Marine Corps Air Station El Toro
Installation Restoration Program

Public Information Materials

5/28/97
Restoration Advisory Board Meeting
held at Irvine City Hall
Irvine, CA

Materials/Handouts Include:

- RAB meeting agenda and meeting announcement/flier..
- RAB draft meeting minutes - 3/26/97 RAB meeting. *(These minutes were approved at the 5/28/97 meeting without any amendments, they are considered Final.)*
- Points Regarding the Proposed Plan for Site 24 Vadose Zone Soil Remediation (provided by Dr. Bennett, OU-2 Subcommittee Chair).
- Executive Summary Draft Final Phase II Vadose Zone Feasibility Study Report Operable Unit 2A, Site 24, MCAS El Toro, March 11, 1997.
- U.S. EPA, "A Citizen's Guide to Soil Vapor Extraction and Air Sparging".
- U.S. EPA, "User's Guide to the VOCs in Soils Presumptive Remedy".
- U.S. EPA, "Presumptive Remedies: Site Characterization and Technology Selection For CERCLA Sites With Volatile Organic Compounds In Soils".
- Results of Remedial Investigation (Site 24), 5/15/97 Public Meeting Handout.
- Table 2-4 Remediation of Deep Soil (Site 24), 5/15/97 Public Meeting Handout.
- Define Media-Specific Remedial Action Objectives (Site 24), 5/15/97 Public Meeting Handout.
- Assemble Remaining Technologies Into Remedial Action Technologies (Site 24), 5/15/97 Public Meeting Handout.
- Comment Form, Site 24 Soil Cleanup Proposed Plan.
- RAB Membership Roster, Revised 5/28/97.

- <u>Agency Comments - U.S. Environmental Protection Agency</u>
  - U.S. EPA Approval of Draft Final Phase II Feasibility Study Reports - Operable Unit 2B, Sites 2 & 17, MCAS El Toro, April 10, 1997.
  - U.S. EPA Comments on Groundwater Monitoring Report, November-December, 1996, Sampling Round, MCAS El Toro, March 24, 1997.
  - U.S. EPA Comments on Draft Final Phase II Remedial Investigation Report, OU-3A Sites, MCAS El Toro, April 16, 1997.
  - U.S. EPA Review of MCAS El Toro Draft Final Phase II RI/FS Addendum, Site 25- Major Drainages, and Response to Comments, April 1997.

- <u>Agency Comments - Cal-EPA, Department of Toxic Substances Control</u>
  - Draft Final Phase II Remedial Investigation Report Approval: Operable Unit 3A, MCAS El Toro, April 17, 1997.
  - Draft Final Phase II Remedial Investigation/Feasibility Study Report Approval: Site 25, Major Drainages. OU-2A, MCAS El Toro, May 12, 1997.

MCAS El Toro
Restoration Advisory Board
Meeting

28 May 1997 6:30-9:00 PM
Irvine City Hall
Conference and Training Center
One Civic Center Plaza
Irvine

AGENDA

NOTE: *RAB Co-Chairs have agreed that questions and answers pertaining to specific presentations will be handled during each presentation.*

Welcome/Introductions/Agenda Review	Joseph Joyce Marine Corps/Navy RAB Co-chair
Old Business	
Approval of 3/26/97 Minutes	Greg Hurley RAB Community Co-chair
Summary of 4/30/97 RAB Subcommittee Meeting	Chuck Bennett Chairperson OU-2A RAB Subcommittee
New Business	
Update on Groundwater + Status of Dept. of Navy/Orange County Water District Negotiations + Separation of Site 24 Soil and Groundwater	Joseph Joyce
Update on VOC Source Area + Public Meeting + Pilot Testing + Cleanup Goals for Soil	Bernie Lindsey U.S. Navy/Southwest Division
Update on Shallow Soil Sites (OU-3) + Proposed No Further Action + Potential Remedial Alternatives	Bernie Lindsey
Regulatory Agency Comment Update	Glenn Kistner U.S. Environmental Protection Agency Tayseer Mahmoud Cal-EPA, Dept. of Toxic Substances Control
Meeting Summary	Greg Hurley
Meeting Evaluation	
Future Topics and Meetings	
Closing	Joseph Joyce/Greg Hurley

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P U B L I C N O T I C E

MARINE CORPS AIR STATION EL TORO

Restoration Advisory Board Meeting

♦ ♦ ♦

Participate in the environmental restoration and cleanup program underway at MCAS El Toro. Your input is welcome!

Wednesday, May 28, 1997
6:30 - 9:00 p.m.

Irvine City Hall
Conference and Training Center
One Civic Center Plaza, Irvine

This meeting will feature the following activities and presentations:

- ***Update on the Volatile Organic Source Area and Groundwater***
- ***Update on Sites with Shallow Soil Concerns***

♦ ♦ ♦

For more information about this meeting and the Installation Restoration Program at MCAS El Toro, please contact:

Commanding General
AC/S, Environment (1AU)
Attn: Mr. Joseph Joyce, MCAS El Toro
P.O. Box 95001, Santa Ana, CA 92709-5001
(714) 726-3470 or 726-2840

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MARINE CORPS AIR STATION EL TORO

RESTORATION ADVISORY BOARD MEETING

March 26, 1997

DRAFT MEETING MINUTES

A Restoration Advisory Board (RAB) meeting for Marine Corps Air Station (MCAS) El Toro was held Wednesday, March 26, 1997 at the Irvine City Hall. The meeting began at 6:35 p.m. These minutes summarize the discussions and presentations from the meeting.

WELCOME, INTRODUCTIONS, AGENDA REVIEW

Mr. Dana Sakamoto, Deputy Base Realignment and Closure (BRAC) Operations Officer, Southwest Division Naval Facilities Engineering Command, served as the Marine Corps/Navy RAB Co-Chair, substituting for Mr. Joseph Joyce. Mr. Sakamoto introduced himself and informed those present that SWDIV considers the El Toro RAB to be one of the most successful RABs. Mr. Sakamoto and Mr. Greg Hurley, the RAB Community Co-Chair welcomed everyone to the meeting. Mr. Sakamoto introduced two new RAB members: Dr. Jeffrey Koepke and George Gallagher. Dr. Keopke, has a Ph.D. in organic chemistry and over 19 years of environmental experience. Mr. Gallagher is a planning commissioner for the City of Irvine.

Mr. Sakamoto informed RAB members that the U.S. EPA is sponsoring a Risk Decision Workshop June 16-19, 1997 and it is open to RAB members. There are openings for about 30 to 40 people. He said he would mail out information to RAB members *(see attached agenda).*

Mr. Hurley reminded RAB members that for this meeting a new format would be tested. Questions and answers will follow each presentation. During the next RAB meeting, questions and answers will be taken during presentations. The RAB will then decide which format is preferred. Also, presenters will state how long their presentation is expected to take. The Co-Chairs reviewed the meeting agenda.

OLD BUSINESS

Review and Approval of January 30, 1997 Meeting Minutes

The RAB minutes were approved without amendment.

Summary of 2/26/97 RAB Subcommittee, Dr. Chuck Bennett, Chairperson
Operable Unit 2A Subcommittee

Dr. Bennett said the subcommittee meeting served as a detailed, technical follow-up discussion of the January 30, 1997 RAB meeting. He said the meeting was very productive and thanked Andy Piszkin and Bernie Lindsey, Remedial Project Managers from SWDIV, for participating. The subcommittee meeting focused on comparing costs for capping and monitoring the landfills at MCAS El Toro versus landfill consolidation (also referred to as "clean closure"). Consolidation/clean closure involves digging up landfill contents for disposal at another landfill. Hazardous wastes removed would be disposed of at proper off-Station, state-approved hazardous waste disposal facilities.

Dr. Bennett's presentation concentrated on Site 5, the Perimeter Road Landfill. This is the smallest landfill site with the least amount of waste. He said that the subcommittee believes that if consolidation/clean closure is not practical at this site, then it is not practical at the others. He presented overheads with cost comparison charts containing information provided by SWDIV from the recent cost analysis conducted.

Dr. Bennett summarized his perceptions of the investigations and cost comparisons conducted for the landfills. The assumption that 50 percent of the waste is hazardous may be high because characterization of landfill contents was not performed. It is understood and accepted that the Remedial Investigation was only intended to define boundaries of the landfills and the potential migration of wastes. There are no contradictions to the basic premises presented by the project team that were used in the cost evaluations. The costs for consolidation compare well with other studies done at March Air Force Base performed by IT Corporation. Costs were higher but there is not a gross difference. When comparing capping/monitoring costs to consolidation there is an uncertainty in the amount of hazardous wastes so it is not possible to determine how much it would cost to perform consolidation. Also, capping/monitoring would result in implementing land use restrictions while consolidation/clean closure would leave the land free from restrictions. It is recognized that the cost comparison did not include economic gain in land value from a clean, unrestricted closure. Dr. Bennett said that the prudent thing to do at this time is to plan for capping and monitoring because of the cost uncertainty of consolidation/clean closure. However, there should be some flexibility during the design and implementation phases and consolidation options should be kept open for reconsideration.

