high-level radioactive wastes.)

Lower Explosive Limit (LEL): The concentration of a compound in air below which the mixture will not catch on fire.

Lowest Achievable Emission Rate: Under the Clean Air Act, the rate of emissions that reflects (a) the most stringent emission limitation in the implementation plan of any state for such source unless the owner or operator demonstrates such limitations are not achievable; or (b) the most stringent emissions limitation achieved in practice, whichever is more stringent. A proposed new or modified source may not emit pollutants in excess of existing new source standards.

M

Magnetic Separation: Use of magnets to separate ferrous materials from mixed municipal waste stream.

Mandatory Recycling: Programs which by law require consumers to separate trash so that some or all recyclable materials are recovered for recycling rather than going to landfills.

Manual Separation: Hand sorting of reyclable or compostable materials in waste.

Major Modification: This term is used to define modifications of major stationary sources of emissions with respect to Prevention of Significant Deteriotation and New Source Review under the Clean Air Act.

Major Stationary Sources: Term used to determine the applicability of Prevention of Significant Deterioration and new source regulations. In a nonattainment area, any stationary pollutant source with potential to emit more than 100 tons per year is considered a major stationary source. In PSD areas the cutoff level may be either 100 or 250 tons, depending upon the source.

Majors: Larger publicly owned treatment works (POTWs) with flows equal to at least one million gallons per day (mgd) or servicing population equivalent to 10,000 persons; certain other POTWs having significant water quality impacts. (See: minors.)

Management Plan: Under the Asbestos Hazard Emergency Response Act (AHERA), a document that each Local Education Agency is required to prepare, describing all activities planned and undertaken by a school to comply with AHERA regulations, including building inspections to identify asbestos-containing materials, response actions, and operations and maintenance programs to minimize the risk of exposure.

Manifest System: Tracking of hazardous waste from "cradle to grave" (generation through disposal) with accompanying documents known as manifests.(See: Cradle to Grave.)

Manual Separation: Hand separation of compostable or recyclable material from waste.

Manufacturers Formulation: A list of substances or component parts as described by the maker of a coating, pesticide, or other product containing chemicals or other substances.

Marine Sanitation Device: Any equipment or process installed on board a vessel to receive, retain, treat, or discharge sewage.

Marsh: A type of wetland that does not accumulate appreciable peat deposits and is dominated by herbaceous vegetation. Marshes may be either fresh or saltwater, tidal or non-tidal. (See: wetlands.)

Material Category: In the asbestos program, broad classification of materials into thermal surfacing insulation, surfacing material, and miscellaneous material.

Materials Recovery Facility: A facility that processes residentially collected mixed recyclables into new products available for market.

Material Type is classification of suspect material by its specific use or application, e.g., pipe insulation, fireproofing, and floor tile.

Material Safety Data Sheet (MSDS): A compilation of information required under the OSHA Communication Standard on the identity of hazardous chemicals, health, and physical hazards, exposure limits, and precautions. Section 311 of SARA requires facilities to submit MSDSs under certain circumstances.

Materials Recovery Facility (MRF): Facility that processes residentially collected mixed recyclables into new products.

Maximum Contaminant Level: The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards.

Maximum Contaminant Level Goal (MCLG): Under the Safe Drinking Water Act, a non-enforceable concentration of a drinking water contaminant, set at the level at which no known or anticipated adverse effects on human health occur and which allows an adequate safety margin. The MCLG is usually the starting point for determining the regulated Maximum Contaminant Level. (See; Maximum Contaminant Level.)

Mechanical Aeration: Use of mechanical energy to inject air into water to cause a waste stream to absorb oxygen.

Mechanical Separation: Using mechanical means to separate waste into various components.

Mechanical Turbulence: Random irregularities of fluid motion in air caused by buildings or other non-thermal, processes.

Media: Specific environments-air, water, soil-which are the subject of regulatory concern and activities.

Medical Surveillance: A periodic comprehensive review of a worker's health status; acceptable elements of such surveillance program are listed in the Occupational Safety and Health Administration standards for asbestos.

Medical Waste: Any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding hazardous waste identified or listed under 40 CFR Part 261 or any household waste as defined in 40 CFR Sub-section 261.4 (b)(1)).

Mercury: A heavy metal that can accumulate in the environment and is highly toxic if breathed or swallowed. (See: heavy metals.)

Metabolites: Any substances produced by biological processes, such as those from pesticides.

Methane: A colorless, nonpoisonous, flammable gas created by anaerobic decomposition of organic compounds.

Method 18: An EPA test method which uses gas chromatographic techniques to measure the concentration of volatile organic compounds in a gas stream.

Method 24: An EPA reference method to determine density, water content and total volatile content (water and VOC) of coatings.

Method 25: An EPA reference method to determine the VOC concentration in a gas stream.

Microclimate: The localized climate conditions with in an urban area or neighborhood.

Microbial Pesticide: A microorganism that is used to control a pest, but of minimum toxicity to man.

Million-gallons Per Day (MGD): A measure of water flow.

Minimization: A comprehensive program to minimize or eliminate wastes, usually applied to wastes at their point of origin. (See: waste minimization.)

Minors: Publicly owned treatment works with flows less than 1 million gallons per day. (See: majors.)

Miscellaneous ACM: Interior asbestos-containing building material or structural components, members or fixtures, such as floor and ceiling tiles; does not include surfacing materials or thermal system insulation.

Miscellaneous materials: Interior building materials on structural components, such as floor or ceiling tiles.

Miscible Liquids: Two or more liquids that can be mixed and will remain mixed under normal conditions.

Missed Detection: The situation that occurs when a test indicates that a tank is "tight" when in fact it is leaking.

Mist: Liquid particles measuring 40 to 500 microns, are formed by condensation of vapor. By comparison, fog particles are smaller than 40 microns.

Mitigation: Measures taken to reduce adverse impacts on the environment.

Mixed Funding: Settlements in which potentially responsible parties and EPA share the cost of a response action.

Mixed Liquor: A mixture of activated sludge and water containing organic matter undergoing activated sludge treatment in an aeration tank.

Mobile Incinerator Systems: Hazardous waste incinerators that can be transported from one site to another.

Mobile Source: Any non-stationary source of air pollution such as cars, trucks, motorcycles, buses, airplanes, locomotives.

Model Plant: A hypothetical plant design used for developing economic, environmental, and energy impact analyses as support for regulations or regulatory guidelines; first step in exploring the economic impact of a potential NSPS.

Molten Salt Reactor: A thermal treatment unit that rapidly heats waste in a heat-conducting fluid bath of carbonate salt.

Monitoring Well: 1. A well used to obtain water quality samples or measure groundwater levels. 2. Well drilled at a hazardous waste management facility or Superfund site to collect ground-water samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants in the ground water beneath the site.

Monitoring: Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

Monoclonal Antibodies: (Also called MABs and MCAs) 1. Man-made clones of a molecule, produced in quantity for medical or research purposes. 2. Molecules of living organisms that selectively find and attach to other molecules to which their structure conforms exactly. This could also apply to equivalent activity by chemical molecules.

Moratorium: During the negotiation process, a period of 60 to 90 days during which EPA and potentially responsible parties may reach settlement but no site response activities can be conducted.

Morbidity: Rate of disease incidence.

Muck Soils: Earth made from decaying plant materials.

Mulch: A layer of material (wood chips, straw, leaves, etc.) placed around plants to hold moisture, prevent weed growth, and enrich or sterilize the soil.

Multiple Use: Use of land for more than one purpose; i.e., grazing of livestock, watershed and wildlife protection, recreation, and timber production. Also applies to use of bodies of water for recreational purposes, fishing, and water supply.

Multistage Remote Sensing: A strategy for landscape characterization that involves gathering and analyzing information at several geographic scales, ranging from generalized levels of detail at the national level through high levels of detail at the local scale.

Municipal Discharge: Discharge of effluent from waste water treatment plants which receive waste water from households, commercial establishments, and industries in the coastal drainage basin. Combined sewer/separate storm overflows are included in this category.

N

National Ambient Air Quality Standards (NAAQS): Standards established by EPA that apply for outside air throughout the country. (See: criteria pollutants, state implementation plans, emissions trading.)

National Emissions Standards For Hazardous Air Pollutants (NESHAPS): Emissions standards set by EPA for an air pollutant not covered by NAAQS that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare (e.g., building facades, visibility, crops, and domestic animals).

National Estuary Program: A program established under the Clean Water Act Amendments of 1987 to develop and implement conservation and management plans for protecting estuaries and restoring and maintaining their chemical, physical, and biological integrity, as well as controlling point and nonpoint pollution sources.

National Municipal Plan: A policy created in 1984 by EPA and the states in 1984 to bring all publicly owned treatment works (POTWs) into compliance with Clean Water Act requirements.

National Oil and Hazardous Substances Contingency Plan (NOHSCP/NCP): The federal regulation that guides determination of the sites to be corrected under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere.

National Pollutant Discharge Elimination System (NPDES): A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

National Priorities List (NPL): EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

National Response Team (NRT): Representatives of 13 federal agencies that, as a team, coordinate federal responses to nationally significant incidents of pollution-an oil spill, a major chemical release, or a Superfund response action-and provide advice and technical assistance to the responding agency(ies) before and during a response action.

National Response Center: The federal operations center that receives notifications of all releases of oil and hazardous substances into the environment; open 24 hours a day, is operated by the U.S. Coast Guard, which evaluates all reports and notifies the appropriate agency.

Navigable Waters: Traditionally, waters sufficiently deep and wide for navigation by all, or specified vessels; such waters in the United States come under federal jurisdiction and are protected by certain provisions of the Clean Water Act.

Necrosis: Death of plant or animal cells or tissues. In plants, necrosis can discolor stems or leaves or kill a plant entirely.

Negotiations: (Under Superfund) After potentially responsible parties are identified for a site, EPA coordinates with them to reach a settlement that will result in the PRP paying for or conducting the cleanup under EPA supervision. If negotiations fail, EPA can order the PRP to conduct the cleanup or EPA can pay for the cleanup using Superfund monies and then sue to recover the costs.

Nematocide: A chemical agent which is destructive to nematodes.

Neutralization: Decreasing the acidity or alkalinity of a substance by adding alkaline or acidic materials, respectively.

New Source Performance Standards (NSPS): Uniform national EPA air emission and water effluent standards which limit the amount of pollution allowed from new sources or from modified existing sources.modified.

New Source: Any stationary source built or modified after publication of final or proposed regulations that prescribe a given standard of performance.

Nitrate: A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals.

Nitric Oxide (NO): A gas formed by combustion under high temperature and high pressure in an internal combustion engine; changes into nitrogen dioxide in the ambient air and contributes to photochemical smog.

Nitrification: The process whereby ammonia in wastewater is oxidized to nitrite and then to nitrate by bacterial or chemical reactions.

Nitrilotriacetic Acid (NTA): A compound now replacing phosphates in detergents.

Nitrite: 1. An intermediate in the process of nitrification. 2. Nitrous oxide salts used in food preservation

Nitrogen Dioxide (NO_2): The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxide (NO_x): Product of combustion from transportation and stationary sources and a major contributor to the formation of ozone in the troposphere and to acid deposition.

Nitrogenous Wastes: Animal or vegetable residues that contain significant amounts of nitrogen.

Nitrophenols: Synthetic organopesticides containing carbon, hydrogen, nitrogen, and oxygen.

No Further Remedial Action Planned: Determination made by EPA following a preliminary assessment that a site does not pose a significant risk and so requires no further activity under CERCLA.

Noise: Product-level or product-volume changes occurring during a test that are not related to a leak but may be mistaken for one.

Non-Attainment Area: Area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Non-Binding Allocations of Responsibility (NBAR): Process for EPA to propose a way for potentially responsible parties to allocate costs among themselves.

Non-Community Water System: A public water system that is not a community water system, e.g., the water supply at a camp site or national park.

Non-Conventional Pollutant: Any pollutant not statutorily listed or which is poorly understood by the scientific community.

No Further Remedial Action Planned: Determination made by EPA following a preliminary assessment that a site does not pose a significant risk and so requires no further activity under CERCLA.

Non-Point Source: Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

Non-Contact Cooling Water: Water used for cooling which does not come into direct contact with any raw material, product, byproduct, or waste.

Non-degradation: An environmental policy which disallows any lowering of naturally occurring quality regardless of established health standards.

Non-ionizing Electromagnetic Radiation: 1. Radiation that does not change the structure of atoms but does heat tissue and may cause harmful biological effects. 2. Microwaves, radio waves, and low-frequency electromagnetic fields from high-voltage transmission lines.

Nondischarging Treatment Plant: A treatment plant that does not discharge treated wastewater into any stream or river. Most are pond systems that dispose of the total flow they receive by means of evaporation or percolation to groundwater, or facilities that dispose of their effluent by recycling or reuse (e.g., spray irrigation or groundwater discharge).

Nonfriable Asbestos-containing Materials: Any material containing more than one percent asbestos (as determined by Polarized Light Microscopy) that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Non-Road Emissions: Pollutants emitted by combustion engines on farm and construction equipment, gasoline-powered lawn and garden equipment, and power boats and outboard motors.

Notice of Deficiency: An EPA request to a facility owner or operator requesting additional information before a preliminary decision on a permit application can be made.

Notice of Intent to Deny: Notification by EPA of its preliminary intent to deny a permit application.

No Till: Planting crops without prior seedbed preparation, into an existing cover crop, sod, or crop residues, and eliminating subsequent tillage operations.

Nuclear Reactors and Support Facilities: Uranium mills, commercial power reactors, fuel reprocessing plants, and uranium enrichment facilities.

Nuclear Winter: Prediction by some scientists that smoke and debris rising from massive fires of a nuclear war could block sunlight for weeks or months, cooling the earth's surface and producing climate changes that could, for example, negatively effect world agricultural and weather patterns.

Nutrient: Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.

O

Ocean Discharge Waiver: A variance from Clean Water Act requirements for discharges into marine waters.

Off-Site Facility: A hazardous waste treatment, storage or disposal area that is located away from the generating site.

Oil Fingerprinting: A method that identifies sources of oil and allows spills to be traced to their source.

Oil Spill: An accidental or intentional discharge of oil which reaches bodies of water. Can be controlled by chemical dispersion, combustion, mechanical containment, and/or adsorption. Spills from tanks and pipelines can also occur away from water bodies, contaminating the soil, getting into sewer systems and threatening underground water sources.

Oligotrophic Lakes: Deep clear lakes with few nutrients, little organic matter and a high dissolved-oxygen level.

On-Scene Coordinator (OSC): The predesignated EPA, Coast Guard, or Department of Defense official who coordinates and directs Superfund removal actions or Clean Water Act oil-or hazardous-spill response actions.

On-Site Facility: A hazardous waste treatment, storage or disposal area that is located on the generating site.

Onboard Controls: Devices placed on vehicles to capture gasoline vapor during refueling and route it to the engines when the vehicle is starting so that it can be efficiently burned.

Opacity: The amount of light obscured by particulate pollution in the air; clear window glass has zero opacity, a brick wall is 100 percent opaque. Opacity is an indicator of changes in performance of particulate control systems.

Open Burning: Uncontrolled fires in an open dump.

Open Dump: An uncovered site used for disposal of waste without environmental controls. (See: dump.)

Operable Unit: Term for each of a number of separate activities undertaken as part of a Superfund site cleanup. A typical operable unit would be removal of drums and tanks from the surface of a site.

Operating Conditions: Conditions specified in a RCRA permit that dictate how an incinerator must operate as it burns different waste types. A trial burn is used to identify operating conditions needed to meet specified performance standards.

Operation And Maintenance: 1. Activities conducted after a Superfund site action is completed to ensure that the action is effective. 2. Actions taken after construction to assure that facilities constructed to treat waste water will be properly operated and maintained to achieve normative efficiency levels and prescribed effluent limitations in an optimum manner. 3. Ongoing asbestos management plan in a school or other public building, including regular inspections, various methods of maintaining asbestos in place, and removal when necessary.

Oral Toxicity: Ability of a pesticide to cause injury when ingested.

Organic: 1. Referring to or derived from living organisms. 2. In chemistry, any compound containing carbon.

Organic Chemicals/Compounds: Animal or plant-produced substances containing mainly carbon, hydrogen, nitrogen, and oxygen.

Organic Matter: Carbonaceous waste contained in plant or animal matter and originating from domestic or industrial sources.

Organophosphates: Pesticides that contain phosphorus; short-lived, but some can be toxic when first applied.

Organotins: Chemical compounds used in anti-foulant paints to protect the hulls of boats and ships, buoys, and pilings from marine organisms such as barnacles.

Original AHERA Inspection/Original Inspection/Inspection: Examination of school buildings arranged by Local Education Agencies to identify asbestos-containing-materials, evaluate their condition, take samples of materials suspected to contain asbestos; performed by EPA-accredited inspectors

Original Generation Point: Where regulated medical or other material first becomes waste.

Outfall: The place where effluent is discharged into receiving waters.

Overburden: Rock and soil cleared away before mining.

Overfire Air: Air forced into the top of an incinerator or boiler to fan the flames.

Overland Flow: A land application technique that cleanses waste water by allowing it to flow over a sloped surface. As the water flows over the surface, contaminants are absorbed and the water is collected at the bottom of the slope for reuse.

Oversized Regulated Medical Waste: Medical waste that is too large for plastic bags or standard containers.

Overturn: One complete cycle of top to bottom mixing of previously stratified water masses. This phenomenon may occur in spring or fall, or after storms, and results in uniformity of chemical and physical properties of water at all depths.

Oxidant: A substance containing oxygen that reacts chemically in air to produce a new substance; the primary ingredient of photochemical smog.

Oxidation: The addition of oxygen that breaks down organic waste or chemicals such as cyanides, phenols, and organic sulfur compounds in sewage by bacterial and chemical means.

Oxidation Pond: A man-made body of water in which waste is consumed by bacteria, used most frequently with other waste-treatment processes; a sewage lagoon.

Oxygenated Fuels: Gasoline which has been blended with alcohols or ethers that contain oxygen in order to reduce carbon monoxide and other emissions.

Oxygenated Solvent: An organic solvent containing oxygen as part of the molecular structure. Alcohols and ketones are oxygenated compounds often used as paint solvents.

Ozone (O^3): Found in two layers of the atmosphere, the stratosphere and the troposphere. In the *stratosphere* (the atmospheric layer 7 to 10 miles or more above the earth's surface) ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation.In the *troposphere* (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component of photochemical smog. It can seriously impair the respiratory system and is one of the most widespread of all the criteria pollutants for which the Clean Air Act required EPA to set standards. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight.

Ozonator: A device that adds ozone to water.

Ozone Depletion: Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

Ozone Hole: Thinning break in the stratospheric ozone layer. Designation of amount of such depletion as a "ozone hole" is made when detected amount of depletion exceeds fifty percent. seasonal ozone holes have been observed over both the Antarctic region and the Arctic region and part of canada and the extreme northeastern United States.

P

Packaging: The assembly of one or more containers and any other components necessary to assure minimum compliance with a program's storage and shipment packaging requirements. Also, the containers, etc., involved.

Packed Bed Scrubber: An air pollution control device in which emissions pass through alkaline water to neutralize hydrogen chloride gas.

Packed Tower: A pollution control device that forces dirty air through a tower packed with crushed rock or wood chips while liquid is sprayed over the packing material. The pollutants in the air stream either dissolve or chemically react with the liquid.

Pandemic: A Widespread throughout an area, nation or the world.

Parameter: A variable, measurable property whose value is a determinant of the characteristics of a system; e.g., temperature, pressure, and density are parameters of the atmosphere.

Paraquat: A standard herbicide used to kill various types of crops, including marijuana.

Part A Permit, Part B Permit: (See: Interim Permit Status.)

Particulate Loading: The mass of particulates per unit volume of air or water.

Participation Rate: Portion of population participating in a recycling program.

Particulates: Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Partition Coefficient: Measure of the sorption phenomenon, whereby a pesticide is divided between the soil and water phase; also referred to as adsorption partition coefficient.

Parts Per Billion (ppb)/Parts Per Million (ppm): Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

Pathogens: Microorganisms that can cause disease in other organisms or in humans, animals and plants (e.g., bacteria, viruses, or parasites) found in sewage, in runoff from farms or rural areas populated with domestic and wild animals, and in water used for swimming. Fish and shellfish contaminated by pathogens, or the contaminated water itself, can cause serious illness.

Peak Electricity Demand: The maximum electricity used to meet the cooling load of a building or buildings in a given area.

Peak Levels: Levels of airborne pollutant contaminants much higher than average or occurring for short periods of time in response to sudden releases.

Percolation: The movement of water downward and radially through sub-surface soil layers, usually continuing downward to ground water; can also involve upward movement of water.

Performance Data (for incinerators): Information collected, during a trial burn, on concentrations of designated organic compounds and pollutants found in incinerator emissions. Data analysis must show that the incinerator meets performance standards under operating conditions specified in the RCRA permit. (See: trial burn; performance standards.)

Performance Standards: (1) Regulatory requirements limiting the concentrations of designated organic compounds, particulate matter, and hydrogen chloride in emissions from incinerators. (2) Operating standards established by EPA for various permitted pollution control systems, asbestos inspections, and various program operations and maintenance requirements.

Permeability: The rate at which liquids pass through soil or other materials in a specified direction.

Permit: An authorization, license, or equivalent control document issued by EPA or an approved state agency to implement the requirements of an environmental regulation; e.g., a permit to operate a wastewater treatment plant or to operate a facility that may generate harmful emissions.

Persistence: Refers to the length of time a compound stays in the environment, once introduced. A compound may persist for less than a second or indefinitely.

Persistent Pesticides: Pesticides that do not break down chemically or break down very slowly and remain in the environment after a growing season.

Personal Air Samples: Air samples taken with a pump is directly attached to the worker with the collecting filter and cassette placed in the worker's breathing zone (required under OSHA asbestos standards and EPA worker protection rule).

Pest: An insect, rodent, nematode, fungus, weed or other form of terrestrial or aquatic plant or animal life that is injurious to

Pesticide Tolerance: The amount of pesticide residue allowed by law to remain in or on a harvested crop. EPA sets these levels well below the point where the compounds might be harmful to consumers.

Pesticide: Substances or mixture there of intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.

Phenols: Organic compounds that are byproducts of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations cause taste and odor problems in water; higher concentrations can kill aquatic life and humans.

Phosphates: Certain chemical compounds containing phosphorus.

Phosphogypsum Piles (stacks): Principal byproduct generated in production of phosphoric acid from phosphate rock. These piles may generate radioactive radon gas.

Phosphorous Plants: Facilities using electric furnaces to produce elemental phosphorous for commercial use, such as high grade phosphoric acid, phosphate-based detergent, and organic chemicals use.

Phosphorus: An essential chemical food element that can contribute to the eutrophication of lakes and other water bodies. Increased phosphorus levels result from discharge of phosphorus-containing materials into surface waters.

Photochemical Oxidants: Air pollutants formed by the action of sunlight on oxides of nitrogen and hydrocarbons.

Photochemical Smog: Air pollution caused by chemical reactions of various pollutants emitted from different sources.

Photosynthesis: The manufacture by plants of carbohydrates and oxygen from carbon dioxide mediated by chlorophyll in the presence if sunlight.

Physical and Chemical Treatment: Processes generally used in large-scale wastewater treatment facilities. Physical processes may include air-stripping or filtration. Chemical treatment includes coagulation, chlorination, or ozonation. The term can also refer to treatment of toxic materials in surface and ground waters, oil spills, and some methods of dealing with hazardous materials on or in the ground.

Phytoplankton: That portion of the plankton community comprised of tiny plants, e.g., algae, diatoms.

Phytotoxic: Harmful to plants.

Picocuries Per Liter pCi/L): A unit of measure for levels of radon gas.

Pilot Tests: Testing a cleanup technology under actual site conditions to identify potential problems prior to full-scale implementation.

Plankton: Tiny plants and animals that live in water.

Plasma-arc Reactor: An incinerator that operates at extremely high temperatures; treats highly toxic wastes that do not burn easily.

Plasmid: A circular piece of DNA that exists apart from the chromosome and replicates independently of it. Bacterial plasmids carry information that renders the bacteria resistant to antibiotics. Plasmids are often used in genetic engineering to carry desired genes into organisms.

Plastics: Non-metallic chemoreactive compounds molded into rigid or pliable construction materials, fabrics, etc.

Plate Tower Scrubber: An air pollution control device that neutralizes hydrogen chloride gas by bubbling alkaline water through holes in a series of metal plates.

Plugging: Act or process of stopping the flow of water, oil, or gas into or out of a formation through a borehole or well penetrating that formation.

Plume: 1. A visible or measurable discharge of a contaminant from a given point of origin. Can be visible or thermal in water, or visible in the air as, for example, a plume of smoke. 2 The area of radiation leaking from a damaged reactor. 3. Area downwind within which a release could be dangerous for those exposed to leaking fumes.

Plutonium: A radioactive metallic element chemically similar to uranium.

PM-10: A new standard for measuring the amount of solid or liquid matter suspended in the atmosphere, i.e. the amount of particulate matter over 10 micrometers in diameter; smaller PM-10 particles penetrate to the deeper portions of the lung, affecting sensitive population groups such as children and individuals with respiratory ailments.

Point Source: A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution, e.g., a pipe, ditch, ship, ore pit, factory smokestack.

Pollen: The fertilizing element of flowering plants; background air pollutant.

Pollutant: Generally, any substance introduced into the environment that adversely affects the usefulness of a resource.

Pollution Prevention: The active process of identifying areas, processes, and activities which create excessive waste byproducts for the purpose of substitution, alteration, or elimination of the process to prevent waste generation.

Pollutant Standard Index (PSI): Measure of adverse health effects of air pollution levels in major cities.

Pollution: Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act, for example, the term is defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water.

Polonium: A radioactive element that occurs in pitchblende and other uranium-containing ores.

Polyelectrolytes: Synthetic chemicals that help solids to clump during sewage treatment.

Polymer: Basic molecular ingredients in plastic.

Polyvinyl Chloride (PVC): A tough, environmentally indestructible plastic that releases hydrochloric acid when burned.

Population: A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.

Post-Closure: The time period following the shutdown of a waste management or manufacturing facility; for monitoring purposes, often considered to be 30 years.

Post-Consumer Recycling: Reuse of materials generated from residential and consumer waste, e.g. converting wastepaper from offices into corrugated boxes or newsprint.

Potable Water: Water that is safe for drinking and cooking.

Potentially Responsible Party (PRP): Any individual or company-including owners, operators, transporters or generators-potentially responsible for, or contributing to a spill or other contamination at a Superfund site. Whenever possible, through administrative and legal actions, GPA requires PRPs to clean up hazardous sites they have contaminated.

Precipitate: A solid that separates from a solution.

Precipitation: Removal of hazardous solids from liquid waste to permit safe disposal; removal of particles from airborne emissions.

Precipitator: Pollution control device that collects particles from an air stream.

Precursor: In photochemistry, a compound antecedent to a volatile organic compound (VOC). Precursors react in sunlight to form ozone or other photochemical oxidants.

Preliminary Assessment: The process of collecting and reviewing available information about a known or suspected waste site or release.

Pressure Sewers: A system of pipes in which water, wastewater, or other liquid is pumped to a higher elevation.

Pretreatment: Processes used to reduce, eliminate, or alter the nature of wastewater pollutants from non-domestic sources before they are discharged into publicly owned treatment works (POTWs).

Prevalent Level Samples: Air samples taken under normal conditions (also known as ambient background samples).

Prevalent Levels: Levels of airborne contaminant occurring under normal conditions.

Prevention of Significant Deterioration (PSD): EPA program in which state and/or federal permits are required in order to restrict emissions from new or modified sources in places where air quality already meets or exceeds primary and secondary ambient air quality standards.

Primary Drinking Water Regulation: Applies to public water systems and specifies a contaminant level, which, in the judgment of the EPA Administrator, will not adversely affect human health.

Primary Waste Treatment: First steps in wastewater treatment; screens and sedimentation tanks are used to remove most materials that float or will settle. Primary treatment removes about 30 percent of carbonaceous biochemical oxygen demand from domestic sewage.

Principal Organic Hazardous Constituents (POHCs): Hazardous compounds monitored during an incinerator's trial burn, selected for high concentration in the waste feed and difficulty of combustion.

Probability of Detection : The likelihood, expressed as a percentage, that a test method will correctly identify a leaking tank.

Process Verification: Verifying that process raw materials, water usage, waste treatment processes, production rate and other facts relative to quantity and quality of pollutants contained in discharges are substantially described in the permit application and the issued permit.

Process Wastewater: Any water that comes into contact with any raw material, product, byproduct, or waste.

Process Weight: Total weight of all materials, including fuel, used in a manufacturing process; used to calculate the allowable particulate emission rate.

Product Level: The level of a product in a storage tank.

Products of Incomplete Combustion (PICs): Organic compounds formed by combustion. Usually generated in small amounts and sometimes toxic, PICs are heat-altered versions of the original material fed into the incinerator (e.g., charcoal is a P.C. from burning wood).

Propellant: Liquid in a self-pressurized pesticide product that expels the active ingredient from its container.

Proposed Plan: A plan for a site cleanup that is available to the public for comment.

Proteins: Complex nitrogenous organic compounds of high molecular weight made of amino acids; essential for growth and repair of animal tissue. Many, but not all, proteins are enzymes.

Protocol: A series of formal steps for conducting a test.

Protoplast: A membrane-bound cell from which the outer wall has been partially or completely removed. The term often is applied to plant cells.

Protozoa: One-celled animals that are larger and more complex than bacteria. May cause disease.

Public Comment Period: The time allowed for the public to express its views and concerns regarding an action by EPA (e.g., a *Federal Register* Notice of proposed rulemaking, a public notice of a draft permit, or a Notice of Intent to Deny).

Public Hearing: A formal meeting wherein EPA officials hear the public's views and concerns about an EPA action or proposal. EPA is required to consider such comments when evaluating its actions. Public hearings must be held upon request during the public comment period.

Public Notice: 1. Notification by EPA informing the public of Agency actions such as the issuance of a draft permit or scheduling of a hearing. EPA is required to ensure proper public notice, including publication in newspapers and broadcast over radio stations. 2. In the safe drinki water program, water suppliers are quired to publish and broadcast notices when pollution problems are discovered.

Public Water System: A system that provides piped water for human consumption to at least 15 service connections or regularly serves 25 individuals.

Publicly Owned Treatment Works: A waste-treatment works owned by a state, unit of local government, or Indian tribe, usually designed to treat domestic wastewaters.

Pumping Station: Pumping devices installed in sewer or water systems or other liquid-carrying pipelines to move the liquids to a higher level.

Putrescible: Able to rot quickly enough to cause odors and attract flies.

Pyrolysis: Decomposition of a chemical by extreme heat.

Q

Quality Assurance/Quality Control: A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical and reporting activiti of the highest achievable quality.

Quench Tank: A water-filled tank used to cool incinerator residues or hot materials during industrial processes.

R

Radiation Standards: Regulations that set maximum exposure limits for protection of the public from radioactive materials.

Radio Frequency Radiation: (See Nonionizing Radiation.)

Radioactive Substances: Substances that emit ionizing radiation.

Radioisotopes: Chemical variants of an element with potentially oncogenic, teratogenic, and mutagenic effects on the human body.

Radionuclide: Radioactive particle, manmade or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutants.

Radius of Vulnerability Zone: The maximum distance from the point of release of a hazardous substance in which the airborne concentration could reach the level of concern under specified weather conditions.

Radon Decay Products: A term used to refer collectively to the immediate products of the radon decay chain. These include Po-218, Pb-214, Bi-214, and Po-214, which have an average combined half-life of about 30 minutes.

Radon: A colorless naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks.

Rasp: A machine that grinds waste into a manageable material and helps prevent odor.

Raw Sewage: Untreated wastewater and its contents.

Raw Water: Intake water prior to any treatment or use.

Reasonably Available Control Measures (RACM): A broadly defined term referring to technological and other measures for pollution control.