RAB member Enid Cohn stated that characterization of landfill contents may be practical if it is not overly expensive. RAB member Don Zweifel said that it is unwise to build on landfills and that the extra cost of consolidation/clean closure frees the land from restrictions for reuse and possible construction. He also said that if landfill areas are transferred with deed restrictions, the Marine Corps/Navy will have problems and face the objections from the citizens of Orange County.

NEW BUSINESS

Overview of 1997 Base Realignment and Closure (BRAC) Cleanup Plan (BCP) - Andy Piszkin, Lead Remedial Project Manager (RPM), Southwest Division Naval Facilities Engineering Command

Mr. Piszkin provided handouts of his overheads and a copy of the Executive Summary of the March 1997 BCP. He informed RAB members that the BCP is produced annually as required by the Department of Defense (DOD) and is based on a partnering agreement between DOD, the U.S. Environmental Protection Agency (U.S. EPA), and the California Environmental Protection Agency (Cal-EPA). It is a living document that provides a roadmap of all ongoing and future environmental restoration programs being conducted at the Station. The key goals of the BCP are: 1) accelerate environmental cleanup and early reuse; 2) review the status of the Station's environmental programs; 3) develop comprehensive strategies for base closure with respect to environmental issues; 4) provide a rationale for funding; 5) provide a master schedule for environmental closure activities; and 6) develop information for Federal Facilities Agreement schedules.

Mr. Piszkin provided an overview of the five-step BCP process that was developed in 1993. Step 1 involved formation of the BRAC Cleanup Team. Step 2 involved conducting the initial bottom up review of all environmental programs at the Station. This step is repeated annually along with Steps 3, 4, and 5. For Step 3, recommendations are complete and adopted. Step 4 is the assembling of the new BCP document. Step 5 encompasses execution and maintaining the integrity of the Base Cleanup Plan.

At MCAS El Toro, the BCP states there are 888 Locations of Concern (LOC). A LOC is defined at any identified location or area that is potentially contaminated or is a potential source of contamination. LOCs are addressed under specific environmental programs including the Installation Restoration Program (IRP), the Resource Conservation and Recovery (RCRA) Facility Assessment Program, and various Compliance Programs. LOCs have to have meet specific federal, state, or local requirements so that no further environmental action need to be taken. Today, 380 of the LOCs have been checked off meeting the requirements for no further action. The BCP also categorizes the environmental condition of Station property into seven categories. Today, 85 percent of the Station property is environmentally ready for transfer. Mr. Piszkin also showed a map that illustrates the category types and the corresponding areas. *Additional information is contained in the two handouts.*

MCAS El Toro Groundwater Monitoring Update, 4th Quarter 1996 - Andy Piszkin

Mr. Piszkin said that the primary objective of the groundwater monitoring effort is to monitor and document quality and flow of groundwater. This is done using 181 different monitoring points at various depths from numerous groundwater monitoring wells located

on- and off-Station. Other objectives include monitoring and assessing the extent of existing groundwater plumes and providing data for remedial (cleanup) designs and remedial actions. He summarized 4th quarter 1996 monitoring results.

Groundwater elevations were consistent with past monitoring results. Minor changes in elevations changes were a result of local groundwater pumping by area water districts. In regard to volatile organic compounds (VOCs), primarily the solvents trichloroethene [TCE] and perchloroethene [PCE], conditions have not changed. Concentrations and the extent of contamination are similar to past monitoring efforts in both the on-Station VOC Source Area (Site 24) and in the regional plume of low-level contamination off-Station. The 4th quarter data suggest that VOCs continue to migrate from the Source Area into the principal aquifer off-Station. He showed a map with the extent of VOC contamination in groundwater. Groundwater at the Site 2 landfill continues to be monitored and results for VOCs are also similar to past results. Concentrations of benzene, which has only been detected at fuel farms and at the Tank 398 (fuel storage) area, are still low. Analysis of metals confirm previous data while general chemistry is also consistent with past results.

Near-term plans call for at least a fifth round of monitoring with a focused effort at the landfills and at the VOC Source Area and in the regional plume of low-level contamination off-Station. A long-term monitoring program will also be developed.

Volatile Organic Compound Source Area/Site 24 Remediation - Bernie Lindsey, Remedial Project Manager (RPM), Southwest Division Naval Facilities Engineering Command

Mr. Lindsey's presentation focused on the VOC Source Area and the BRAC Cleanup Team's (BCT) strategy for addressing solvent-contaminated soil at Site 24. The BCT is comprised of the Marine Corps, the U.S. EPA and the California EPA. The contaminated soil at Site 24 (subsurface soil located above the water table) serves as the chemical source and starting point for low-level groundwater contamination that is present in the regional groundwater. The BCT recently examined ways to take quicker action at Site 24 and still comply with federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that governs the Installation Restoration Program at MCAS El Toro. The BCT agreed to first focus on the VOC-contaminated soil at Site 24 and follow up later with actions that address VOC-contaminated groundwater. This strategy will allow for faster cleanup of the soil and for the overall VOC Source Area.

The draft Feasibility Study Report for Site 24 evaluated various technologies and options for addressing VOC-contaminated soil, including soil vapor extraction (SVE), the U.S. EPA's "presumptive remedy". SVE provides the most technically feasible and cost-effective method for soil cleanup at Site 24. SVE is a proven treatment technology and has been successfully implemented at sites throughout the country. Mr. Lindsey explained that SVE is a simple process that physically separates VOCs from the soil. By applying a vacuum to a network of SVE wells, VOCs are pulled to the surface as a vapor.

This vapor is passed through an activated carbon filter to trap VOCs before the air is discharged to the atmosphere. When the activated carbon filters become saturated with VOCs, the carbon is returned to the manufacturer where it is regenerated and the VOCs are destroyed.

Pilot tests were conducted during the summer and fall of 1996 to determine if this technology would work at Site 24. Mr. Lindsey said that very positive results were achieved and more than 600 pounds of VOCs were removed from the soil. SVE was demonstrated to be effective at Site 24. In light of the success of the pilot tests, the BCT is exploring the possibility of obtaining SVE equipment from Norton Air Force Base. At Norton, a very similar scenario to MCAS El Toro's Site 24 exists including VOC contamination in the soil below two aircraft hangars and contaminated soil resulting in an elongated plume of VOC-contaminated groundwater. Other existing SVE systems, as well as new designs, are also being considered.

The next step involves completion and distribution of the Marine Corps' Proposed Plan for Site 24 soil cleanup for public review and comment. The public comment period will run from April 30 through May 30, 1997, with a public meeting scheduled for May 15. The Plan will propose SVE as the Marine Corps' preferred remedy for cleaning up solvent-contaminated soil at Site 24. Mr. Lindsey stressed that public participation is important and that public comments will be considered in the Interim Record of Decision (ROD) that documents the selected cleanup alternative. A ROD is the legal document that sets the clean-up standards and identifies the selected clean-up methods. The BCT is anticipating completion of the ROD for the contaminated soil prior to September 30, the end of Fiscal Year 1997.

Schedule Update: Federal Facilities Agreement (FFA) - Andy Piszkin

Mr. Piszkin provided an overview of the Federal Facilities Agreement schedule for the Installation Restoration Program at MCAS El Toro. The FFA schedule requires following all CERCLA requirements for remedial investigation/feasibility study efforts accompanying public input and participation activities, and subsequent cleanup activities. Similar sites have been grouped together to more effectively manage environmental investigation and cleanup. These groups, also referred to as operable units, include:

- VOC Source Area - Soil Cleanup for Site 24;
- VOC Groundwater - Source Area (Site 24) and Regional Groundwater (Site 18);
- Landfills - Sites 3 and 5;
- Landfills - Sites 2 and 17;
- Proposed No Further Action Sites - Sites 4, 6, 9, 10, 13, 15, 19, 20, 21, 22, and 25;
- Sites 8, 11, and 12; and
- Sites 1, 7, 14, and 16.