Reasonably Available Control Technology (RACT): Control technology that is both reasonably available, and both technologically and economically feasible. Usually applied to existing sources in nonattainment areas; in most cases is less stringent than new source performance standards.

Receiving Waters: A river, lake, ocean, stream or other watercourse into which wastewater or treated effluent is discharged.

Recharge: The process by which water is added to a zone of saturation, usually by percolation from the soil surface, e.g., the recharge of an aquifer.

Recharge Area: A land area in which water reaches the zone of saturation from surface infiltration, e.g., where rainwater soaks through the earth to reach an aquifer.

Recombinant Bacteria: A microorganism whose genetic makeup has been altered by deliberate introduction of new genetic elements. The offspring of these altered bacteria also contain these new genetic elements, i.e. they "breed true."

Recombinant DNA: The new DNA that is formed by combining pieces of DNA from different organisms or cells.

Recommended Maximum Contaminant Level (RMCL): The maximum level of a contaminant in drinking water at which no known or anticipated adverse affect on human health would occur, and that includes an adequate margin of safety. Recommended levels are nonenforceable health goals. (See: maximum contaminant level.)

Reconstructed Source: Facility in which components are replaced to such an extent that the fixed capital cost of the new components exceed 50 percent of the capital cost of constructing a comparable brand-new facility. New-source performance standards may be applied to sources reconstructed after the proposal of the standard if it is technologically and economically feasible to meet the standard.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used at National Priorities List sites where, under CERCLA, Trust Funds pay for the cleanup.

Recovery Rate: Percentage of usable recycled materials that have been removed from the total amount of municipal solid waste generated in a specific area or by a specific business.

Reclamation: (In recycling) Restoration of materials found in the waste stream to a beneficial use which may be for purposes other than the original use.

Recycle/Reuse: Minimizing waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e. recycling of aluminum cans, paper, and bottles, etc.).

Red Bag Waste: (See: infectious waste.)

Red Border: An EPA document undergoing review before being submitted for final management decision-making.

Red Tide: A proliferation of a marine plankton toxic and often fatal to fish, perhaps stimulated by the addition of nutrients. A tide can be red, green, or brown, depending on the coloration of the plankton.

Reentry Interval: The period of time immediately following the application of a pesticide during which unprotected workers should not enter a field.

Reference Dose (RfD): The concentration of a chemical known to cause health problems; also be referred to as the ADI, or acceptable daily intake.

Reformulated Gasoline: Gasoline with a different composition from conventional gasoline (e.g., lower aromatics content) that cuts air pollutants.

Refuse Reclamation: Conversion of solid waste into useful products, e.g., composting organic wastes to make soil conditioners or separating aluminum and other metals for recycling.

Refuse: (See: solid waste.)

Regeneration: Manipulation of cells to cause them to develop into whole plants.

Regional Response Team (RRT): Representatives of federal, local, and state agencies who may assist in coordination of activities at the request of the On-Scene Coordinator before and during a significant pollution incident such as an oil spill, major chemical release, or a Superfund response.

Registrant: Any manufacturer or formulator who obtains registration for a pesticide active ingredient or product.

Registration: Formal listing with EPA of a new pesticide before it can be sold or distributed. Under the Federal Insecticide, Fungicide, and Rodenticide Act. EPA is responsible for registration (pre-market licensing) of pesticides on the basis of data demonstrating no unreasonable adverse effects on human health or the environment when applied according to approved label directions.

Registration Standards: Published documents which include summary reviews of the data available on a pesticide's active ingredient, data gaps, and the Agency's existing regulatory position on the pesticide.

Regulated Asbestos-Containing Material (RACM): Friable asbestos material or nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, or been pulverized or reduced to powder in the course of demolition or renovation operations.

Regulated Medical Waste: Under the Medical Waste Tracking Act of 1988, any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals. Included are cultures and stocks of infectious agents; human blood and blood products; human pathological body wastes from surgery and autopsy; contaminated animal carcasses from medical research; waste from patients with communicable diseases; and all used sharp implements, such as needles and scalpels, etc., and certain unused sharps. (See; treated medical waste; untreated medical waste; destroyed medical waste.)

Release: Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous or toxic chemical or extremely hazardous substance.

Remedial Action (RA): The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Remedial Design: A phase of remedial action that follows the remedial investigation/feasibility study and includes development of engineering drawings and specifications for a site cleanup.

Remedial Investigation: An in-depth study designed to gather data needed to determine the nature and extent of contamination at a Superfund site; establish site cleanup criteria; identify preliminary alternatives for remedial action; and support technical and cost analyses of alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the "RI/FS".

Remedial Project Manager (RPM): The EPA or state official responsible for overseeing on-site remedial action.

Remedial Response: Long-term action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious but not an immediate threat to public health.

Remediation: 1. Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a Superfund site; 2. for the Asbestos Hazard Emergency Response program, abatement methods including evaluation, repair, enclosure, encapsulation, or removal of greater than 3 linear feet or square feet of asbestos-containing materials from a building.

Remote Sensing: The collection and interpretation of information about an object without physical contact with the object; e.g., satellite imaging and aerial photograph.

Removal Action: Short-term immediate actions taken to address releases of hazardous substances that require expedited response. (See: cleanup.)

Reportable Quantity (RQ): Quantity of a hazardous substance that triggers reports under CERCLA. If a substance exceeds its RQ, the release must be reported to the National Response Center, the SERC, and community emergency coordinators for areas likely to be affected.

Repowering: Replacement of an existing coal-fired boiler with one or more clean coal technologies in order to achieve significantly greater emission reduction relative to the performance of technology in widespread use at the time the Clean Air Act amendments of 1990 were enacted. (See: Clean coal technology.)

Reregistration: The reevaluation and relicensing of existing pesticides originally registered prior to current scientific and regulatory standards. EPA reregisters pesticides through its Registration Standards Program.

Reserve Capacity: Extra treatment capacity built into solid waste and wastewater treatment plants and interceptor sewers to accommodate flow increases due to future population growth.

Reservoir: Any natural or artificial holding area used to store, regulate, or control water.

Residual: Amount of a pollutant remaining in the environment after a natural or technological process has taken place, e.g., the sludge remaining after initial wastewater treatment, or particulates remaining in air after it passes through a scrubbing or other process.

Residual Risk: The extent of health risk from air pollutants remaining after application of the Maximum Achievable Control Technology (MACT).

Resistance: For plants and animals, the ability to withstand poor environmental conditions or attacks by chemicals or disease. May be inborn or acquired.

Resource Recovery: The process of obtaining matter or energy from materials formerly discarded.

Response Action: 1. Generic term for actions taken in response to actual or potential health-threatening environmental events such as spills, sudden releases, and asbestos abatement/management problems; 2. A CERCLA-authorized action involving either a short-term removal action or a long-term removal response. This may include but is not limited to: removing hazardous materials from a site to an EPA-approved hazardous waste facility for treatment, containment or treating the waste on-site, identifying and removing the sources of ground-water contamination and halting further migration of contaminants; 3. Any of the following actions taken in school buildings in response to AHERA to reduce the risk of exposure to asbestos: removal, encapsulation, enclosure, repair, and operations and maintenance. (See: cleanup) .

Responsiveness Summary: A summary of oral and/or written public comments received by EPA during a comment period on key EPA documents, and EPA's response to those comments.

Restoration: Measures taken to return a site to pre-violation conditions.

Restricted Use: A pesticide may be classified (under FIFRA regulations) for restricted use if the it requires special handling because of its toxicity, and, if so, it may be applied only by trained, certified applicators or those under their direct supervision.

Restriction Enzymes: Enzymes that recognize specific regions of a long DNA molecule and cut it at those points.

Reuse: Using a product or component of municipal solid waste in its original form more than once, e.g., refilling a glass bottle that has been returned or using a coffee can to hold nuts and bolts.

Reverse Osmosis: A treatment process used in water systems by adding pressure to force water through a semi-permeable membrane. Reverse osmosis removes most drinking water contaminants. Also used in wastewater treatment. Large-scale reverse osmosis plants are being developed.

Ribonucleic Acid (RNA): A molecule that carries the genetic message from DNA to a cellular protein-producing mechanisms.

Ringlemann Chart: A series of shaded illustrations used to measure the opacity of air pollution emissions, ranging from light grey through black; used to set and enforce emissions standards.

Riparian Habitat: Areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

Riparian Rights: Entitlement of a land owner to certain uses of water on or bordering his property, including the right to prevent diversion or misuse of upstream waters. Generally a matter of state law.

Risk: A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

Risk Assessment: Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Risk Communication: The exchange of information about health or environmental risks among risk assessors and managers, the general public, news media, interest groups, etc.

Risk Management: The process of evaluating and selecting alternative regulatory and non-regulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors.

River Basin: The land area drained by a river and its tributaries.

Rodenticide: A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc.

Rotary Kiln Incinerator: An incinerator with a rotating combustion chamber that keeps waste moving, thereby allowing it to vaporize for easier burning.

Rough Fish: Fish not prized for eating, such as gar and suckers. Most are more tolerant of changing environmental conditions than game species.

Rubbish: Solid waste, excluding food waste and ashes, from homes, institutions, and work-places.

Run-Off: That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface-water. It can carry pollutants from the air and land into receiving waters.

S

Safener: A chemical added to a pesticide to keep it from injuring plants.

Salinity: The percentage of salt in water.

Salt Water Intrusion: The invasion of fresh surface or ground water by salt water. If it comes from the ocean it may be called sea water intrusion.

Salts: Minerals that water picks up as it passes through the air, over and under the ground, or from households and industry.

Salvage: The utilization of waste materials.

Sanctions: Actions taken by the federal government for failure to plan or implement a State Improvement Plan (SIP). Such action may be include withholding of highway funds and a ban on construction of new sources of potential pollution.

Sand Filters: Devices that remove some suspended solids from sewage. Air and bacteria decompose additional wastes filtering through the sand so that cleaner water drains from the bed.

Sanitary Landfill: (See: landfills.)

Sanitary Sewers: Underground pipes that carry off only domestic or industrial waste, not storm water.

Sanitary Survey: An on-site review of the water sources, facilities, equipment, operation and maintenance of a public water system to evaluate the adequacy of those elements for producing and distributing safe drinking water.

Sanitary Water (Also known as gray water): Water discharged from sinks, showers, kitchens, or other nonindustrial operations, but not from commodes.

Sanitation: Control of physical factors in the human environment that could harm development, health, or survival.

Saturated Zone: A subsurface area in which all pores and cracks are filled with water under pressure equal to or greater than that of the atmosphere.

Scrap: Materials discarded from manufacturing operations that may be suitable for reprocessing.

Screening: Use of screens to remove coarse floating and suspended solids from sewage.

Science Advisory Board (SAB): A group of external scientists who advise EPA on science and policy.

Scrubber: An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Secondary Drinking Water Regulations: Non-enforceable regulations applying to public water systems and specifying the maximum contamination levels that, in the judgment of EPA, are required to protect the public welfare. These regulations apply to any contaminants that may adversely affect the odor or appearance of such water and consequently may cause people served by the system to discontinue its use.

Secondary Materials: Materials that have been manufactured and used at least once and are to be used again.

Secondary Treatment: The second step in most publicly owned waste treatment systems in which bacteria consume the organic parts of the waste. It is accomplished by bringing together waste, bacteria, and oxygen in trickling filters or in the activated sludge process. This treatment removes floating and settleable solids and about 90 percent of the oxygen-demanding substances and suspended solids. Disinfection is the final stage of secondary treatment. (See: primary, tertiary treatment.)

Secure Chemical Landfill: (See: landfills.)

Secure Maximum Contaminant Level: Maximum permissible level of a contaminant in water delivered to the free flowing outlet of the ultimate user, or of contamination resulting from corrosion of piping and plumbing caused by water quality.

Sedimentation Tanks: Wastewater tanks in which floating wastes are skimmed off and settled solids are removed for disposal.

Sedimentation: Letting solids settle out of wastewater by gravity during treatment.

Sediments: Soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities will expose sediment materials, allowing them to wash off the land after rainfall.

Seed Protectant: A chemical applied before planting to protect seeds and seedlings from disease or insects.

Seepage: Percolation of water through the soil from unlined canals, ditches, laterals, watercourses, or water storage facilities.

Selective Pesticide: A chemical designed to affect only certain types of pests, leaving other plants and animals unharmed.

Semi-Confined Aquifer: An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur.

Senescence: The aging process. Sometimes used to describe lakes or other bodies of water in advanced stages of eutrophication.

Septic Tank: An underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank, where it is decomposed by bacteria. The sludge settles to the bottom and is pumped out periodically, but effluent flows into the ground through drains.

Service Connector: The pipe that carries tap water from a public water main to a building.

Settleable Solids: Material heavy enough to sink to the bottom of a wastewater treatment tank.

Settling Chamber: A series of screens placed in the way of flue gases to slow the stream of air, thus helping gravity to pull particles into a collection device.

Settling Tank: A holding area for wastewater, where heavier particles sink to the bottom for removal and disposal.

7Q10: Seven-day, consecutive low flow with a ten year return frequency; the lowest stream flow for seven consecutive days that would be expected to occur once in ten years.

Sewage: The waste and wastewater produced by residential and commercial sources and discharged into sewers.

Sewage Lagoon: (See: lagoon.)

Sewage Sludge: Sludge produced at a Publicly Owned Treatment Works, the disposal of which is regulated under the Clean Water Act.

Sewer: A channel or conduit that carries wastewater and storm-water runoff from the source to a treatment plant or receiving stream. "Sanitary" sewers carry household, industrial, and commercial waste. "Storm" sewers carry runoff from rain or snow. "Combined" sewers handle both.

Sewerage: The entire system of sewage collection, treatment, and disposal.

Sharps: Hypodermic needles, syringes (with or without the attached needle) pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes used in animal or human patient care or treatment, or in medical, research or industrial laboratories. Also included are other types of broken or unbroken glassware that were in contact with infectious agents, such as used slides and cover slips, and unused hypodermic and suture needles, syringes, and scalpel blades.

Signal: The volume or product-level change produced by a leak in a tank.

Signal Words: The words used on a pesticide label-Danger, Warning, Caution-to indicate level of toxicity.

Significant Deterioration: Pollution resulting from a new source in previously "clean" areas. (See: prevention of significant deterioration.)

Significant Municipal Facilities: Those publicly owned sewage treatment plants that discharge a million gallons per day or more and are therefore considered by states to have the potential for to substantially effect the quality of receiving waters.

Significant Non-Compliance: (See Significant Violations.)

Significant Violations: Violations by point source dischargers of sufficient magnitude or duration to be a regulatory priority.

Silviculture: Management of forest land for timber. Sometimes contributes to water pollution, as in clear-cutting.

Sinking: Controlling oil spills by using an agent to trap the oil and sink it to the bottom of the body of water where the agent and the oil are biodegraded.

Site Assessment Program: A means of evaluating hazardous waste sites through preliminary assessments and site inspections to develop a Hazard Ranking System score.

Site Inspection: The collection of information from a Superfund site to determine the extent and severity of hazards posed by the site. It follows and is more extensive than a preliminary assessment. The purpose is to gather information necessary to score the site, using the Hazard Ranking System, and to determine if it presents an immediate threat requiring prompt removal.

Site Safety Plan: A crucial element in all removal actions, it includes information on equipment being used, precautions to be taken, and steps to take in the event of an on-site emergency.

Siting: The process of choosing a location for a facility.

Skimming: Using a machine to remove oil or scum from the surface of the water.

Slow Sand Filtration: Passage of raw water through a bed of sand at low velocity, resulting in substantial removal of chemical and biological contaminants.

Sludge: A semi-solid residue from any of a number of air or water treatment processes; can be a hazardous waste.

Sludge Digester: Tank in which complex organic substances like sewage sludges are biologically dredged. During these reactions, energy is released and much of the sewage is converted to methane, carbon dioxide, and water.

Slurry: A watery mixture of insoluble matter resulting from some pollution control techniques.

Small Quantity Generator (SQG-sometimes referred to as "Squeegee"): Persons or enterprises that produce 220-2200 pounds per month of hazardous waste; are required to keep more records than conditionally exempt generators. The largest category of hazardous waste generators, SQGs include automotive shops, dry cleaners, photographic developers, and a host of other small businesses. (See: conditionally exempt generators).

Smelter: A facility that melts or fuses ore, often with an accompanying chemical change, to separate its metal content. Emissions cause pollution. "Smelting" is the process involved.

Smog: Air pollution associated with oxidants. (See: photochemical smog.)

Smoke: Particles suspended in air after incomplete combustion.

Soft Detergents: Cleaning agents that break down in nature.

Soft Water: Any water that does not contain a significant amount of dissolved minerals such as salts of calcium or magnesium.

Soil Adsorption Field: A sub-surface area containing a trench or bed with clean stones and a system of piping through which treated sewage may seep into the surrounding soil for further treatment and disposal.

Soil and Water Conservation Practices: Control measures consisting of managerial, vegetative, and structural practices to reduce the loss of soil and water.

Soil Conditioner: An organic material like humus or compost that helps soil absorb water, build a bacterial community, and take up mineral nutrients.

Soil Erodibility: An indicator of a soil's susceptibility to raindrop impact, runoff, and other erosive processes.

Soil Gas: Gaseous elements and compounds in the small spaces between particles of the earth and soil. Such gases can be moved or driven out under pressure.

Soil Sterilant: A chemical that temporarily or permanently prevents the growth of all plants and animals. depending on the chemical.

Sole-Source Aquifer: An aquifer that supplies 50-percent or more of the drinking water of an area.

Solid Waste: Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers.

Solid Waste Disposal: The final placement of refuse that is not salvaged or recycled.

Solid Waste Management: Supervised handling of waste materials from their source through recovery processes to disposal.

Solidification and Stabilization: Removal of wastewater from a waste or changing it chemically to make it less permeable and susceptible to transport by water.

Soot: Carbon dust formed by incomplete combustion.

Sorption: The action of soaking up or attracting substances; process used in many pollution control systems.

Source Reduction: Reducing the amount of materials entering the waste stream by redesigning products or patterns of production or consumption (e.g., using returnable beverage containers). Synonymous with waste reduction.

Source Separation: Segregating various wastes at the point of generation (e.g., separation of paper, metal and glass from other wastes to make recycling simpler and more efficient.)

Special Review: Formerly known as Rebuttable Presumption Against Registration (RPAR), this is the regulatory process through which existing pesticides suspected of posing unreasonable risks to human health, non-target organisms, or the environment are referred for review by EPA. Such review requires an intensive risk/benefit analysis with opportunity for public comment. If risk is found to outweigh social and economic benefits, regulatory actions ranging from label revisions and use-restriction to cancellation or suspended registration can be initiated.

Special Waste: Items such as household hazardous waste, bulky wastes (refrigerators, pieces of furniture, etc.) tires, and used oil.

Species: A reproductively isolated aggregate of interbreeding organisms.

Spill Prevention Control and Countermeasures Plan (SPCP): Plan covering the release of hazardous substances as defined in the Clean Water Act.

Spoil: Dirt or rock removed from its original location-destroying the composition of the soil in the process-as in strip-mining, dredging, or construction.

Sprawl: Unplanned development of open land.

Spray Tower Scrubber: A device that sprays alkaline water into a chamber where acid gases present to aid in the neutralizing of the gas.

Stable Air: A motionless mass of air that holds instead of dispersing pollutants.

Stabilization: Conversion of the active organic matter in sludge into inert, harmless material.

Stack: A chimney, smokestack, or vertical pipe that discharges used air.

Stabilization Ponds: (See: lagoon.)

Stack Effect: Air, as in a chimney, that moves upward because it is warmer than the ambient atmosphere.

Stack Gas: (See: flue gas.)

Stage II Controls: Systems placed on service station gasoline pumps to control and capture gasoline vapors during refuelling.

Stagnation: Lack of motion in a mass of air or water that holds pollutants in place.

Standards: Norms that impose limits on the amount of pollutants or emissions produced. EPA establishes minimum standards, but states are allowed to be stricter.

Start of a Response Action: The point in time when there is a guarantee or set-aside of funding either by EPA, other federal agencies, states or Principal Responsible Parties in order to begin response actions at a Superfund site.

State Emergency Response Commission (SERC): Commission appointed by each state governor according to the requirements of SARA Title III. The SERCs designate emergency planning districts, appoint local emergency planning committees, and supervise and coordinate their activities.

State Implementation Plans (SIP): EPA-approved state plans for the establishment, regulation, and enforcement of air pollution standards.

Stationary Source: A fixed-site producer of pollution, mainly power plants and other facilities using industrial combustion processes.

Storage: Temporary holding of waste pending treatment or disposal, as in containers, tanks, waste piles, and surface impoundments.

Storm Sewer: A system of pipes (separate from sanitary sewers) that carries only water runoff from buildings and land surfaces.

Stratification: Separating into layers.

Stratosphere: The portion of the atmosphere 10-to-25 miles above the earth's surface.

Strip-Cropping: Growing crops in a systematic arrangement of strips or bands that serve as barriers to wind and water erosion.

Strip-Mining: A process that uses machines to scrape soil or rock away from mineral deposits just under the earth's surface.

Structural Deformation: Distortion in walls of a tank after liquid has been added or removed.

Sulfur Dioxide (SO_2): A pungent, colorless, gaseous pollutant formed primarily by the combustion of fossil fuels.

Sump: A pit or tank that catches liquid runoff for drainage or disposal.

Supercritical Water: A type of thermal treatment using moderate temperatures and high pressures to enhance the ability of water to break down large organic molecules into smaller, less toxic ones. Oxygen injected during this process combines with simple organic compounds to form carbon dioxide and water.

Superfund: The program operated under the legislative authority of CERCLA and SARA that funds and carries out EPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising the cleanup and other remedial actions.

Superfund Innovative Technology Evaluation: EPA program to promote development and use of innovative treatment technologies in Superfund site cleanups.

Surface Impoundment: Treatment, storage, or disposal of liquid hazardous wastes in ponds.

Surface Uranium Mines: Strip mining operations for removal of uranium-bearing ore.

Surface Water: All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors directly influenced by surface water.

Surfacing ACM: Asbestos-containing material that is sprayed or troweled on or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members.

Surfacing Material: Material sprayed or troweled onto structural members (beams, columns, or decking) for fire protection; or on ceilings or walls for fireproofing, acoustical or decorative purposes. Includes textured plaster, and other textured wall and ceiling surfaces.

Surfactant: A detergent compound that promotes lathering.

Surveillance System: A series of monitoring devices designed to check on environmental conditions.

Suspect Material: Building material suspected of containing asbestos, e.g., surfacing material, floor tile, ceiling tile, thermal system insulation, and miscellaneous other materials.

Suspended Loads: Sediment particles maintained in the water column by turbulence and carried with the flow of water.

Suspended Solids: Small particles of solid pollutants that float on the surface of, or are suspended in, sewage or other liquids. They resist removal by conventional means.

Suspension: Suspending the use of a pesticide when EPA deems it necessary to prevent an imminent hazard resulting from its continued use. An emergency suspension takes effect immediately; under an ordinary suspension a registrant can request a hearing before the suspension goes into effect. Such a hearing process might take six months.

Suspension Culture: Cells growing in a liquid nutrient medium.

Swamp: A type of wetland dominated by woody vegetation but without appreciable peat deposits. Swamps may be fresh or salt water and tidal or non-tidal. (See: wetlands.)

Synthetic Organic Chemicals (SOCs): Man-made organic chemicals. Some SOCs are volatile, others tend to stay dissolved in water instead of evaporating.

Systemic Pesticide: A chemical absorbed by an organism that makes the organism toxic to pests.

T

Tailings: Residue of raw material or waste separated out during the processing of crops or mineral ores.

Tail Water: The runoff of irrigation water from the lower end of an irrigated field.

Technical Assistance Grant (TAG): As part of the Superfund program, Technical Assistance Grants of up to $50,000 are provided to citizens' groups to obtain assistance in interpreting information related to cleanups at Superfund sites or those proposed for the National Priorities List. Grants are used by such groups to hire technical advisors to help them understand the site-related technical information for the duration of response activities.

Technology-Based Limitations: Industry-specific effluent limitations applied to a discharge when it will not cause a violation of water quality standards at low stream flows. Usually applied to discharges into large rivers.

Technology-Based Standards: Effluent limitations applicable to direct and indirect sources which are developed on a category-by-category basis using statutory factors, not including water-quality effects.

Terracing: Dikes built along the contour of sloping farm land that hold runoff and sediment to reduce erosion.

Tertiary Treatment: Advanced cleaning of wastewater that goes beyond the secondary or biological stage, removing nutrients such as phosphorus, nitrogen, and most BOD and suspended solids.

Thermal Pollution: Discharge of heated water from industrial processes that can kill or injure aquatic organisms.

Thermal System Insulation (TSI): Asbestos-containing material applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.

Thermal Treatment: Use of elevated temperatures to treat hazardous wastes. (See: incineration; pyrolysis.)

Threshold Limit Value (TLV): The concentration of an airborne substance that an average person can be repeatedly exposed to without adverse effects. TLVs may be expressed in three ways: TLV-TWA-Time weighted average, based on an allowable exposure averaged over a normal 8-hour workday or 40-hour workweek; TLV-STE-L-Short-term exposure limit or maximum concentration for a brief specified period of time, depending on a specific chemical (TWA must still be met); and TLV-C-Ceiling Exposure Limit or maximum exposure concentration not to be exceeded under any circumstances. (TWA must still be met.)

Threshold Planning Quantity: A quantity designated for each chemical on the list of extremely hazardous substances that triggers notification by facilities to the State Emergency Response Commission that such facilities are subject to emergency planning requirements under SARA Title III.

Tidal Marsh: Low, flat marshlands traversed by channels and tidal hollows, subject to tidal inundation; normally, the only vegetation present is salt-tolerant bushes and grasses. (See: wetlands.)

Time-weighted Average (TWA): In air sampling, the average air concentration of contaminants during a given period.

Tolerances: Permissible residue levels for pesticides in raw agricultural produce and processed foods. Whenever a pesticide is registered for use on a food or a feed crop, a tolerance (or exemption from the tolerance requirement) must be established. EPA establishes the tolerance levels, which are enforced by the Food and Drug Administration and the Department of Agriculture.

Tonnage: The amount of waste that a landfill accepts, usually expressed in tons per month. The rate at which a landfill accepts waste is limited by the landfill's permit.

Topography: The physical features of a surface area including relative elevations and the position of natural and man-made features.

Total Dissolved Phosphorous: The total phosphorous content o all material that will pass through a filter, which is determined as orthophosphate without prior digestion or hydrolysis. Also called soluble P. or ortho P.

Total Dissolved Solids (TDS): All material that passes the standard glass river filter; now called total filtrable reside. Term is used to reflect salinity.

Total Suspended Solids (TSS): A measure of the suspended solids in wastewater, effluent, or water bodies, determined by tests for "total suspended non-filterable solids." (See: suspended solids.)

Toxic Chemical Release Form: Information form required of facilities that manufacture, process, or use (in quantities above a specific amount) chemicals listed under SARA Title III.

Toxic Chemical: Any chemical listed in EPA rules as "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986."

Toxic Chemical Use Substitution: Replacing toxic chemicals with less harmful chemicals in industrial processes.

Toxic Cloud: Airborne plume of gases, vapors, fumes, or aerosols containing toxic materials.

Toxic Pollutants: Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

Toxic Release Inventory: Database of toxic releases in the United States compiled from SARA Title III section 313 reports.

Toxic Substance: A chemical or mixture that may present an unreasonable risk of injury to health or the environment.

Toxic Waste: A waste that can produce injury if inhaled, swallowed, or absorbed through the skin.

Toxicity Testing: Biological testing (usually with an invertebrate, fish, or small mammal) to determine the adverse effects of a compound or effluent.

Toxicological Profile: An examination, summary, and interpretation of a hazardous substance to determine levels of exposure and associated health effects.

Transpiration: The process by which water vapor is lost to the atmosphere from living plants. The term can also be applied to the quantity of water thus dissipated.

Transportation Control Measures (TCMs): Steps taken by a locality to adjust traffic patterns (e.g., bus lanes, turnout, right turn on red) or reduce vehicle use (ride sharing, high-occupancy vehicle lanes) to cut vehicular emissions.

Trash: Material considered worthless or offensive that is thrown away. Generally defined as dry waste material, but in common usage it is a synonym for garbage, rubbish, or refuse.

Treatability Studies: Tests of potential cleanup technologies conducted in a laboratory (See: bench-scale tests.)

Trash-to-Energy Plan: Burning trash to produce energy.

Treated Regulated Medical Waste: Medical waste treated to substantially reduce or eliminate its pathogenicity, but that has not yet been destroyed.

Treatment Plant: A structure built to treat wastewater before discharging it into the environment.

Treatment, Storage, and Disposal Facility: Site where a hazardous substance is treated, stored, or disposed of. TSD facilities are regulated by EPA and states under RCRA.

Treatment: (1) Any method, technique, or process designed to remove solids and/or pollutants from solid waste, wastestreams, effluents, and air emissions. (2) methods used to change the biological character or composition of any regulated medical waste so as to substantially reduce or eliminate its potential for causing disease.

Trial Burn: An incinerator test in which emissions are monitored for the presence of specific organic compounds, particulates, and hydrogen chloride.

Trichloroethylene (TCE): A stable, low boiling-point colorless liquid, toxic if inhaled. Used as a solvent or metal decreasing agent, and in other industrial applications.

Trickling Filter: A coarse treatment system in which wastewater is trickled over a bed of stones or other material covered with bacteria that break down the organic waste and produce clean water.

Trickle Irrigation: Method in which water drips to the soil from perforated tubes or emitters.

Trihalomethane (THM): One of a family of organic compounds named as derivative of methane. THMs are generally by-products of chlorination of drinking water that contains organic material.

Trust Fund (CERCLA): A fund set up under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to help pay for cleanup of hazardous waste sites and for legal action to force those responsible for the sites to clean them up.

Tundra: A type of ecosystem dominated by lichens, mosses, grasses, and woody plants. Tundra is found at high latitudes (arctic tundra) and high altitudes (alpine tundra). Arctic tundra is underlain by permafrost and is usually saturated. (See: wetlands.)

Turbidimeter: A device that measures the density of suspended solids in a liquid.

Turbidity: 1. Haziness in air caused by the presence of particles and pollutants. 2. A cloudy condition in water due to suspended silt or organic matter.

U

Ultra Clean Coal (UCC): Coal that is washed, ground into fine particles, then chemically treated to remove sulfur, ash, silicone, and other substances; usually briquetted and coated with a sealant made from coal.

Ultraviolet Rays: Radiation from the sun that can be useful or potentially harmful. UV rays from one part of the spectrum (UV-A) enhance plant life and are useful in some medical and dental procedures; UV rays from other parts of the spectrum (UV-B) can cause skin cancer or other tissue damage. The ozone layer in the atmosphere partly shields us from ultraviolet rays reaching the earth's surface.

Underground Injection Control (UIC): The program under the Safe Drinking Water Act that regulates the use of wells to pump fluids into the ground.

Underground Sources of Drinking Water: Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solids content of 10,000 milligrams per liter or less, and are not "exempted aquifers." (See: exempted aquifer.)

Underground Storage Tank: A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals.

Unreasonable Risk: Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), "unreasonable adverse effects" means any unreasonable risk to man or the environment, taking into account the medical, economic, social, and environmental costs and benefits of any pesticide.

Unsaturated Zone: The area above the water table where soil pores are not fully saturated, although some water may be present.

Uranium Mill Tailings Piles: Former uranium ore processing sites that contain leftover radioactive materials (wastes), including radium and unrecovered uranium.

Uranium Mill-Tailings Waste Piles: Licensed active mills with tailings piles and evaporation ponds created by acid or alkaline leaching processes.

Urban Runoff: Storm water from city streets and adjacent domestic or commercial properties that carries pollutants of various kinds into the sewer systems and receiving waters.

Utility Load: The total electricity demand for a utility district.

V

Vapor Capture System: Any combination of hoods and ventilation system that captures or contains organic vapors so they may be directed to an abatement or recovery device.

Vapor Dispersion: The movement of vapor clouds in air due to wind, thermal action, gravity spreading, and mixing.