Each schedule provides the time frames for the cleanup remedy selection process following the remedial investigation and feasibility study effort. The key steps in this process are:

- Marine Corp development of the Proposed Plan and Agency review;
- Public comment period (a public meeting will be scheduled during the comment period);
- Agency review of the Record of Decision; and
- Record of Decision completion and signing by the Marine Corps/Navy and federal and state environmental agencies.

The Record of Decision completes the process for remedy selection described above. Completion of the Record of Decision leads directly into engineering designs of the selected cleanup alternatives and the actual cleanup work. *For specific schedule information and dates of the key steps listed above for each of site groups, please consult the handout provided at the meeting.*

Public Notification of Project Milestones - 1st Lt. Matt Morgan, BRAC Public Affairs Officer - MCAS El Toro

Lt. Morgan's presentation focused on how the Marine Corps provides public notification regarding the major milestones in the FFA schedule covered in Mr. Piszkin's presentation. Lt. Morgan emphasized the importance of following the CERCLA process and notifying the public of the Proposed Plan comment period for each group of sites being addressed at the Station. He said that these comment periods are mandated by CERCLA to provide the community with the opportunity to comment on proposed alternatives in each Proposed Plan and technical documents specific to each of group of sites. Public comment periods, which run for 30 consecutive days, are the most important opportunity for community members to participate in the decisionmaking process.

Key communication techniques used for telling the public of this opportunity to participate are: publishing of paid public notices in area newspapers, direct mailings, and dissemination of information by RAB members. Public notices are used to announce comment periods and publicize the public meetings. Mailings are distributed to residents, anyone who has attended RAB meetings, individuals who have requested to be on the mailing list through mailing list coupons provided in fact sheets, city and county officials, environmental groups, and other interested stakeholders. RAB members are encouraged to notify neighbors, co-workers, and friends to come to the public meetings.

RAB members were reminded that the Navy operates an environmental program web site which has RAB meeting minutes, public meeting announcements, and other information. Also, RAB members were encouraged to use and tell others about the MCAS El Toro Information Repository at the Heritage Park Regional Library in Irvine. Key information housed at the Information Repository includes: fact sheets, Remedial Investigation and Feasibility Study reports, regulatory agency comments to these reports, responses to

comments, and RAB meeting information including meeting minutes and all handouts. An Administrative Record listing of all Installation Restoration Program documentation for MCAS El Toro is also available at the library. *The web site address and the library's address, operating hours, and phone number are included at the end of these minutes.*

Regulatory Agency Comment Update - Glenn Kistner, Project Manager, U.S. EPA and Tayseer Mahmoud, Project Manager, Cal-EPA DTSC

Mr. Kistner said that U.S. EPA recently completed review of Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, two of the four landfill sites at MCAS El Toro. He said that the predominant comment was that more detailed explanations on land use restrictions needs to be included in the report. Mr. Mahmoud said that DTSC also reviewed these reports provided the same predominant comment to the Marine Corps. *Copies of regulatory agency comments were provided to RAB members and are also listed at the end of these minutes.*

MEETING EVALUATION AND FUTURE TOPICS

Note: During this meeting, Mr. Sakamoto implemented a "parking lot" for issues and questions that were raised during the meeting by RAB members. They comprise topics that the RAB would like to have addressed and are included below after the future presentation topics segment.

During the meeting evaluation RAB members provided the following comments:

- Tonight's meeting covered a lot of ground.
- The "parking lot" was well received and members would like to try it again.
- It is important that the "parking lot" not become disruptive to the presentations.
- Questions were handled well.
- Handouts were detailed and provided a lot of information.
- Dr. Bennett provided a good summary of the subcommittee meeting.
- The BCP presentation was helpful.
- In the future, provide an overhead of the VOC plume.

Suggestions for future presentation topics include:

- Update on the OU-3A Draft Feasibility Study Report.
- General presentation on institutional controls, to be followed by a specific presentation at a later RAB meeting.
- Environmental investigation performed for fuel pipelines at MCAS El Toro.
- OU-1 update.

"Parking lot" issues:

- Lead-based paint/asbestos policy and data.

- Consolidation issues - regulatory policy, reuse considerations.
- Characterizing cleanup at landfills.
- Land use restrictions.
- Off-Station migration of contaminants.
- Features of the SVE system - carbon replacement, efficiency, and effectiveness.
- Rationale of splitting up soil and groundwater at Site 24.
- Status and condition and placement of the fuel delivery pipeline at the Station.
- Web site information.
- Public meeting process.

CLOSING ANNOUNCEMENTS/FUTURE MEETING DATES

The next RAB meeting is scheduled for 6:30 to 9:00 p.m., Wednesday, May 28, 1997 at the Irvine City Hall, Conference and Training Center, One Civic Center Plaza, Irvine. The Multipurpose Room L102, next to the Conference and Training Center is available for a RAB Subcommittee meeting on Wednesday, April 30, 1997 from 6:30 to 9:00 p.m.

The meeting was adjourned at 9:35 p.m.

Attachments:

-Sign-in sheets.

Handouts provided at the meeting and available at the Information Repository:

- RAB meeting agenda.
- RAB draft meeting minutes - 1/30/97 RAB meeting.
- Cost comparison for landfills (provided by Dr. Bennett).
- MCAS El Toro Base Realignment and Closure (BRAC) Cleanup Plan (BCP) Overview.
- Executive Summary BCP, March 1997.
- MCAS El Toro Groundwater Monitoring Update, 4th Quarter 1996.
- Volatile Organic Compound (VOC) Source Area, Operable Unit 2A, Site 24.
- U.S. EPA, "A Citizen's Guide to Soil Vapor Extraction and Air Sparging".
- Executive Summary Draft Final Phase II Vadose Zone Feasibility Study Report Operable Unit 2A, Site 24, MCAS El Toro, March 11, 1997.
- MCAS El Toro Schedule Update, Federal Facility Agreement.

- Agency Comments - U.S. Environmental Protection Agency
  - U.S. EPA Technical Comments, Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, MCAS El Toro, March 11, 1997.
  - Additional U.S. EPA Technical Comments, Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, MCAS El Toro, March 24, 1997.

- Agency Comments - Cal-EPA, Department of Toxic Substances Control
  - Draft Phase II Remedial Investigation/Feasibility Study Report for Site 25, Major Drainages, Operable Unit 2A, MCAS El Toro, March 12, 1997; California Regional Water Quality Control Board [comments dated February 5, 1997].
  - Draft Final Phase II Feasibility Study Report for the Perimeter Road Landfill, Site 5 Operable Unit 2C, MCAS El Toro; DTSC Comments [dated March 12, 1997]; Integrated Waste Management Board [comments dated March 10, 1997].

- Draft Final Phase II Feasibility Study Reports for the Perimeter Road Landfill, Site 5 Operable Unit 2C, DTSC Comments [dated March 12, 1997] Integrated Waste Management Board [comments dated March 10, 1997].

A copy of these minutes and the handouts provided at the RAB meeting are available at the MCAS El Toro Information Repository, located at the Heritage Park Regional Library in Irvine. The address is 14361 Yale Avenue, Irvine; the phone number is (714) 551-7151. Library hours are Monday through Thursday, 10 am to 9 pm; Friday and Saturday, 10 am to 5 pm; Sunday 12 pm to 5 pm.

RAB meeting minutes are also located on the Navy's Southwest Division Environmental Web Page. There are two different internet addresses, both sites are identical and either one can be used:
http://ivory.nosc.mil/~saundel/default.html
http://www.efdswest.navfac.navy.mil/DEP/ENV/default.htm

MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

RAB MEMBER SIGN-IN SHEET

Name	Signature	Name	Signature
Allen, Bob		Mathews, Thomas	
Barney, Col. Joseph P. (ret)	Joseph P. Barney	McVicker, Robert R.	Robert R. McVicker
Bennett, Dr. Charles	Ellen Bennett	Meier, Fred J.	Fred J. Meier
Brady Jr., Paul		Merryman, Robert	Camille L. Schaffer Orange Co.
Britton, George	Georgia Britton	Mountford, Dan	Dan Mountford
Cohn, Enid		Murphy, Don	Don Murphy
Crompton, Chris		Olquin, A. Richard	
Gallagher, George M.		Ritchie, Col. E.J.	
Hayes, Finola		Rudolph, Marcia	Marcia Rudolph
Herndon, Roy		Shayegan, Maria	Maria P. Shayegan
Hurley, Greg - Co-Chair		Sievers, Larry	
Hersh, Peter	Peter Hersh	Sipp, Jr., Myron L.	
Joyce, Joseph - Co-chair		Vasquez, Barbara	
Kistner, Glenn	Glenn Kistner	Vitale, Larry	
Koepke, Jeffrey		Werner, Jerry B.	Jerry Werner
Mahmoud, Tayseer	Tayseer Mahmoud	Woodings, Bob	
Matheis, Mary Aileen		Zweifel, Donald E.	Don Zweifel
HARTMAN, BOB			

MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

NON-RAB MEMBER SIGN-IN SHEET
Other Attendees, Guests

NAME	AFFILIATION	MAILING ADDRESS	PHONE FAX	INTERESTED IN RAB MEMBERSHIP?
R.D. Brady	BNI			
HARRY CHENARIDES	AVCA	17 MERLIN AVE ALISO VIEJO	714-452-9488	YES
BETHANY DILLOW	SVS, Inc	24692 NYMPHA Mission VIEJO, CA 92691	714-859-7008 472-0483	
Mary Lynn WORBY	Tustin	14512 Emerywood Rd Tustin 92780	714) 8324678	

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MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

NON-RAB MEMBER SIGN-IN SHEET
Other Attendees, Guests

NAME	AFFILIATION	MAILING ADDRESS	PHONE FAX	INTERESTED IN RAB MEMBERSHIP?
Scott Kehe	Navy	ROICC El Toro	(714) 726-2506	No
GAIL Reavis	21281 Astoria	Mission Viejo 92692	461-0020	Yes!
Robert Stollar		1409 Samoa Laguna Beach 92651	494 9988	yes
JACK COTTER		30842 DRIFTWOOD SOUTH LAGUNA 92677	499-1865	yes
Rex Calloway	Navy	SWDIV	619-532-1662	No
RICHARD TAMBARA	SCAQMD	21865 E. COPLEY DR. DIAMOND BAR CA. 91765	(909) 396-2319	NO
Arline Chenaides	TRP	17 Merlin Ave. Aliso Viejo 92656	(714) 452-9488	NO
JERRY Riechgesswesser	NIVA	3486 EBOE IRVINE 92606	714 552 3548	

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MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

NON-RAB MEMBER SIGN-IN SHEET
Other Attendees, Guests

NAME	*AFFILIATION*	*MAILING ADDRESS*	*PHONE FAX*	*INTERESTED IN RAB MEMBERSHIP?*
DIANA SAKAMOTO	SOUTHWEST NAVFAC ENG COM			
~~[illegible]~~	~~U.S. EPA~~	~~75 HAWTHORNE ST. SF CA 94105~~		
ANGELO VASSOS	PROJECT '99	79 SETON RD IRVINE 92612	(714) 786-7546	YES

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U.S. Environmental Protection Agency

Risk, Decision Making and Public Involvement Workshop

San Diego, California
June 16-19, 1997

DRAFT AGENDA

Monday, June 16	
8:30 - 8:45	Welcome - Captain Alvin Chun, US Public Health Service Senior Environmental Health Policy Advisor, EPA, Region 9 Arnold Den, Senior Science Advisor, EPA, Region 9
8:45 - 10:00	Introductions and Trust & Credibility Issues Discussion
10:00 - 10:15	Break
10:15 - 11:45	Discussion - Why Bother with Public Involvement?
11:45 - 12:45	Lunch
12:45 - 2:45	Presentation & Discussion - Risk Communication & Public Involvement Principles
2:45 - 3:00	Break
3:00 - 4:30	MARJOL Case Study - A Superfund Lead Waste Site
4:30 - 4:45	Evening Reading Assignments
Tuesday, June 17	
8:30 - 9:45	ACME Plastics Case Study - Introduction
9:45 - 12:00	Case Study - Hazard Identification
12:00 - 1:00	Lunch
1:00 - 3:00	Case Study - Hazard Identification
3:00 - 3:20	Break
3:20 - 4:30	Case Study - Dose-Response Overnight Assignments
Wednesday, June 18	
8:30 - 10:15	Case Study - Site Characterization & Exposure Assessment
10:15 - 10:30	Break
10:30 - 12:00	Case Study - Exposure Assessment & Risk Characterization
12:00 - 1:00	Lunch
1:00 - 3:00	Case Study - Risk Management - Clean-Up Options
3:00 - 3:20	Break
3:20 - 4:30	Case Study - Risk Management
Thursday, June 19	
8:30 - 10:00	Prepare for a Public Meeting
10:00 - 10:15	Break
10:15 - 11:45	Role Play Public Meeting
11:45 - 12:45	Lunch
12:45 - 1:15	Lecture on Working with the Media Prepare for an Interview with a Reporter
1:15 - 1:30	Break
1:30 - 3:00	Role Play Meeting with Reporter
3:00 - 4:15	Evaluation/Wrap Up

For More Information Contact:
U.S. EPA - Region IX (800) 231-3075

Summary of 2/26/97 RAB Subcommittee, Dr. Chuck Bennett, Chairperson
Operable Unit 2A Subcommittee

Dr. Bennett said the subcommittee meeting served as a detailed, technical follow-up discussion of the January 30, 1997 RAB meeting. He said the meeting was very productive and thanked Andy Piszkin and Bernie Lindsey, Remedial Project Managers from SWDIV, for participating. The subcommittee meeting focused on comparing costs for capping and monitoring the landfills at MCAS El Toro versus landfill consolidation (also referred to as "clean closure"). Consolidation/clean closure involves digging up landfill contents for disposal at another landfill. Hazardous wastes removed would be disposed of at proper off-Station, state-approved hazardous waste disposal facilities.

Dr. Bennett's presentation concentrated on Site 5, the Perimeter Road Landfill. This is the smallest landfill site with the least amount of waste. He said that the subcommittee believes that if consolidation/clean closure is not practical at this site, then it is not practical at the others. He presented overheads with cost comparison charts containing information provided by SWDIV from the recent cost analysis conducted.

Dr. Bennett summarized his perceptions of the investigations and cost comparisons conducted for the landfills. The assumption that 50 percent of the waste is hazardous may be high because characterization of landfill contents was not performed. It is understood and accepted that the Remedial Investigation was only intended to define boundaries of the landfills and the potential migration of wastes. There are no contradictions to the basic premises presented by the project team that were used in the cost evaluations. The costs for consolidation compare well with other studies done at March Air Force Base performed by IT Corporation. Costs were higher but there is not a gross difference. When comparing capping/monitoring costs to consolidation there is an uncertainty in the amount of hazardous wastes so it is not possible to determine how much it would cost to perform consolidation. Also, capping/monitoring would result in implementing land use restrictions while consolidation/clean closure would leave the land free from restrictions. It is recognized that the cost comparison did not include economic gain in land value from a clean, unrestricted closure. Dr. Bennett said that the prudent thing to do at this time is to plan for capping and monitoring because of the cost uncertainty of consolidation/clean closure. However, there should be some flexibility during the design and implementation phases and consolidation options should be kept open for reconsideration.

RAB member Enid Cohn stated that characterization of landfill contents may be practical if it is not overly expensive. RAB member Don Zweifel said that it is unwise to build on landfills and that the extra cost of consolidation/clean closure frees the land from restrictions for reuse and possible construction. He also said that if landfill areas are transferred with deed restrictions, the Marine Corps/Navy will have problems and face the objections from the citizens of Orange County.

MARINE CORPS AIR STATION EL TORO

RESTORATION ADVISORY BOARD MEETING

March 26, 1997

DRAFT MEETING MINUTES

A Restoration Advisory Board (RAB) meeting for Marine Corps Air Station (MCAS) El Toro was held Wednesday, March 26, 1997 at the Irvine City Hall. The meeting began at 6:35 p.m. These minutes summarize the discussions and presentations from the meeting.

WELCOME, INTRODUCTIONS, AGENDA REVIEW

Mr. Dana Sakamoto, Deputy Base Realignment and Closure (BRAC) Operations Officer, Southwest Division Naval Facilities Engineering Command, served as the Marine Corps/Navy RAB Co-Chair, substituting for Mr. Joseph Joyce. Mr. Sakamoto introduced himself and informed those present that SWDIV considers the El Toro RAB to be one of the most successful RABs. Mr. Sakamoto and Mr. Greg Hurley, the RAB Community Co-Chair welcomed everyone to the meeting. Mr. Sakamoto introduced two new RAB members: Dr. Jeffrey Koepke and George Gallagher. Dr. Keopke, has a Ph.D. in organic chemistry and over 19 years of environmental experience. Mr. Gallagher is a planning commissioner for the City of Irvine.