Vapor Plumes: Flue gases visible because they contain water droplets.

Variance: Government permission for a delay or exception in the application of a given law, ordinance, or regulation.

Vector: 1. An organism, often an insect or rodent, that carries disease. 2. Plasmids, viruses, or bacteria used to transport genes into a host cell. A gene is placed in the vector; the vector then "infects" the bacterium.

Vehicle Miles Travelled (VMT): A measure of the extent of motor vehicle operation; the total number of vehicle miles travelled within a specific geographic area over a given period of time.

Ventilation/Suction: The act of admitting fresh air into a space in order to replace stale or contaminated air; achieved by blowing air into the space. Similarly, suction represents the admission of fresh air into an interior space by lowering the pressure outside of the space, thereby drawing the contaminated air outward.

Venturi Scrubbers: Air pollution control devices that use water to remove particulate matter from emissions.

Vinyl Chloride: A chemical compound, used in producing some plastics, that is believed to be oncogenic.

Virgin Materials: Resources extracted from nature in their raw form, such as timber or metal ore.

Volatile: Any substance that evaporates readily.

Volatile Organic Compound (VOC): Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

Volatile Synthetic Organic Chemicals: Chemicals that tend to volatilize or evaporate.

Volume Reduction: Processing waste materials to decrease the amount of space they occupy, usually by compacting or shredding, incineration, or composting.

Volumetric Tank Test: One of several tests to determine the physical integrity of a storage tank; the volume of fluid in the tank is measured directly or calculated from product-level changes. A marked drop in volume indicates a leak.

Vulnerable Zone: An area over which the airborne concentration of a chemical accidentally released could reach the level of concern.

Vulnerability Analysis: Assessment of elements in the community that are susceptible to damage should a release of hazardous materials occur.

W

Waste: 1. Unwanted materials left over from a manufacturing process. 2. Refuse from places of human or animal habitation.

Waste Characterization: Identification of chemical and microbiological constituents of a waste material.

Waste Exchange: Arrangement in which companies exchange their wastes for the benefit of both parties.

Waste Feed: The continuous or intermittent flow of wastes into an incinerator.

Waste Load Allocation: The maximum load of pollutants each discharger of waste is allowed to release into a particular waterway. Discharge limits are usually required for each specific water quality criterion being, or expected to be, violated. The portion of a stream's total assimilative capacity assigned to an individual discharge.

Waste Minimization: Measures or techniques that reduce the amount of wastes generated during industrial production processes; term is also applied to recycling and other efforts to reduce the amount of waste going into the waste stream.

Waste Reduction: Using source reduction, recycling, or composting to prevent or reduce waste generation.

Waste Stream: The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that are recycled, burned, or disposed of in landfills, or segments thereof such as the "residential waste stream" or the "recyclable waste stream."

Waste Treatment Lagoon: Impoundment made by excavation or earth fill for biological treatment of wastewater.

Waste Treatment Plant: A facility containing a series of tanks, screens, filters and other processes by which pollutants are removed from water.

Waste Treatment Stream: The continuous movement of waste from generator to treater and disposer.

Wastewater: The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

Wastewater Infrastructure: The plan or network for the collection, treatment, and disposal of sewage in a community. The level of treatment will depend on the size of the community, the type of discharge, and/or the designated use of the receiving water.

Wastewater Operations and Maintenance: Actions taken after construction to assure that facilities constructed to treat wastewater will be operated, maintained, and managed to reach prescribed effluent levels in an optimum manner.

Water Pollution: The presence in water of enough harmful or objectionable material to damage the water's quality.

Water Purveyor: A public utility, mutual water company, county water district, or municipality that delivers drinking water to customers.

Water Quality Criteria: Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water Quality Standards: State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Water Quality-Based Limitations: Effluent limitations applied to dischargers when mere technology-based limitations would cause violations of water quality standards. Usually applied to discharges into small streams.

Water Quality-Based Permit: A permit with an effluent limit more stringent than one based on technology performance. Such limits may be necessary to protect the designated use of receiving waters (i.e., recreation, irrigation, industry or water supply).

Water Solubility: The maximum possible concentration of a chemical compound dissolved in water. If a substance is water soluble it can very readily disperse through the environment.

Water Supplier: One who owns or operates a public water system.

Water Supply System: The collection, treatment, storage, and distribution of potable water from source to consumer.

Water Table: The level of groundwater.

Watershed: The land area that drains into a stream.

Well Injection: The subsurface emplacement of fluids into a well.

Well Monitoring: Measurement by on-site instruments or laboratory methods of well water quality.

Well Plug: A watertight, gastight seal installed in a bore hole or well to prevent movement of fluids.

Wellhead Protection Area: A protected surface and subsurface zone surrounding a well or wellfield supplying a public water system to keep contaminants from reaching the well water.

Wetlands: An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Wildlife Refuge: An area designated for the protection of wild animals, within which hunting and fishing are either prohibited or strictly controlled.

Wood-Burning-Stove Pollution: Air pollution caused by emissions of particulate matter, carbon monoxide, total suspended particulates, and polycyclic organic matter from wood-burning stoves.

Wood Treatment Facility: An industrial facility that treats lumber and other wood products for outdoor use. The process employs chromated copper arsenate, which is regulated as a hazardous material.

Working Level Month (WLM): A unit of measure used to determine cumulative exposure to radon.

Working Level (WL): A unit of measure for documenting exposure to radon decay products, the so-called "daughters". One working level is equal to approximately 200 picocuries per liter.

X Y Z

Xenobiote: Any biotum displaced from its normal habitat; a chemical foreign to a biological system.

Yard Waste: The part of solid waste composed of grass clippings, leaves, twigs, branches, and garden refuse.

Yellow-Boy: Iron oxide flocculent (clumps of solids in waste or water); usually observed as orange-yellow deposits in surface streams with excess iron content. (See: floc, flocculation.)

Z-list: OSHA's tables of toxic and hazardous air contaminants.

Zone of Saturation: (See: saturated zone.)

Zooplankton: Tiny aquatic animals eaten by fish.

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-3010

ACQUISITION AND TECHNOLOGY

JUL 25 1997

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS, LOGISTICS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE
(MANPOWER, RESERVE AFFAIRS, INSTALLATIONS AND ENVIRONMENT)
DEPUTY UNDER SECRETARY OF DEFENSE
(ENVIRONMENTAL SECURITY)
DEPUTY UNDER SECRETARY OF DEFENSE
(INDUSTRIAL AFFAIRS AND INSTALLATIONS)
DIRECTOR, DEFENSE LOGISTICS AGENCY (D)

SUBJECT: Responsibility for Additional Environmental Cleanup after Transfer of Real Property

The purpose of the attached policy is to describe the circumstances under which DoD would perform additional cleanup on DoD property that is transferred by deed to any person or entity outside the federal government. This policy is applicable to real property under DoD control that is to be transferred outside the federal government, and is effective immediately. For property that is transferred pursuant to section 120(h)(3)(C) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 9620(h)(3)(C)), this policy applies after the termination of the deferral period.

DoD continues to be committed to a remedy selection process that provides for full protection of human health and the environment, even after property has been transferred by DoD. The Deputy Under Secretary of Defense (Environmental Security) will issue separately any specific guidance needed to implement this policy. This policy should be read to be compatible with and does not supersede other related DoD polices, and is to be incorporated in the next revision of the appropriate DoD Instruction. I ask for your support in implementing this policy and working with communities so that they can make informed decisions in developing their redevelopment plans.

R. Noel Longuemare
Acting Under Secretary of Defense
(Acquisition and Technology)

Attachment

DoD Policy on Responsibility for Additional Environmental Cleanup After Transfer of Real Property

Background. This policy is instituted within the framework established by land use planning practices and land use planning authorities possessed by communities, and the environmental restoration process established by statute and regulation. The land use planning and environmental restoration processes – two separate processes – are interdependent. Land use planners need to know the environmental condition of property in order to make plans for the future use of the land. Similarly, knowledge of land use plans is needed in order to ensure that environmental restoration efforts are focused on making the property available when needed by the community and that remedy selection is compatible with land use. This policy does not supplant either process, but seeks to integrate the two by emphasizing the need to integrate land use planning assumptions into the cleanup, and to notify the community of the finality of the cleanup decisions and limited circumstances under which DoD would be responsible for additional cleanup after transfer.

Cleanup Process. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 9601 et seq.) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR 300) establish the requirements and procedures for the cleanup of sites that have been contaminated by releases of hazardous substances. CERCLA, furthermore, requires that a deed for federally owned property being transferred outside the government contain a covenant that all remedial action necessary to protect human health and the environment has been taken, and that the United States shall conduct any additional remedial action "found to be necessary" after transfer. Within the established restoration process, it is DoD's responsibility, in conjunction with regulatory agencies, to select cleanup levels and remedies that are protective of human health and the environment. The environmental restoration process also calls for public participation, so that the decisions made by DoD and the regulatory agencies have the benefit of community input.

Land Use Assumptions in Cleanup Process. Under the NCP, future land use assumptions are developed and considered when performing the baseline risk assessment, developing remedial action alternatives, and selecting a remedy. The NCP permits other-than-residential land use assumptions to be considered when selecting cleanup levels and remedies, so long as selected remedies are protective of human health and the environment. The U.S. Environmental Protection Agency (EPA) further amplified the role of future land use assumptions in the remedy selection process in its May 25, 1995, "Land Use in the CERCLA Remedy Selection Process" directive (OSWER Directive No. 9355.7-04).

Development of Land Use Plans. By law, the local community has been given principal responsibility for reuse planning for surplus DoD property being made available at Base Realignment and Closure (BRAC) installations. That reuse planning and implementation authority is vested in the Local Redevelopment Authority (LRA) described in the DoD Base Reuse Implementation Manual (DoD 4165.66-M). The DoD Base Reuse Implementation Manual calls for the LRA to develop the community redevelopment plan to reflect the long term needs of the community. A part of the redevelopment plan is a "land use plan" that identifies the proposed land use for given portions of the surplus DoD property. The DoD is committed to working with local land use planning authorities, local government officials, and the public to develop realistic assumptions concerning the future use of property that will be transferred by DoD. The DoD will act on the expectation that the community land use plan developed by the LRA reflects the long-range regional needs of the community.

Use of Land Use Assumptions in the Cleanup Process. DoD environmental restoration efforts for properties that are to be transferred out of federal control will attempt, to the extent reasonably practicable, to facilitate the land use and redevelopment needs stated by the community in plans approved prior to the remedy selection decision. For BRAC properties, the LRA's redevelopment plan, specifically the land use plan, typically will be the basis for the land use assumptions DoD will consider during the remedy selection process. For non-BRAC property transfers, DoD environmental restoration efforts will be similarly guided by community input on land use, as provided by the local government land use planning agency. In the unlikely event that no community land use plan is available at the time a remedy selection decision requiring a land use assumption must be made, DoD will consider a range of reasonably likely future land uses in the remedy selection process. The existing land use, the current zoning classification (if zoned by a local government), unique property attributes, and the current land use of the surrounding area all may serve as useful indicators in determining likely future land uses. These likely future land uses then may be used for remedy selection decisions which will be made by DoD (in conjunction with regulatory agencies) in accordance with CERCLA and the NCP.

DoD's expectation is that the community at-large, and in particular the land use planning agency, will take the environmental condition of the property, planned remedial activities, and technology and resource constraints into consideration in developing their reuse plan. The February 1996 "Guide to Assessing Reuse and Remedy Alternatives at Closing Military Installations" provides a useful tool for considering various possible land uses and remedy alternatives, so that cost and time implications for both processes can be examined and integrated. Obviously, early development of community consensus and publication of the land use plan by the LRA or the land planning agency will provide the stability and focus for DoD cleanup efforts.

Applicable guidelines in EPA's May 25, 1995, "Land Use in the CERCLA Remedy Selection Process" Directive should be used in developing cleanup decisions using land use assumptions. For a remedy that will require restrictions on future use of the land, the proposed plan and record of decision (ROD) or other decision documents must identify the future land use assumption that was used to develop the remedy, specific land use restrictions necessitated by the selected remedy, and possible mechanisms for implementing and enforcing those use restrictions. Examples of implementation and enforcement mechanisms include deed restrictions, easements, inspection or monitoring, and zoning. The community and local government should be involved throughout the development of those implementation and enforcement mechanisms. Those mechanisms must also be valid within the jurisdiction where the property is located.

Enforcement of Land Use Restrictions. The DoD Component disposal agent will ensure that transfer documents for real property being transferred out of federal control reflect the use restrictions and enforcement mechanisms specified in the remedy decision document. The transfer document should also include a description of the assumed land use used in developing the remedy and the remedy decision. This information required in the transfer documents should be provided in the environmental Finding Of Suitability to Transfer (FOST) prepared for the transfer. The DoD Component disposal agent will also ensure that appropriate institutional controls and other implementation and enforcement mechanisms, appropriate to the jurisdiction where the property is located, are either in-place prior to the transfer or will be put in place by the transferee as a condition of the transfer. If it becomes evident to the DoD Component that a deed restriction or other institutional control is not being followed, the DoD Component will attempt to ensure that appropriate actions are taken to enforce the deed restriction.

The DoD expects the transferee and subsequent owners to abide by restrictions stated in the transfer documents. The DoD will reserve the right to enforce deed restrictions and other institutional controls, and the disposal agent will ensure that such language is also included in the transfer documents. If DoD becomes aware of action or inaction by any future owner that will cause or threaten to cause a

release or cause the remedy not to perform effectively, DoD also reserves the right to perform such additional cleanup necessary to protect human health and the environment and then to recover costs of such cleanup from that owner under the terms of the transfer document or other authority.

Circumstances Under Which DoD Would Return to do Additional Cleanup. A determination may be made in the future that the selected remedy is no longer protective of human health and the environment because the remedy failed to perform as expected, or because an institutional control has proven to be ineffective, or because there has been a subsequent discovery of additional contamination attributable to DoD activities. This determination may be made by DoD as a part of the remedy review process, or could be a regulatory determination that the remedy has failed to meet remediation objectives. In these situations, the responsible DoD Component disposing of the surplus property will, consistent with CERCLA Section 120(h), perform such additional cleanup as is both necessary to remedy the problem and consistent with the future land use assumptions used to determine the original remedy. Additionally, after the transfer of property from DoD, applicable regulatory requirements may be revised to reflect new scientific or health data and the remedy put in place by DoD may be determined to be no longer protective of human health and the environment. In that circumstance, DoD will likewise, consistent with CERCLA Section 120(h), return to perform such additional cleanup as would be generally required by regulatory agencies of any responsible party in a similar situation. Also note that DoD has the right to seek cost recovery or contribution from other parties for additional cleanup required for contamination determined not to have resulted from DoD operations.

Circumstance Under Which DoD Would Not Return to do Additional Cleanup. Where additional remedial action is required only to facilitate a use prohibited by deed restriction or other appropriate institutional control, DoD will neither perform nor pay for such additional remedial action. It is DoD's position that such additional remedial action is not "necessary" within the meaning of CERCLA Section120(h)(3). Moreover, DoD's obligation to indemnify transferees of closing base property under Section 330 (of the Fiscal Year 1993 Defense Authorization Act) would not be applicable to any claim arising from any use of the property prohibited by an enforceable deed restriction or other appropriate institutional control.

Changes to Land Use Restrictions after Transfer. Deed restrictions or other institutional controls put in place to ensure the protectiveness of the remedy may need to be revised if a remedy has performed as expected and cleanup objectives have been meet. For example, the specified groundwater cleanup levels have been reached after a period of time. In such a case, the DoD Component disposing of the surplus property will initiate action to revise the deed restrictions or other institutional controls, as appropriate.

DoD will also work cooperatively with any transferee of property that is interested in revising or removing deed restrictions in order to facilitate a broader range of land uses. Before DoD could support revision or removal, however, the transferee would need to demonstrate to DoD and the regulators, through additional study and/or remedial action undertaken and paid for by the transferee, that a broader range of land uses may be undertaken consistent with the continued protection of human health and the environment. The DoD Component, if appropriate, may require the transferee to provide a performance bond or other type of financial surety for ensuring the performance of the additional remedial action. The transferee will need to apply to the DoD Component disposal agent for revision or removal of deed restrictions or other institutional controls. Effective immediately, the process for requesting the removal of such restrictions by a transferee should be specified by the disposal agent in the documents transferring property from DoD.

Making those revisions or changes will be considered by DoD to be an amendment of the remedy decision document. Such an amendment will follow the NCP process and require the participation by DoD and regulatory agencies, as well as appropriate public input.

Disclosure by DoD on Using Future Land Use in Remedy Selection. A very important part of this policy is that the community be informed of DoD's intent to consider land use expectations in the remedy selection process. At a minimum, disclosure shall be made to the Restoration Advisory Board (or other similar community group), the LRA (if BRAC) or other local land use planning authority, and regulatory agencies. The disclosure to the community for a specific site shall clearly communicate the basis for the decision to consider land use, any institutional controls to be relied upon, and the finality of the remedy selection decision, including this policy. In addition, any public notification ordinarily made as part of the environmental restoration process shall include a full disclosure of the assumed land use used in developing the remedy selected.

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Office of the Deputy Under Secretary of Defense (Environmental Security)

BRAC Environmental Program Fact Sheet
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Spring 1997

INSTITUTIONAL CONTROLS
What they are and how they are used

WHAT IS AN INSTITUTIONAL CONTROL?

The purpose of this fact sheet is to provide an overview of Institutional Controls (IC) and how they are used. A separate fact sheet is being developed on establishing and maintaining ICs as part of an environmental cleanup remedy decision. That fact sheet will also be available on the Department of Defense (DoD) BRAC Environmental homepage at *http://www.dtic.mil/envirodod/envbrac.html.*

- ICs have a long history as a tool in property law and their use in a non-environmental context is quite common. An example of an IC in a non-environmental context is a prohibition against having a television reception satellite dish in a planned community.
- An IC is a legal or institutional mechanism that limits access to or use of property, or warns of a hazard. An IC can be imposed by the property owner, such as use restrictions contained in a deed or by a government, such as a zoning restriction.

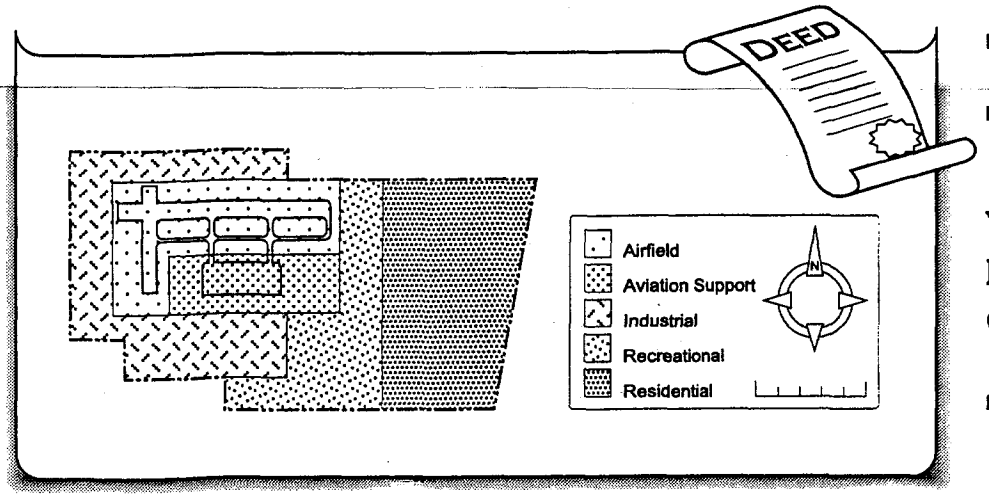
USES OF INSTITUTIONAL CONTROLS IN ENVIRONMENTAL CLEANUP

- ICs are used to ensure protection of human health and the environment.
- ICs are used to protect ongoing remedial activities and to ensure viability of the remedy.
- ICs are specifically provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP).
- DoD has used and will use ICs in remedial activities during cleanup and as part of a final remedy.

TYPES OF INSTITUTIONAL CONTROLS

ICs fall into two categories:

- Proprietary controls
- Governmental controls



WHAT IS A PROPRIETARY CONTROL?

- A proprietary control is a private contractual mechanism contained in

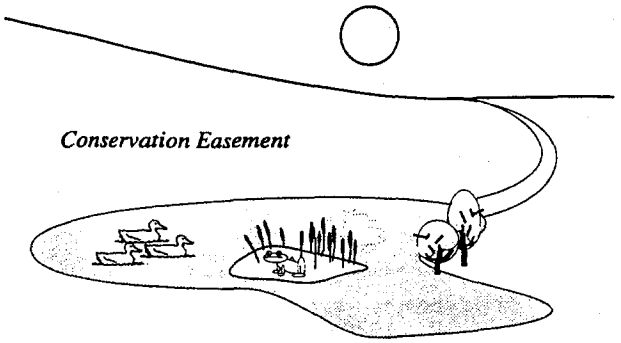
the deed or other document transferring the property.

- Proprietary controls involve the placement of restrictions on land through the use of easements, covenants, and reversionary interests. Easements, covenants, and reversionary interests are nonpossessory interests. Nonpossessory interests give their holders the right to use or restrict the use of land, but not to possess it.

- State law varies on the application and enforcement of such restrictions.

What is an Easement?

- An easement allows the holder to use the land of another, or to restrict the uses of the land. For example, a conservation easement restricts the owner to uses that are compatible with conservation of the environment or scenery.



- If the owner violates the easement, the holder may bring suit to restrain the owner.

- An easement "appurtenant" provides a specific benefit to a particular piece of land. For example, allowing a neighbor to walk across your land to get to the beach. The neighbor's land, the holder of the easement, benefits by having beach access through your land.

- An easement "in gross" benefits an individual or company. For example, allowing the utility company to come on your land to lay a gas line. The utility company, the holder of the easement, benefits by having use of the land to lay the gas line.

- An affirmative easement allows the holder to use another's land in a way that, without the easement, would be unlawful-- for example, allowing a use that would otherwise be a trespass.

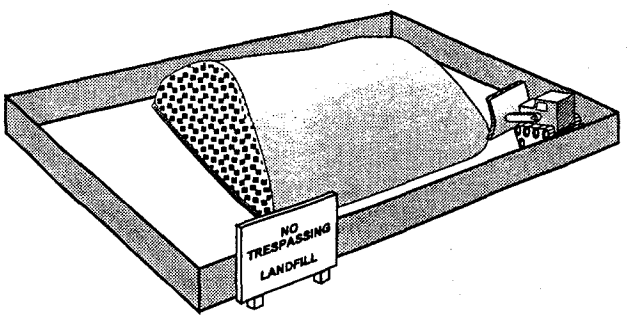
- A negative easement prohibits a lawful use of land — for example, creating a restriction on the type and amount of development on land.

What is a Covenant?

- A covenant is a promise that certain actions have been taken, will be taken, or may not be taken.

- Covenants can bind subsequent owners of the land. There are special legal requirements needed to bind subsequent owners.

- An affirmative covenant is a promise that the owner will do something that the owner might not otherwise be obligated to do -- for example, maintaining a fence on the property that surrounds a landfill.

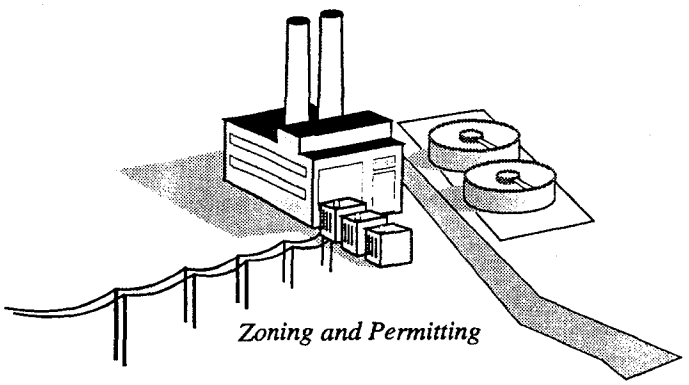


- A negative covenant is a promise that an owner will not do something that the owner is otherwise free to do -- for example, restricting the use of groundwater on the land.

What is a Reversionary Interest?

- A reversionary interest places a condition on the transferee's right to own and occupy the land. If the condition is violated, the property is returned to the original owner or the owner's successors.

- Each owner in the chain of title must comply with conditions placed on the property. If a condition is violated the property can revert to the original owner, even if there have been several transfers in the chain of title.



WHAT IS A GOVERNMENTAL CONTROL?

- Governmental controls are restrictions that are within the traditional police powers of state and local governments to impose and enforce.

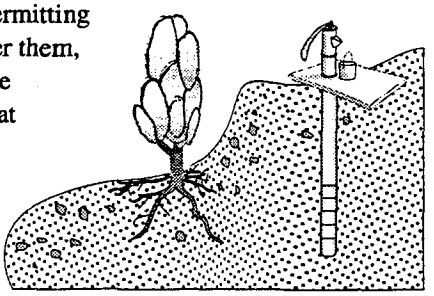
- Permit programs and planning and zoning limits on land use are examples of governmental controls.

What are possible governmental controls?

- **Zoning**— Use restrictions imposed through the local zoning or land use planning authority. Such restrictions can limit access and prohibit disturbance of the remedy. Zoning authority does not exist in every jurisdiction.

- **Siting restrictions** — Control land use in areas subject to natural hazards, such as earthquakes, fires, or floods. Such restrictions are created through statutory authority to require that states implement and enforce certain land use controls as well through local ordinances.

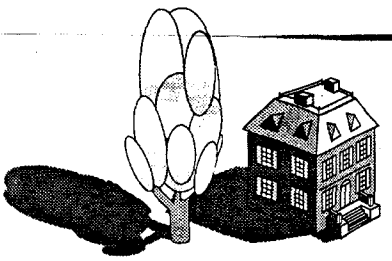
- **Groundwater restrictions**— Specific classification systems used to protect the quality of or use of ground water. These systems operate through a state well permitting system. Under them, criteria may be established that must be met before a use permit or construction is allowed.



Examples of the Application of Institutional Controls

Historic Preservation at U.S. Customs House, Boston

In 1987, the Custom House in Boston was deemed excess and the General Services Administration (GSA), through special legislation, sold it to the Boston Redevelopment Authority. At the time of the sale, the GSA placed an historic preservation covenant in the deed to protect the exterior architectural and structural integrity of the building. The Boston Redevelopment Authority wanted to resell the Custom House to a developer that planned to connect it by a skyway to a building half a block away. When GSA refused to remove the historic covenant, the deal fell through. Several years later, the Marriott Corporation proposed a plan to buy the Custom House and create an urban park between the Marriott at the Wharf and the Custom House. Under the plan, the building will retain its historic appearance and will be used as one of Marriott's time-share properties.



Examples of the Application of Institutional Controls

Limiting Subsurface Use at Former Minuteman Missile Silos

With the end of the Cold War, the Department of Defense announced the retirement of the Force Minuteman missile system in North and South Dakota and Missouri. As allowed by the Strategic Arms Reduction Treaty, the Air Force, after extensive technical analysis and public comment, determined that dismantlement of the missile facilities would be accomplished by imploding the structures, capturing the contamination within the concrete structures; capping each structure with a combination of three feet of soil and a thick plastic liner; and contouring the landscape at an additional depth of seven feet above the facility. The Air Force also determined that CERCLA 120(h) applied to the transfer of these facilities to non-federal entities. The Air Force and the U.S. Environmental Protection Agency (EPA) found a sensible approach to address environmental issues, which was formalized in an agreement between the two agencies. The agreement calls for the GSA in disposing the property to notify federal and state regulators when the property is transferred; provide prior notice to and obtain the approval of federal and state regulators for any construction or other activity that would affect the underground facility or groundwater monitoring wells; and place restrictions in the deed of conveyance to prohibit future property owners from installing water wells or otherwise physically penetrating beneath the surface of the site below two feet. The Air Force and regulators also were provided with rights of access. The ICs are in place for the disposal of these missile sites in North and South Dakota and Missouri.

Other Sources of Information

1. John Pendergrass, *Use of Institutional Controls as Part of a Superfund Remedy: Lessons from Other Programs*, 26 ELR 10219 (March 1996).

2. Report of the Future Land Use Working Group to the Defense Environmental Response Task Force, *Types of Institutional Controls,* (May 1996), available on DoD BRAC environmental homepage at *http://www.dtic.mil/envirodod/envbrac.html.*

3. Report to the Future Land Use Working Group to the Defense Environmental Response Task Force, *Making Institutional Controls Effective,* (September 1996) available on DoD BRAC environmental homepage at *http://www.dtic.mil/envirodod/envbrac.html.*

NOTICE

We welcome and invite your comments on this fact sheet, as we seek ways to improve the information provided. Please send comments to the following address:

OADUSD (Environmental Cleanup)
Attn: Fast-track Cleanup
3400 Defense Pentagon
Washington, D.C. 20301-3400.

February 1998

A Guide to Establishing Institutional Controls at Closing Military Installations

About This Guide

This guide supplements the land use matrix developed under the February 1996 "Guide to Assessing Reuse and Remedy Alternatives at Closing Military Installations" by helping to ensure the compatibility between the selected land use and the selected remedy. The land use matrix is intended as a tool to build consensus among Base Realignment and Closure (BRAC) cleanup teams (BCTs), local redevelopment authorities (LRAs), restoration advisory boards (RABs), and other community members, as well as to identify and resolve the complex restoration and reuse issues at closing installations. This guide further explains land use restrictions, namely institutional controls (ICs), that may be associated with a restoration and reuse alternative. This guide is intended to:

ICs are mechanisms that protect property users and the public from existing site contamination that continues to be present during the use of a site.

- facilitate, early in the process, discussions among stakeholders to enhance understanding of ICs, i.e., what they are and how they might be used as part of a proposed remedy alternative in the BRAC cleanup program;
- act as a planning tool and checklist to assist stakeholders in considering a selected remedy which does in fact include the use of ICs; and
- provide a framework for building cooperation among the stakeholders in the establishment and maintenance of ICs.

For a particular restoration and reuse alternative, the stakeholders may identify the need for ICs. This guide assumes that the LRA will take the environmental condition of property into account in development of its reuse plan, and that use restrictions will be included in the remedy decision arrived at through the remedy selection process. In this guide, ICs are taken to be mechanisms that protect property users and the public from existing contamination that continues to be present during the use of a site. A more detailed explanation of ICs is presented in the BRAC Environmental Program Fact Sheet: *Institutional Controls: What They Are and How They Are Used* (see "Where to Learn More," page 8). There may be other ICs associated with the property but not related directly to an environmental response action, such as historic and cultural preservation, access for utility maintenance, or ecological concerns, e.g., wetlands and wildlife protection.

Conflict can arise among stakeholders during the process of identifying and evaluating restoration and reuse alternatives. A detailed discussion of conflict resolution techniques can be found in the July 1996 document entitled *Partnering Guide for Environmental Missions of the Air Force, Army, and Navy* (see "Where to Learn More," page 8). That guide provides techniques for forming and maintaining an effective problem-finding, problem-solving team. By applying the techniques described, the parties involved in establishing and maintaining ICs can identify common issues and maximize the effectiveness of the tools available to each.

What Is the Role of Institutional Controls in the Remedy Selection Process?

The potential need for ICs is identified when stakeholders develop the land use matrix recommended in the BRAC Environmental Program Fact Sheet: *A Guide to Assessing Reuse and Remedy Alternatives at Closing Military Installations*. When various restoration and reuse alternatives are being developed, the first question to be asked is:

Does this alternative require some sort of control or limit on use of the property?

If the answer to that question is "yes," then this guide should be used to evaluate how an IC would be established. Considering the pros and cons of establishing and maintaining ICs should be an integral part of the decision-making process in the selection of a restoration action. When ICs are used, they are a vital part of the remedy and must be maintained to protect human health and the environment. ICs are legal mechanisms, such as deed restrictions, and may be coupled with physical controls, such as signs posted at the site or fences. The control or notice mechanism will vary depending on the nature of the contamination, its location, the targeted land use, the structures located on the site, and the length of time for which the use is restricted.