Mr. Sakamoto informed RAB members that the U.S. EPA is sponsoring a Risk Decision Workshop June 16-19, 1997 and it is open to RAB members. There are openings for about 30 to 40 people. He said he would mail out information to RAB members *(see attached agenda).*

Mr. Hurley reminded RAB members that for this meeting a new format would be tested. Questions and answers will follow each presentation. During the next RAB meeting, questions and answers will be taken during presentations. The RAB will then decide which format is preferred. Also, presenters will state how long their presentation is expected to take. The Co-Chairs reviewed the meeting agenda.

OLD BUSINESS

Review and Approval of January 30, 1997 Meeting Minutes

The RAB minutes were approved without amendment.

NEW BUSINESS

Overview of 1997 Base Realignment and Closure (BRAC) Cleanup Plan (BCP) - Andy Piszkin, Lead Remedial Project Manager (RPM), Southwest Division Naval Facilities Engineering Command

Mr. Piszkin provided handouts of his overheads and a copy of the Executive Summary of the March 1997 BCP. He informed RAB members that the BCP is produced annually as required by the Department of Defense (DOD) and is based on a partnering agreement between DOD, the U.S. Environmental Protection Agency (U.S. EPA), and the California Environmental Protection Agency (Cal-EPA). It is a living document that provides a roadmap of all ongoing and future environmental restoration programs being conducted at the Station. The key goals of the BCP are: 1) accelerate environmental cleanup and early reuse; 2) review the status of the Station's environmental programs; 3) develop comprehensive strategies for base closure with respect to environmental issues; 4) provide a rationale for funding; 5) provide a master schedule for environmental closure activities; and 6) develop information for Federal Facilities Agreement schedules.

Mr. Piszkin provided an overview of the five-step BCP process that was developed in 1993. Step 1 involved formation of the BRAC Cleanup Team. Step 2 involved conducting the initial bottom up review of all environmental programs at the Station. This step is repeated annually along with Steps 3, 4, and 5. For Step 3, recommendations are complete and adopted. Step 4 is the assembling of the new BCP document. Step 5 encompasses execution and maintaining the integrity of the Base Cleanup Plan.

At MCAS El Toro, the BCP states there are 888 Locations of Concern (LOC). A LOC is defined at any identified location or area that is potentially contaminated or is a potential source of contamination. LOCs are addressed under specific environmental programs including the Installation Restoration Program (IRP), the Resource Conservation and Recovery (RCRA) Facility Assessment Program, and various Compliance Programs. LOCs have to have meet specific federal, state, or local requirements so that no further environmental action need to be taken. Today, 380 of the LOCs have been checked off meeting the requirements for no further action. The BCP also categorizes the environmental condition of Station property into seven categories. Today, 85 percent of the Station property is environmentally ready for transfer. Mr. Piszkin also showed a map that illustrates the category types and the corresponding areas. *Additional information is contained in the two handouts.*

MCAS El Toro Groundwater Monitoring Update, 4th Quarter 1996 - Andy Piszkin

Mr. Piszkin said that the primary objective of the groundwater monitoring effort is to monitor and document quality and flow of groundwater. This is done using 181 different monitoring points at various depths from numerous groundwater monitoring wells located

on- and off-Station. Other objectives include monitoring and assessing the extent of existing groundwater plumes and providing data for remedial (cleanup) designs and remedial actions. He summarized 4th quarter 1996 monitoring results.

Groundwater elevations were consistent with past monitoring results. Minor changes in elevations changes were a result of local groundwater pumping by area water districts. In regard to volatile organic compounds (VOCs), primarily the solvents trichloroethene [TCE] and perchloroethene [PCE], conditions have not changed. Concentrations and the extent of contamination are similar to past monitoring efforts in both the on-Station VOC Source Area (Site 24) and in the regional plume of low-level contamination off-Station. The 4th quarter data suggest that VOCs continue to migrate from the Source Area into the principal aquifer off-Station. He showed a map with the extent of VOC contamination in groundwater. Groundwater at the Site 2 landfill continues to be monitored and results for VOCs are also similar to past results. Concentrations of benzene, which has only been detected at fuel farms and at the Tank 398 (fuel storage) area, are still low. Analysis of metals confirm previous data while general chemistry is also consistent with past results.

Near-term plans call for at least a fifth round of monitoring with a focused effort at the landfills and at the VOC Source Area and in the regional plume of low-level contamination off-Station. A long-term monitoring program will also be developed.

Volatile Organic Compound Source Area/Site 24 Remediation - Bernie Lindsey, Remedial Project Manager (RPM), Southwest Division Naval Facilities Engineering Command

Mr. Lindsey's presentation focused on the VOC Source Area and the BRAC Cleanup Team's (BCT) strategy for addressing solvent-contaminated soil at Site 24. The BCT is comprised of the Marine Corps, the U.S. EPA and the California EPA. The contaminated soil at Site 24 (subsurface soil located above the water table) serves as the chemical source and starting point for low-level groundwater contamination that is present in the regional groundwater. The BCT recently examined ways to take quicker action at Site 24 and still comply with federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that governs the Installation Restoration Program at MCAS El Toro. The BCT agreed to first focus on the VOC-contaminated soil at Site 24 and follow up later with actions that address VOC-contaminated groundwater. This strategy will allow for faster cleanup of the soil and for the overall VOC Source Area.

The draft Feasibility Study Report for Site 24 evaluated various technologies and options for addressing VOC-contaminated soil, including soil vapor extraction (SVE), the U.S. EPA's "presumptive remedy". SVE provides the most technically feasible and cost-effective method for soil cleanup at Site 24. SVE is a proven treatment technology and has been successfully implemented at sites throughout the country. Mr. Lindsey explained that SVE is a simple process that physically separates VOCs from the soil. By applying a vacuum to a network of SVE wells, VOCs are pulled to the surface as a vapor.

This vapor is passed through an activated carbon filter to trap VOCs before the air is discharged to the atmosphere. When the activated carbon filters become saturated with VOCs, the carbon is returned to the manufacturer where it is regenerated and the VOCs are destroyed.

Pilot tests were conducted during the summer and fall of 1996 to determine if this technology would work at Site 24. Mr. Lindsey said that very positive results were achieved and more than 600 pounds of VOCs were removed from the soil. SVE was demonstrated to be effective at Site 24. In light of the success of the pilot tests, the BCT is exploring the possibility of obtaining SVE equipment from Norton Air Force Base. At Norton, a very similar scenario to MCAS El Toro's Site 24 exists including VOC contamination in the soil below two aircraft hangars and contaminated soil resulting in an elongated plume of VOC-contaminated groundwater. Other existing SVE systems, as well as new designs, are also being considered.

The next step involves completion and distribution of the Marine Corps' Proposed Plan for Site 24 soil cleanup for public review and comment. The public comment period will run from April 30 through May 30, 1997, with a public meeting scheduled for May 15. The Plan will propose SVE as the Marine Corps' preferred remedy for cleaning up solvent-contaminated soil at Site 24. Mr. Lindsey stressed that public participation is important and that public comments will be considered in the Interim Record of Decision (ROD) that documents the selected cleanup alternative. A ROD is the legal document that sets the clean-up standards and identifies the selected clean-up methods. The BCT is anticipating completion of the ROD for the contaminated soil prior to September 30, the end of Fiscal Year 1997.

Schedule Update: Federal Facilities Agreement (FFA) - Andy Piszkin

Mr. Piszkin provided an overview of the Federal Facilities Agreement schedule for the Installation Restoration Program at MCAS El Toro. The FFA schedule requires following all CERCLA requirements for remedial investigation/feasibility study efforts accompanying public input and participation activities, and subsequent cleanup activities. Similar sites have been grouped together to more effectively manage environmental investigation and cleanup. These groups, also referred to as operable units, include:

- VOC Source Area - Soil Cleanup for Site 24;
- VOC Groundwater - Source Area (Site 24) and Regional Groundwater (Site 18);
- Landfills - Sites 3 and 5;
- Landfills - Sites 2 and 17;
- Proposed No Further Action Sites - Sites 4, 6, 9, 10, 13, 15, 19, 20, 21, 22, and 25;
- Sites 8, 11, and 12; and
- Sites 1, 7, 14, and 16.

Each schedule provides the time frames for the cleanup remedy selection process following the remedial investigation and feasibility study effort. The key steps in this process are:

- Marine Corp development of the Proposed Plan and Agency review;
- Public comment period (a public meeting will be scheduled during the comment period);
- Agency review of the Record of Decision; and
- Record of Decision completion and signing by the Marine Corps/Navy and federal and state environmental agencies.