During remedy selection, the nature and extent of specific limits placed on future property use should be discussed with the community and the LRA so that they may be considered in planning reuse of BRAC property.

Once remedy alternatives, including ICs, have been identified, the remedy selection process is applied to evaluate the alternative as a whole, including any ICs involved. For example, using the process under the National Contingency Plan (NCP) for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the BCT will develop a proposal on which the public and regulatory agencies will be invited to comment — both in writing and at a public meeting. A response to those comments will be prepared, and a response action selected. Throughout the remedy selection process, the ICs will be evaluated in the same manner as all other components of a potential remedy, as required by statute and Executive Order 12580. Stakeholders need to seriously consider and discuss all aspects of establishing, maintaining, and funding ICs as part of a remedy.

Two situations commonly occur in which ICs play an important role: (1) to protect the integrity of an engineering control intended to contain contamination, reduce its mobility, and minimize exposure, such as a landfill cap, and (2) to limit the exposure of individuals to residual contamination by limiting the reuse activities associated with that portion of the installation.

The information collected during the Remedial Investigation is used to determine if contamination is present and to characterize the site. In some cases, removing all contamination to allow unrestricted use of property may be very costly, the technology may be unavailable, or the time required to remediate and transfer the property may be prohibitive considering the community's reuse requirements for planned reuse and timing of property transfer.

The preferred remedy, protective of human health and the environment, sometimes requires that contaminants not be disturbed, leaving them in place. For example, the excavation of landfills can actually increase the risk to human health and the environment, in the short term, by exposing toxic contamination. One approach to reducing the long-term risk associated with such contamination left in place is to limit the uses to which that property will be put. The limit may be broad — for example, no residential occupancy — or it may be specific — for example, any activity involving the disturbance of soil must be approved in advance and any excavated soil must be disposed of properly.

During the remedy selection, the nature and extent of the specific limits placed on future property use should be discussed with the community and the LRA so that they may be considered in planning reuse of BRAC property. Although the final details, such as engineering plans, zoning plans, and certain longer-term ICs such as deed restrictions, will not be determined until the Remedial Design is developed, the Feasibility Study (FS) should provide as clear a description as possible of the nature of the anticipated restrictions. Another important element of the FS is the anticipated duration of the restriction. If the

restriction is limited to a relatively short period during the actual remediation, it will have a very different impact on reuse than a restriction that is anticipated to last for a longer period of time. Such a longer-term restriction, for example, might be a restriction on groundwater use until treatment or attenuation has reduced contaminant levels to below health-based standards or a restriction on surface use over a landfill cap.

The proposed plan outlines the preferred remedial alternative and summarizes the other alternatives considered in the FS. The proposed plan should be written in a manner that can be easily understood by the public. A clear statement of the restrictions associated with the proposed action should be included to allow the public to be fully informed about the proposed action and implications of using ICs if they are a part of that action. The remedy selection process under CERCLA and the Environmental Protection Agency's (EPA) position on the use of ICs are described in the National Contingency Plan (NCP) (40 CFR Part 300.430(a)(1)(iii)) and its preamble (55 FR 8706). Under the NCP, community acceptance is one of the nine criteria for selecting a CERCLA remedy. While community acceptance is an essential ingredient in making the final remedy selection, it is not always possible to accomplish all the community's goals. It is the Department of Defense's (DoD) responsibility to make the final remedy selection in accordance with applicable laws and requirements and to ensure that it will be protective of human health and the environment, as well as be compatible with, to the extent reasonably practicable, community reuse plans. This final remedy selection is formalized through the Record of Decision (ROD), which will be compatible with any ICs that may be implemented at the site.

When the Selected Response Includes Institutional Controls

Form a Team

When a selected response includes ICs, the team members (see box) involved in developing the future land use and evaluating the response should work together to establish and maintain the selected ICs. Requirements for establishment and maintenance of ICs vary from site to site and are dependent on the real property and environmental cleanup laws and regulations of that jurisdiction. Cooperation, therefore, is essential to achieve success. That success depends on building a team that will be effective in using the tools available at that site and in that location.

Team members already should be a part of the process through their participation in groups such as those listed in the box below. Key members of these existing entities (although others may be consulted as necessary) should be part of the team developing a plan for the success of ICs at that site. It is important to build a team that works together to ensure the success of the response action and the effective reuse of the land.

The Team

Team Member	*Potential Role in Establishing and Maintaining ICs*
BRAC Cleanup Team	Identify the remaining contamination and associated risks at a site that requires ICs
Local Redevelopment Authority	Identify the intended use of the site consistent with the environmental condition of property that may require ICs, may assist in the establishment of ICs
Community Stakeholders (including the RAB)	Provide input and recommendations on establishing and maintaining ICs
Base Transition Coordinator	Facilitate the coordination of information for property reuse and transfer with cleanup activities, including establishment of ICs
Real Estate Attorney/Environmental Attorney	Develop deed language for restrictions; may assist in developing other ICs
Federal, State, and Local Government Officials	Establish, monitor or enforce ICs
Identified Holders of Property Interest	Maintain a use of the site that is consistent with ICs

Establish Cooperation

Such success will be easier to achieve when the following commitments are made:

- The team makes a commitment to the success of ICs
- The team develops the skills needed to work together well
- Throughout the process, all team members make a commitment to open communication
- The team members maintain mutual trust, honor, and respect
- The team members accept responsibility, make decisions, take risks, and resolve issues
- The team makes decisions through consensus
- The team develops creative solutions and applies them to all problems
- The team maintains agreed-upon processes for resolving disagreements or disputes
- The team evaluates progress and recognizes successes

The Task of the Team

This guide identifies issues that may be relevant to any number of response actions. It does not suggest how to resolve specific issues, but offers tools that the team may find useful. It is up to the team establishing the ICs to develop and implement a plan that uses these and other tools and the resources available to them at that site to create an effective remedy.

Checklist of Issues and Tools To Be Considered When Establishing and Maintaining ICs

The following questions should be asked when DoD and stakeholders discuss how to establish and maintain ICs.

Q. What are the ICs meant to accomplish?

What types of reuse are possible, given the environmental condition of property and/or the planned remedial activities? For example:

TYPE(S) OF REUSE ALLOWED

- ☐ Residential
  - ☐ *Housing* ☐ *Daycare* ☐ *Hospitals* ☐ *Schools* ☐ *Other*
- ☐ Commercial
- ☐ Industrial
- ☐ Recreation
- ☐ Agricultural
- ☐ Other

What are the activities that must be restricted? For example:

SPECIFIC RESTRICTIONS

- ❑ Uses of ground and surface water
  - ❑ Prohibitions against drinking the water
  - ❑ Prohibitions against use of groundwater from existing wells
  - ❑ Prohibitions against any other use of the water (e.g., irrigation, watering livestock, or recreational uses, including fishing)
  - ❑ Restrictions to maintain the integrity of monitoring and reinjection wells
  - ❑ Other
- ❑ Use of soils
  - ❑ Prohibitions against excavation, construction, drilling, or disturbance of the soil (e.g., well installation that may connect an uncontaminated aquifer with a contaminated aquifer, or maintaining landfill cap)
  - ❑ Restrictions governing depth of excavation
  - ❑ Other
- ❑ Other ICs not directly related to the environmental response
  - ❑ Restrictions preserving historic or cultural areas
  - ❑ Restrictions protecting wildlife or wetlands
  - ❑ Restrictions governing access to the property (e.g., utility maintenance)

Q. What are the techniques and tools available to establish and maintain ICs?

TECHNIQUES: METHODS FOR ACCOMPLISHING THE GOALS OF THE ICs

- ❑ *Layering:* Layering means the use of a strategy to combine mutually reinforcing controls, for example, a combination of deed restrictions, physical barriers, and notice can expand the number of parties involved and strengthen the network that maintains the remedy and protects human health and the environment. Many tools can be used at the same time and at various levels to accomplish that result. Different team members may have methods available to them that enhance maintenance of the remedy.

- ❑ *Notice:* Providing notice that controls exist at a site is essential to maintain those controls and ensure that users of the property abide by them. The more people who are aware of and responsible for an IC, the easier it is to ensure that the controls will be heeded and maintained.

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TOOLS: SPECIFIC ACTIONS THAT CAN BE USED TO IMPLEMENT THESE TWO TECHNIQUES

- ❑ *Deed Language:* Language in the deed is a good method of providing notice and generally will be an important part of any IC plan. The legal instrument and language used should be tailored to the requirements and processes that are best suited to the jurisdiction. The instrument, which may be separate from the deed, may be a covenant or easement or some other form of property right; however, before relying on any such right, the legality and enforceability of such a right in the jurisdiction must be determined. The legal instrument should provide a

stand-alone explanation of the restrictions and should cite the portions of the administrative record, regulations, and transfer documents that are relevant to establishing the restrictions. Language providing notice and describing the restrictions may also be included in the transfer documents.

Depending on state law, which may vary, and depending on the intentions of the parties to the original transaction and third parties who hold an interest in the land, deed language can be structured to give enforcement rights to the previous owner and to those third parties. Deed restrictions implementing ICs should be structured to run with the land — in other words, to remain in force despite changes in ownership; for example, by stating that the restrictions benefit the surrounding property and benefit the general public, or by stating that the parties intend the ICs to run with the land and bind future parties. State laws vary and the enforceability of deed restrictions should be considered carefully in structuring deed language. The more stakeholders that have authority to enforce a deed restriction, the more effective it will be as a method of control. In spite of any legal limits on the enforceability of deed language, a deed restriction is an important form of notice.

- ❑ ***Records and Community Involvement:*** Other available methods of providing notice include the administrative record for the response action; local records like planning and zoning maps and subdivision plats; and similar state records and registries. Means of community education such as public meetings, recurring notices in newspapers, and signs and fences also provide notice.

- ❑ ***Federal, state, and local laws and regulations:*** Statutory authority under CERCLA and the Resource Conservation and Recovery Act (RCRA) may provide Federal and state regulators direct legal authority to protect human health and the environment, prevent releases, or control site activities. State and local governments may also play a role through already existing legal frameworks or regulatory programs such as permitting the use of land, monitoring public health through public health statutes, authorizing zoning and land use plans, passing ordinances, and acting under established statewide environmental programs. Such legal avenues can be integrated into an IC plan and provide notice that activities at the site in question are restricted.

- ❑ ***Inspections:*** There may be inspections of the affected property associated with the selected remedy, generally as part of the remedy's operation and maintenance. Even though these inspections may not be intended for the purpose of monitoring an IC, they may provide an opportunity to assess activities at the site. For example, an inspection of monitoring wells may also provide an opportunity to establish compliance with an IC restricting excavation. Other existing inspection routines associated with regulatory programs not related to the remediation may also protect the site in question. While such inspections should not be confused with the ICs themselves, they can be used to assist in the maintenance of ICs. Such existing programs can be integrated into an IC plan in association with or in addition to the state and local laws and regulations listed above. The state and Federal members of the BCT may give the appropriate section or branch of the environmental regulatory agency or other pertinent agency notice of the IC or deed restriction by adding the organization's representative to the finding of suitability to transfer distribution list. In addition, the Federal government is required to review a remedy at least every five years, where contamination remains in place. Where ICs are part of the remedy, such reviews should include verification that the ICs are still in place and effective.

  - ❑ Remedy-specific environmental inspections (generally part of operation and maintenance of a remedy)
    - ❑ Inspections to ensure the integrity of the landfill cap
    - ❑ Inspections of the leachate treatment system
    - ❑ Inspections of the water treatment system
    - ❑ Other inspections required for operation and maintenance

- ❑ Other Federal, state, and local government inspections not directly related to the environmental response
  - ❑ Restrictions preserving historic or cultural areas
  - ❑ Restrictions protecting wildlife or wetlands
  - ❑ Restrictions governing access to the property (e.g., utility maintenance)
  - ❑ Restrictions concerning health
  - ❑ Restrictions concerning building standards
  - ❑ Other

Q. What are the responsibilities to maintain and ensure the effectiveness of ICs?

As a network for establishing an IC is created, it is also appropriate and necessary to discuss the associated responsibilities for maintaining its effectiveness. As previously noted, there are numerous existing statutory frameworks and regulatory programs at the Federal, state, and local levels that provide the authority to maintain the integrity of the remedy requirements. Stakeholders may need to discuss resources that are available or might be needed for certain ICs. They also need to discuss how long-term responsibilities for IC implementation at the site will be coordinated among team members.

- ❑ Statutory authority to enforce RCRA and CERCLA
- ❑ State and local, general or site-specific enforcement authorities that can be applied
  - ❑ Property laws
  - ❑ Permitting programs
  - ❑ Zoning
  - ❑ Other laws or ordinances
- ❑ Funding maintenance of the IC
- ❑ Long-term coordination responsibilities

Q. How is an IC modified or terminated?

ICs may also be modified or terminated over time. It is therefore useful to discuss what time frames, if known, and what procedures may be necessary for accomplishing these tasks. Due to the site-specific nature of IC plans, procedures for modifications to ICs may vary depending on that plan.

- ❑ Length of time ICs are needed
- ❑ Legal steps to remove or modify each IC
- ❑ Organizations that may be involved with modification or termination:
  - ❑ Federal government
  - ❑ Local court
  - ❑ State government
  - ❑ Landowner
  - ❑ State court
  - ❑ Adjacent landowner
  - ❑ Local government
  - ❑ Previous landowner

Where to Learn More

Further information on this and other BRAC issues can be found by reading:

- DoD's Future Land Use Policy: *Responsibility for Additional Environmental Cleanup after Transfer of Real Property* (July 1997)
- BRAC Environmental Program Fact Sheet: *Institutional Controls: What They Are and How Are They Used* (Spring 1997)
- BRAC Environmental Program Fact Sheet: *A Guide to Assessing Reuse and Remedy Alternatives at Closing Military Installations* (February 1996)
- *Fast Track to FOST: A Guide to Determining if Property is Environmentally Suitable for Transfer* (Fall 1996)
- *Partnering Guide for Environmental Missions of the Air Force, Army, and Navy* (July 1996)

Or by contacting:

Office of the Assistant Deputy Under Secretary of Defense
(Environmental Cleanup)
Attn: Fast-Track Cleanup
3400 Defense Pentagon
Washington, D.C. 20301-3400

Or by looking on the World Wide Web at:
http://www.dtic.mil/envirodod/envbrac.html

For additional information about selection of response actions, see the following EPA Office of Solid Waste and Emergency Response (OSWER) documents:

- Land Use in CERCLA Remedy Selection Process, OSWER Publication Number PB95-963234\NDZ (June 1995)
- Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, OSWER Publication Number 9355.0-30 (April 1991)
- A Guide to Selecting Superfund Remedial Actions, OSWER Publication Number 9355.0-27FS (April 1990)

These are available on the World Wide Web at:
http://www.epa.gov/epa/oswer

The *Guide to Establishing Institutional Controls at Closing Military Installations* was prepared with input from an inter-agency work group made up of representatives of the Office of the Secretary of Defense, the DoD Components, the U.S. EPA, the General Services Administration, the California EPA, the National Association of Attorneys General, the International City/County Management Association, the National Association of Installation Developers, and others. This guide is not a formal statement of DoD policy, but is meant to assist in the establishment and maintenance of ICs at BRAC properties.

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COMMONLY ASKED QUESTIONS REGARDING THE USE OF NATURAL ATTENUATION FOR CHLORINATED SOLVENT SPILLS AT FEDERAL FACILITIES

This brochure was developed through a partnership among the U.S. EPA, Air Force, Army, Navy, and Coast Guard.

Do federal, state, and local regulations allow natural attenuation as an option for remediation of chlorinated solvents?

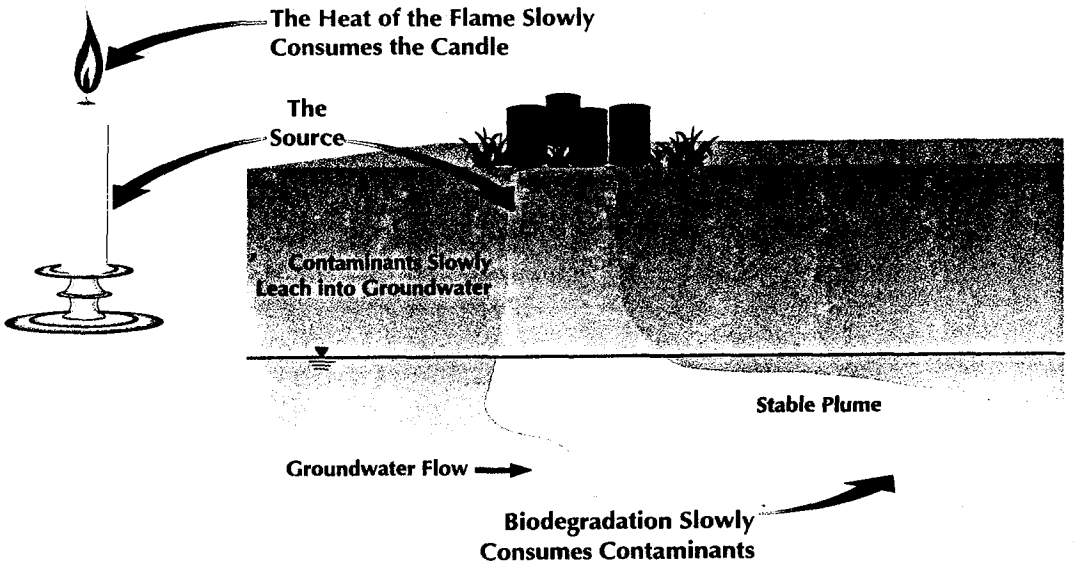
Natural attenuation is recognized by the EPA as a viable method of remediation for soil and groundwater that can be evaluated and compared to other methods of achieving site remediation as a part of the remedy selection process. The selection of natural attenuation as a component of any site remedy should be based on its ability to achieve remediation goals in a reasonable timeframe and protect human health and the environment. EPA recognition of natural attenuation extends to sites regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Resource Conservation and Recovery Act (RCRA); and underground storage tank (UST) regulations. Natural attenuation is not a default option or a "presumptive remedy." As with any remedy, it must comply with state groundwater use classifications and standards.

"Under certain site conditions, and if properly documented, natural attenuation can be a viable option for remediating sites as a stand-alone option or in conjunction with other engineered remediation." Jim Woolford, Director, EPA's Federal Facilities Restoration and Reuse Office

What is natural attenuation?

When chlorinated solvents such as trichloroethene (TCE) or perchloroethene (PCE) are spilled or leak into the soil or groundwater, several natural processes can occur to destroy or alter these chemicals. These processes, known collectively as natural attenuation, include adsorption to soil particles, biodegradation of contaminants, and dilution and dispersion in groundwater. Many contaminants are prevented from migrating off the site because they are adsorbed to soil particles. Although biodegradation does not occur at all chlorinated solvent sites, it can be an important process in destroying these contaminants. Dilution and dispersion do not destroy contaminants, but can significantly reduce their potential risk at many sites.

"Intrinsic" and "passive" remediation are other terms which have been used to describe the combined effect of these processes. Dr. John Wilson of the EPA compares natural attenuation in groundwater to the flame of a candle. The source of the flame is the wax of the candle just as the source of the groundwater contamination is the concentrated solvents trapped in the soil. The flame appears steady because the wax is destroyed in the flame as fast as it is removed from the candle. In the same way, many groundwater plumes will reach "steady state" at some distance from the source, when biological reactions are able to destroy contaminants as they enter the groundwater from the soil. Eventually, the candle is consumed by the flame just as the contaminants in the soil and groundwater can be attenuated through biodegradation and other natural processes.



How is natural attenuation different from the "do nothing" approach?

Natural attenuation is sometimes mislabeled as the "do nothing" or "walk away " approach to site cleanup. The truth is that natural attenuation is a proactive approach that focuses on the verification and monitoring of natural remediation processes rather than relying totally on "engineered" processes.

Before natural attenuation can be proposed for any site, significant soil and groundwater data must be collected and evaluated to document that natural attenuation is occurring and to estimate the effectiveness of natural processes in reducing contaminant concentrations over time. If natural attenuation is selected as the preferred site remedy, the party responsible for site cleanup must commit to long-term monitoring to verify that the contaminants pose no risk to human health or the environment and that natural processes are reducing contaminant levels and risk as predicted. Land use and groundwater use are generally controlled on these sites to prevent human exposure to contaminants.

How does natural attenuation of chlorinated solvents differ from natural attenuation of petroleum products such as fuels?

Because chlorinated solvents are synthetic chemicals, they tend to be more resistant to natural biodegradation processes. However, significant evidence now exists that biochemical reactions can also break down chlorinated compounds in the soil and groundwater. These processes are harder to predict and are effective at a smaller percentage of sites compared to petroleum-contaminated sites. Despite these limitations, significant progress has been made in understanding the fate and transport of chlorinated solvents and the role of natural attenuation.

Chlorinated solvents also migrate differently than petroleum hydrocarbons. Because chlorinated compounds have a greater density than water, they tend to sink rapidly into the aquifer. When large quantities of solvent are released, they will sink until they encounter an impermeable layer where they form small pools which serve as a long-term source of groundwater contamination. These untreated sources dissolve slowly over time, contaminating large volumes of water.

How can you tell if natural attenuation may work at a site?

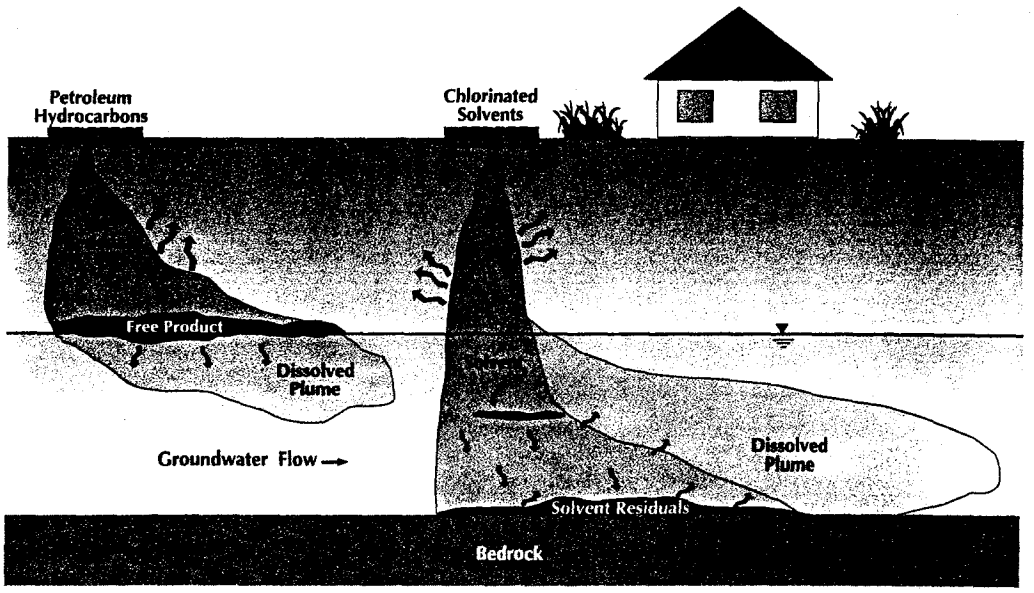
Experts in the science of natural attenuation have identified several good indicators or lines of evidence that can be used to prove that natural processes are reducing contaminant concentrations. The following lines of evidence are useful in documenting the natural attenuation of chlorinated solvents:

- Historical trends indicating a decrease in contaminant concentrations, as well as a stable or retreating plume. A stable or retreating plume generally indicates that contaminants are being destroyed as fast as they are dissolved into the groundwater.

- Favorable geochemical conditions. Biological reactions will change the chemical composition of the groundwater. One condition which is particularly favorable for chlorinated solvent destruction occurs in groundwater that has been completely depleted of oxygen and nitrate. Depleted levels of sulfate and elevated levels of dissolved methane are also favorable conditions.

- Breakdown or "daughter" products. Chlorinated solvents are often destroyed by biochemical reactions which remove one chlorine atom at a time from the "parent" or original solvent. When these breakdown products are detected in the groundwater, it provides evidence that contaminant destruction is underway. It is important for biodegradation to be complete, because some breakdown products may be more toxic than parent compounds.

- Laboratory "microcosm" studies. These studies can be used to simulate aquifer conditions and to demonstrate that native bacteria can create the necessary biochemical reactions to destroy contaminants of concern. This technique is sometimes required for chlorinated solvent sites because the biochemical reactions are more complex and more difficult to predict than reactions on petroleum-contaminated sites.



The Air Force Center for Environmental Excellence is developing a comprehensive natural attenuation protocol (Draft Technical Protocol for Natural Attenuation of Chlorinated Solvents in Groundwater) for chlorinated solvent sites. This document describes how this evidence can be collected during site investigation activities and how it can be interpreted to estimate the contribution of natural attenuation in the remediation process.

Will natural attenuation be effective on all chlorinated sites?

Definitely not. Some chlorinated solvent contamination has impacted large quantities of groundwater which will be required for some beneficial use. There are risks associated with the continued migration of these plumes into public drinking water supplies and some form of engineered remediation is needed at these sites. On sites where no current risk to public health or the environment exists, natural attenuation can play an important role in reducing future risk if institutional controls (e.g., deed restrictions and zoning ordinances) can be implemented. Scientists are beginning to observe certain site profiles where natural attenuation has a higher probability of being integrated into the remediation process. These include:

- Sites where chlorinated solvents are spilled with other petroleum compounds (the best biochemical reactions for degradation are produced).
- Sites where the soil contains high levels of natural organic matter, such as swampy areas or former marshlands.
- Sites where shallow (unused) groundwater is separated from deeper groundwater by a thick, low-permeability clay layer.
- Sites where there is little or no source remaining due to active remediation.

Why are chlorinated solvent spills so common at federal facilities?

Chlorinated solvents were developed as superior cleaning solutions for removing grease and carbon buildup from metal parts. For over 40 years they were widely used by U.S. industry and the federal government for a variety of equipment cleaning tasks.

Prior to environmental laws restricting their use, these compounds were often stored in drums or underground storage tanks and disposed of in the sanitary sewer, in evaporation ponds, or mixed with fuels and burned. These solvents have created significant groundwater contamination at many federal facilities. Since 1976, when RCRA was established, the use and disposal of these solvents have been carefully regulated and many chlorinated solvents have been replaced with less harmful substitutes.

Can natural attenuation achieve site cleanup goals?

Natural attenuation may be effective in achieving cleanup goals at some sites, particularly when these goals are based on site-specific risk reduction. For example, if contaminant migration is limited to shallow groundwater, and groundwater use can be controlled, natural attenuation may eventually achieve cleanup goals on some sites. However, natural attenuation is more likely to play a role in cleaning up a portion of a chlorinated site. Natural attenuation is more likely to clean up areas that have lower levels of contamination. Such areas are normally found outside of highly contaminated source areas, or at sites with relatively small source areas.

What are some of the potential advantages and limitations of natural attenuation?

Potential Advantages

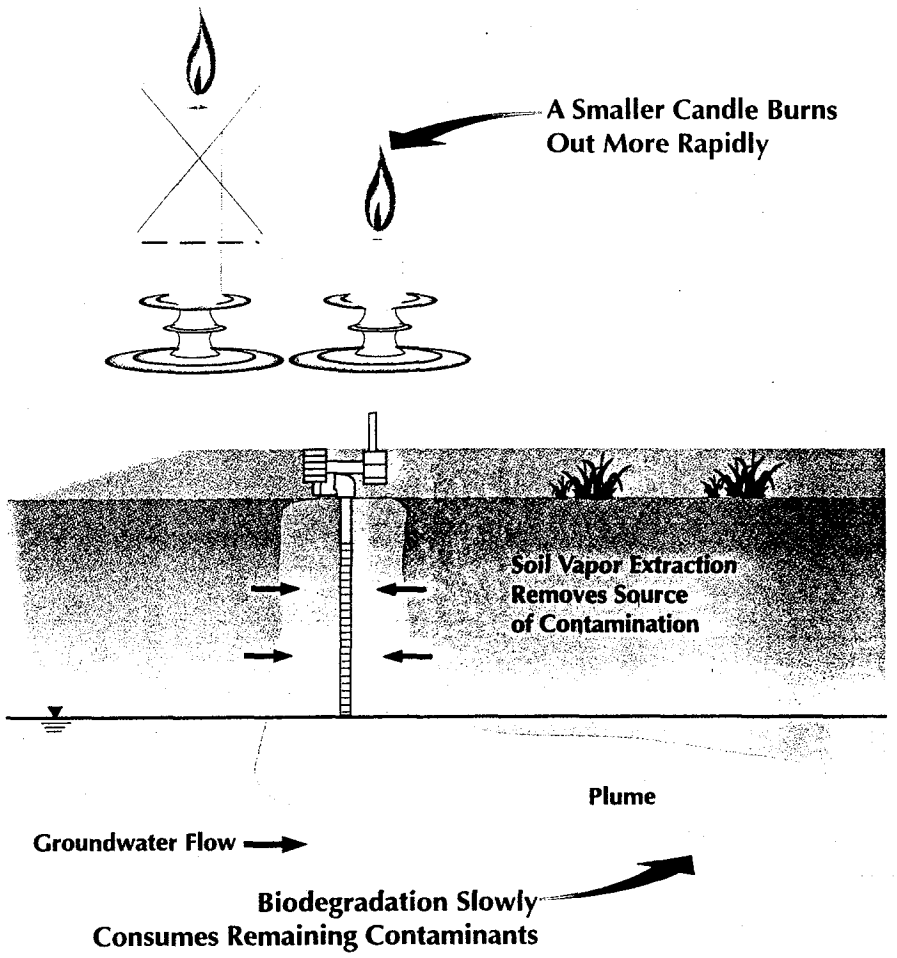
- Less generation or transfer of wastes.
- Less intrusive and disruptive than engineered methods.
- Can be combined with active remedial measures or used to remediate a portion of the site.
- Remediation costs may be lower than with active remediation.

Potential Limitations

- May require more time to achieve cleanup goals and requires a commitment to long-term monitoring. On some sites, long-term monitoring costs can be excessive.
- If natural attenuation rates are too slow, the plume could continue to migrate.
- Incomplete biodegradation can create new, more toxic contaminants.
- Land and groundwater use controls are often required.

Can natural attenuation processes be enhanced to speed up the cleanup process?

Natural attenuation may be successfully combined with other remediation techniques to achieve cleanup goals within a reasonble time frame. Engineered approaches that may be used in conjunction with natural attenuation include hydraulic containment, soil vapor extraction, source removal, and pump-and-treat methods. In addition, non-toxic organic compounds may be added to enhance the breakdown of contaminants.



Again, the candle provides a useful illustration of how active and natural remediation can be combined. If the top of the candle (the source) is cut off and removed, the flame (plume) will exist for only a fraction of the original time. Soil vapor extraction, free product recovery, soil excavation, and groundwater extraction in the source area are all methods of reducing or containing the source of solvent contamination. The rate at which the candle burns can also be increased by improving the conditions for combustion. As mentioned previously, many chlorinated solvents actually degrade faster in the absence of oxygen under anaerobic conditions. Researchers are now developing methods of adding highly biodegradable organic compounds to increase the natural bacteria population in the groundwater which will consume available oxygen and create these favorable conditions. Regardless of whether an engineered remediation or natural attenuation is used, controls on groundwater use will be required on most chlorinated solvent sites.

What if natural attenuation does not work at a site?

As with any remedy, if monitoring results indicate inadequate progress, it will be necessary to reevaluate the remedial action plan. If this occurs, the remediation project manager would consider implementing an engineered approach for all or part of the plume.

This brochure was developed through a partnership among the U.S. EPA, Air Force, Army, Navy, and Coast Guard. If you would like additional information about natural attenuation and its application at federal facilities, you may fax your request to the National Center for Environmental Publications and Information at (513) 489-8695 or contact the following agency home pages on the Internet:

EPA - http://www.epa.gov
Air Force - http://www.afcee.brooks.af.mil
Army - http://aec-www.apgea.army.mil:8080
Navy - http://www.nfesc.navy.mil
Coast Guard - http://www.dot.gov/dotinfo/uscg