The Record of Decision completes the process for remedy selection described above. Completion of the Record of Decision leads directly into engineering designs of the selected cleanup alternatives and the actual cleanup work. *For specific schedule information and dates of the key steps listed above for each of site groups, please consult the handout provided at the meeting.*

Public Notification of Project Milestones - 1st Lt. Matt Morgan, BRAC Public Affairs Officer - MCAS El Toro

Lt. Morgan's presentation focused on how the Marine Corps provides public notification regarding the major milestones in the FFA schedule covered in Mr. Piszkin's presentation. Lt. Morgan emphasized the importance of following the CERCLA process and notifying the public of the Proposed Plan comment period for each group of sites being addressed at the Station. He said that these comment periods are mandated by CERCLA to provide the community with the opportunity to comment on proposed alternatives in each Proposed Plan and technical documents specific to each of group of sites. Public comment periods, which run for 30 consecutive days, are the most important opportunity for community members to participate in the decisionmaking process.

Key communication techniques used for telling the public of this opportunity to participate are: publishing of paid public notices in area newspapers, direct mailings, and dissemination of information by RAB members. Public notices are used to announce comment periods and publicize the public meetings. Mailings are distributed to residents, anyone who has attended RAB meetings, individuals who have requested to be on the mailing list through mailing list coupons provided in fact sheets, city and county officials, environmental groups, and other interested stakeholders. RAB members are encouraged to notify neighbors, co-workers, and friends to come to the public meetings.

RAB members were reminded that the Navy operates an environmental program web site which has RAB meeting minutes, public meeting announcements, and other information. Also, RAB members were encouraged to use and tell others about the MCAS El Toro Information Repository at the Heritage Park Regional Library in Irvine. Key information housed at the Information Repository includes: fact sheets, Remedial Investigation and Feasibility Study reports, regulatory agency comments to these reports, responses to

comments, and RAB meeting information including meeting minutes and all handouts. An Administrative Record listing of all Installation Restoration Program documentation for MCAS El Toro is also available at the library. *The web site address and the library's address, operating hours, and phone number are included at the end of these minutes.*

Regulatory Agency Comment Update - Glenn Kistner, Project Manager, U.S. EPA and Tayseer Mahmoud, Project Manager, Cal-EPA DTSC

Mr. Kistner said that U.S. EPA recently completed review of Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, two of the four landfill sites at MCAS El Toro. He said that the predominant comment was that more detailed explanations on land use restrictions needs to be included in the report. Mr. Mahmoud said that DTSC also reviewed these reports provided the same predominant comment to the Marine Corps. *Copies of regulatory agency comments were provided to RAB members and are also listed at the end of these minutes.*

MEETING EVALUATION AND FUTURE TOPICS

Note: During this meeting, Mr. Sakamoto implemented a "parking lot" for issues and questions that were raised during the meeting by RAB members. They comprise topics that the RAB would like to have addressed and are included below after the future presentation topics segment.

During the meeting evaluation RAB members provided the following comments:

- Tonight's meeting covered a lot of ground.
- The "parking lot" was well received and members would like to try it again.
- It is important that the "parking lot" not become disruptive to the presentations.
- Questions were handled well.
- Handouts were detailed and provided a lot of information.
- Dr. Bennett provided a good summary of the subcommittee meeting.
- The BCP presentation was helpful.
- In the future, provide an overhead of the VOC plume.

Suggestions for future presentation topics include:

- Update on the OU-3A Draft Feasibility Study Report.
- General presentation on institutional controls, to be followed by a specific presentation at a later RAB meeting.
- Environmental investigation performed for fuel pipelines at MCAS El Toro.
- OU-1 update.

"Parking lot" issues:

- Lead-based paint/asbestos policy and data.

- Consolidation issues - regulatory policy, reuse considerations.
- Characterizing cleanup at landfills.
- Land use restrictions.
- Off-Station migration of contaminants.
- Features of the SVE system - carbon replacement, efficiency, and effectiveness.
- Rationale of splitting up soil and groundwater at Site 24.
- Status and condition and placement of the fuel delivery pipeline at the Station.
- Web site information.
- Public meeting process.

CLOSING ANNOUNCEMENTS/FUTURE MEETING DATES

The next RAB meeting is scheduled for 6:30 to 9:00 p.m., Wednesday, May 28, 1997 at the Irvine City Hall, Conference and Training Center, One Civic Center Plaza, Irvine. The Multipurpose Room L102, next to the Conference and Training Center is available for a RAB Subcommittee meeting on Wednesday, April 30, 1997 from 6:30 to 9:00 p.m.

The meeting was adjourned at 9:35 p.m.

Attachments:

-Sign-in sheets.

Handouts provided at the meeting and available at the Information Repository:

- RAB meeting agenda.
- RAB draft meeting minutes - 1/30/97 RAB meeting.
- Cost comparison for landfills (provided by Dr. Bennett).
- MCAS El Toro Base Realignment and Closure (BRAC) Cleanup Plan (BCP) Overview.
- Executive Summary BCP, March 1997.
- MCAS El Toro Groundwater Monitoring Update, 4th Quarter 1996.
- Volatile Organic Compound (VOC) Source Area, Operable Unit 2A, Site 24.
- U.S. EPA, "A Citizen's Guide to Soil Vapor Extraction and Air Sparging".
- Executive Summary Draft Final Phase II Vadose Zone Feasibility Study Report Operable Unit 2A, Site 24, MCAS El Toro, March 11, 1997.
- MCAS El Toro Schedule Update, Federal Facility Agreement.

- Agency Comments.- U.S. Environmental Protection Agency
  - U.S. EPA Technical Comments, Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, MCAS El Toro, March 11, 1997.
  - Additional U.S. EPA Technical Comments, Draft Final Phase II Feasibility Study Reports - Operable Unit 2C, Sites 3 & 5, MCAS El Toro, March 24, 1997.

- Agency Comments - Cal-EPA, Department of Toxic Substances Control
  - Draft Phase II Remedial Investigation/Feasibility Study Report for Site 25, Major Drainages, Operable Unit 2A, MCAS El Toro, March 12, 1997; California Regional Water Quality Control Board [comments dated February 5, 1997].
  - Draft Final Phase II Feasibility Study Report for the Perimeter Road Landfill, Site 5 Operable Unit 2C, MCAS El Toro; DTSC Comments [dated March 12, 1997]; Integrated Waste Management Board [comments dated March 10, 1997].

- Draft Final Phase II Feasibility Study Reports for the Perimeter Road Landfill, Site 5 Operable Unit 2C, DTSC Comments [dated March 12, 1997] Integrated Waste Management Board [comments dated March 10, 1997].

A copy of these minutes and the handouts provided at the RAB meeting are available at the MCAS El Toro Information Repository, located at the Heritage Park Regional Library in Irvine. The address is 14361 Yale Avenue, Irvine; the phone number is (714) 551-7151. Library hours are Monday through Thursday, 10 am to 9 pm; Friday and Saturday, 10 am to 5 pm; Sunday 12 pm to 5 pm.

RAB meeting minutes are also located on the Navy's Southwest Division Environmental Web Page. There are two different internet addresses, both sites are identical and either one can be used:
http://ivory.nosc.mil/~saundel/default.html
http://www.efdswest.navfac.navy.mil/DEP/ENV/default.htm

MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

RAB MEMBER SIGN-IN SHEET

Name	Signature	Name	Signature
Allen, Bob		Mathews, Thomas	
Barney, Col. Joseph P. (ret)		McVicker, Robert R.	
Bennett, Dr. Charles		Meier, Fred J.	
Brady Jr., Paul		Merryman, Robert	
Britton, George		Mountford, Dan	
Cohn, Enid		Murphy, Don	
Crompton, Chris		Olquin, A. Richard	
Gallagher, George M.		Ritchie, Col. E.J.	
Hayes, Finola		Rudolph, Marcia	
Herndon, Roy		Shayegan, Maria	
Hurley, Greg - Co-Chair		Sievers, Larry	
Hersh, Peter		Sipp, Jr., Myron L.	
Joyce, Joseph - Co-chair		Vasquez, Barbara	
Kistner, Glenn		Vitale, Larry	
Koepke, Jeffrey		Werner, Jerry B.	
Mahmoud, Tayseer		Woodings, Bob	
Matheis, Mary Aileen		Zweifel, Donald E.	
HARTMAN, BOB			

MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

NON-RAB MEMBER SIGN-IN SHEET
Other Attendees, Guests

NAME	AFFILIATION	MAILING ADDRESS	PHONE FAX	INTERESTED IN RAB MEMBERSHIP?
Scott Kehe	NAVY	ROICC EL TORO	(714) 726-2506	No
GAIL Reavis	21281 Astoria	Mission Viejo 92692	461-0020	Yes!
Robert Stillar		1409 Samoa Laguna Beach 92651	494 8988	yes
JACK COTTER		30842 DRIFTWOOD SOUTH LAGUNA 92677	499-1865	yes
Rex Callaway	Navy	SWDIV	619-532-1662	No
RICHARD TAMBARA	SCAQMD	21865 E. COBLEY DR. DIAMOND BAR CA. 91765	(909) 396-2319	NO
Arline Chenarides	TRP	17 Merlyn Ave. Aliso Viejo 92656	(714) 452-9488	NO
JERRY Kirchgessner	NIVA	3486 EBOE IRVINE 92606	714 552 3548	

MCAS EL TORO
RESTORATION ADVISORY BOARD MEETING
March 26, 1997

NON-RAB MEMBER SIGN-IN SHEET
Other Attendees, Guests

NAME	AFFILIATION	MAILING ADDRESS	PHONE FAX	INTERESTED IN RAB MEMBERSHIP?
R.D. Brady	BNI			
HARRY CHENARIDES	AVCA	17 MERLIN AVE ALISO VIEJO	714-452-9488	YES
BETHANY DILLOW	SVS, Inc	24692 NYMPHA Mission VIEJO, CA 92691	714-859-7008 472-0483	
Mary Lynn NORBY	Tustin	14512 Emerywood Rd Tustin 92780	714) 8324678	

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U.S. Environmental Protection Agency

Risk, Decision Making and Public Involvement Workshop

San Diego, California
June 16-19, 1997

DRAFT AGENDA

Monday, June 16	
8:30 - 8:45	Welcome - Captain Alvin Chun, US Public Health Service Senior Environmental Health Policy Advisor, EPA, Region 9 Arnold Den, Senior Science Advisor, EPA, Region 9
8:45 - 10:00	Introductions and Trust & Credibility Issues Discussion
10:00 - 10:15	Break
10:15 - 11:45	Discussion - Why Bother with Public Involvement?
11:45 - 12:45	Lunch
12:45 - 2:45	Presentation & Discussion - Risk Communication & Public Involvement Principles
2:45 - 3:00	Break
3:00 - 4:30	MARJOL Case Study - A Superfund Lead Waste Site
4:30 - 4:45	Evening Reading Assignments
Tuesday, June 17	
8:30 - 9:45	ACME Plastics Case Study - Introduction
9:45 - 12:00	Case Study - Hazard Identification
12:00 - 1:00	Lunch
1:00 - 3:00	Case Study - Hazard Identification
3:00 - 3:20	Break
3:20 - 4:30	Case Study - Dose-Response Overnight Assignments
Wednesday, June 18	
8:30 - 10:15	Case Study - Site Characterization & Exposure Assessment
10:15 - 10:30	Break
10:30 - 12:00	Case Study - Exposure Assessment & Risk Characterization
12:00 - 1:00	Lunch
1:00 - 3:00	Case Study - Risk Management - Clean-Up Options
3:00 - 3:20	Break
3:20 - 4:30	Case Study - Risk Management
Thursday, June 19	
8:30 - 10:00	Prepare for a Public Meeting
10:00 - 10:15	Break
10:15 - 11:45	Role Play Public Meeting
11:45 - 12:45	Lunch
12:45 - 1:15	Lecture on Working with the Media Prepare for an Interview with a Reporter
1:15 - 1:30	Break
1:30 - 3:00	Role Play Meeting with Reporter
3:00 - 4:15	Evaluation/Wrap Up

For More Information Contact:
U.S. EPA - Region IX (800) 231-3075

El Toro / OU2 Roster

Joe Barney	Jerry B. Werner	
Charles Bennett	John Westermeier	
Robert McVicker	Don Zweifel	
Fred Meier	Joseph Joyce	- ex officio
Maria Shayegan	Greg Hurley	- ex officio

Research • Service

Project # - El Toro RAB Report
re: OU 2 Sub-Committee Meeting / 30 April 1997

Points regarding the Proposed Plan for Site 24 Vadose Zone Soil Remediation:

A. The 27 ppb TCE & 69 ppb PCE cleanup targets:

What is the basis for these goals?

How are these targets justified?

Will "rebound" mean targets exceeded?

B. Norton AFB soil remediation was similar to this plan, what has been the degree of success at Norton?

C. Are the El Toro ROD's still on their original schedules?

D. Note: All unresolved issues regarding Site 24, which anyone commented upon earlier, must be resubmitted for this first "official" Public Comment Period to obtain official response.

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN II

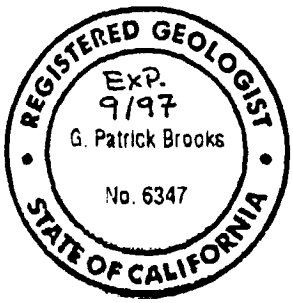
EXECUTIVE SUMMARY

DRAFT FINAL PHASE II VADOSE ZONE FEASIBILITY STUDY REPORT OPERABLE UNIT 2A – SITE 24 MARINE CORPS AIR STATION EL TORO, CALIFORNIA

CTO-0073/0317

March 1997

Prepared by:



BECHTEL NATIONAL, INC.
401 West A Street, Suite 1000
San Diego, California 92101

Signature: G. Patrick Brooks Date: 3/11/97
G. Patrick Brooks, R.G., CTO Leader

EXECUTIVE SUMMARY

This report presents the results of a vadose zone feasibility study (FS) conducted to identify and evaluate potential remedial action alternatives for volatile organic compound (VOC)-contaminated soil at Site 24, the VOC Source Area, at Marine Corps Air Station (MCAS) El Toro. This FS report was prepared by Bechtel National, Inc., on behalf of the Department of the Navy, Southwest Division Naval Facilities Engineering Command, in accordance with Contract Task Order No. 0073, under the Comprehensive Long-Term Environmental Action Navy contract No. N68711-92D-4670. Initially, soil and groundwater remedial action alternatives were presented together in the draft Site 24 FS. Soil and groundwater issues are now considered separately. Remedial action alternatives for soil are presented in this report. Remedial action alternatives for groundwater will be presented later in the draft final groundwater FS.

BACKGROUND

Site 24 is located in the southwest quadrant of MCAS El Toro. The site contains two large aircraft hangers (Buildings 296 and 297) and several smaller buildings that are used for aircraft and vehicle maintenance and repair (Figure ES-1). Past industrial activities at Site 24, such as dust suppression with waste liquids, paint stripping, degreasing, vehicle and aircraft washing, and waste-disposal practices, may have involved the use of solvents containing VOCs such as trichloroethene (TCE) and tetrachloroethene. Wastes from these practices may have reached the surface or subsurface through leakage, runoff, storm drains, or direct application to the soil. Although interviews with former MCAS personnel support this hypothesis, an extensive records review did not produce any documentation of work practices involving TCE or tetrachloroethene.

In 1985, routine groundwater sampling performed by Orange County Water District discovered TCE in groundwater from an agricultural well located about 3,000 feet west of the Station. Subsequent investigations by Orange County Water District concluded that the TCE had originated from the Station. As a result of these findings, the United States Environmental Protection Agency placed the Station on the National Priorities List in 1990, and the Marine Corps subsequently agreed to conduct a Remedial Investigation/Feasibility Study.

The Phase I and Phase II Remedial Investigations identified a plume of TCE in groundwater originating beneath Site 24 that extends approximately 3 miles off-Station and downgradient of MCAS El Toro. The area of highest TCE concentrations in groundwater was located beneath Building 296.

NATURE AND EXTENT OF CONTAMINATION

The chemicals of concern for this feasibility study are VOCs. The VOC detected most often and at the highest concentrations during the Phase I and Phase II Remedial Investigations was TCE. The horizontal and vertical extent of TCE in the vadose zone was characterized using soil gas sampling and analysis. This characterization showed that the primary TCE source is present beneath Buildings 296 and 297, extending to the south with decreasing concentrations to the southern Station boundary. Several smaller source areas exist in the soil beneath Site 24, including a PCE soil gas plume located west

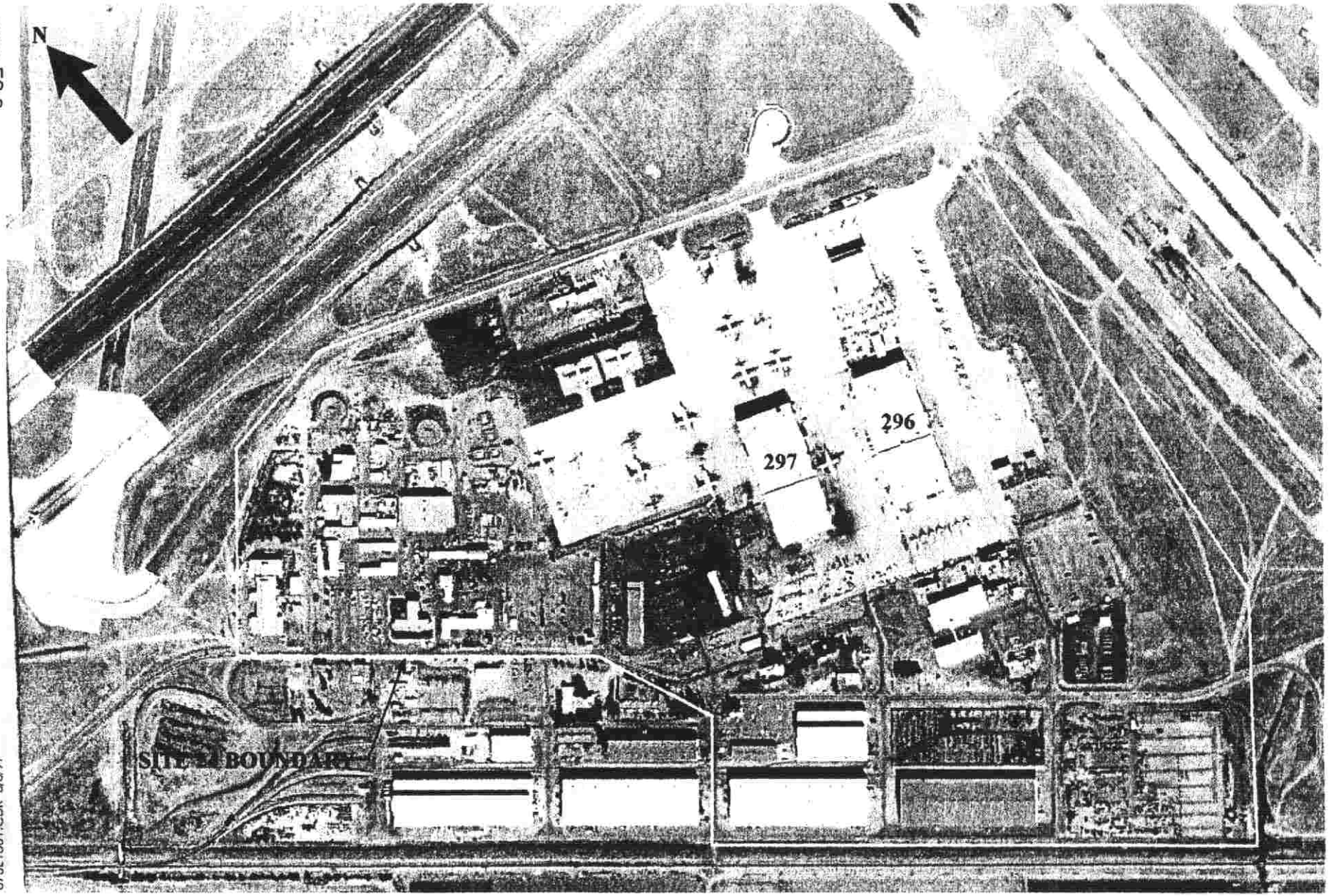


Figure ES-1
Aerial Photograph of Site 24 (1980)

EXECUTIVE SUMMARY (continued)

of Building 297. The TCE concentrations in soil gas generally increase with depth, and the highest concentrations occur near the water table. VOCs in the area of Buildings 296 and 297 extend to groundwater directly beneath those buildings. Measured soil gas and groundwater TCE concentrations demonstrate that TCE mass flux is from the vadose zone toward groundwater. The trend of increasing soil gas concentrations with depth suggests a depleting source at the surface that is consistent with the end of TCE usage in approximately 1975.

Although the VOC contamination at Site 24 is believed to have entered the soil at or close to the surface, the current contamination level near the surface is low. Soil samples collected from the upper 10 feet of soil at Site 24 contained TCE concentrations less than 21 micrograms per kilogram. Low TCE concentrations in the soil near the surface may be due to the continued flushing by infiltrating water after TCE use was discontinued and the volatilization of TCE into the atmosphere in the past.

The highest reported TCE concentration in soil was 400 micrograms per kilogram. These relatively low concentrations suggest that TCE may have been introduced in the dissolved form. However, because solvents may also have been used in a pure or nonaqueous phase, the potential for the existence of dense nonaqueous-phase liquid (DNAPL) at the site was investigated during the Phase I and Phase II Remedial Investigations. The conclusion by both investigative teams is consistent: there is little evidence for DNAPL at Site 24. The VOC concentrations reported for soil, soil gas, and groundwater are well below the levels that would be expected if an active DNAPL source were present at the site (U.S. EPA 1991a). Even though no direct evidence was found, it is possible that some residual DNAPL may be trapped between soil grains in the vadose zone or within the aquifer skeletal material.

The primary TCE source in the vadose zone beneath Buildings 296 and 297 is linked to a shallow groundwater TCE hot spot. This hot spot is defined as the area of TCE in groundwater that exceeds 500 micrograms per liter (the maximum reported concentration is 3,100 micrograms per liter). It begins beneath Building 296 and extends approximately 2,800 feet downgradient to the northwest. Within the hot spot, TCE concentrations are fairly uniform in the top 40 feet. Silt and clay layers separate the generally sandy upper 40 feet of the shallow groundwater unit from deeper sands. TCE concentrations decrease markedly in groundwater beneath the silt and clay layers. Although the deeper principal aquifer is contaminated with TCE off-Station, a review of the data does not suggest principal aquifer contamination beneath Site 24. Off-Station, the maximum reported TCE concentration is 47.8 micrograms per liter.

At Site 24, approximately 1,500 pounds of TCE are estimated to be present in soil gas in the primary TCE vadose zone source. Assuming the soil pore space is equally shared by soil gas and soil moisture, an additional 4,000 pounds of TCE would be present in the soil moisture. Based on the low organic carbon content of the soil, the adsorbed mass of TCE is on the order of 500 pounds. The mass of TCE in groundwater beneath Site 24 is estimated to be approximately 2,000 pounds. Based on these estimates, there is approximately 3 times more TCE in the vadose zone than in the groundwater at Site 24.

BASELINE RISK ASSESSMENT FOR VOLATILE ORGANIC COMPOUNDS

In 1995, a baseline human-health risk assessment was conducted to estimate the risk from VOCs found at Site 24. Four receptors were evaluated: 1) a resident living in a house on-site, 2) an office worker employed at the site, 3) a construction worker performing excavation work at the site, and 4) a child playing at an on-site park. The baseline human-health risk assessment indicated that lifetime excess upper-bound cancer risk presented by the VOCs in the soil is less than approximately five chances in one billion (5×10^{-9}). This is well below the United States Environmental Protection Agency target risk threshold of one in ten thousand (1×10^{-4}) to one in a million (1×10^{-6}). Based on the human-health risk assessment, concentrations of VOCs in the soil are not high enough to cause noncarcinogenic effects to the same receptors.

The lifetime excess upper-bound cancer risk to a resident from exposure to VOCs in the groundwater is on the order of one chance in a thousand (1×10^{-3}). This assumes that groundwater is drawn from an on-site well located in the shallow groundwater unit. This water is also assumed to be used for all consumptive uses (e.g., drinking and washing). The results also showed that VOC concentrations in groundwater are high enough to potentially cause noncarcinogenic effects to the resident.

REMEDIAL ACTION OBJECTIVES

Based on the Phase I and Phase II Remedial Investigations, the baseline human-health risk assessment, and a review of applicable or relevant and appropriate requirements, the following remedial action objectives were established for soil and groundwater at Site 24:

- **Vadose Zone**
  - reduce concentrations of VOCs in the VOC source areas to prevent or minimize further degradation of the shallow groundwater unit above the maximum contaminant level 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 maximum contaminant levels).

DEVELOPMENT OF REMEDIAL ALTERNATIVES

Remedial action objectives for groundwater at Site 24 will be presented in the draft final groundwater FS. Two remedial alternatives were selected for detailed evaluation in this FS:

- Alternative 1: No Action; and
- Alternative 2a: Soil vapor extraction in the vadose zone source area.

EXECUTIVE SUMMARY (continued)

The development of remedial alternatives was guided by prior United States Environmental Protection Agency experience at VOC-contaminated sites. The document Presumptive Remedies: Policies and Procedures (U.S. EPA 1993a) describes certain preferred technologies or presumptive remedies for VOC-contaminated soil. The objective of the presumptive remedy is to use past experience to expedite the investigation and selection of cleanup alternatives. The presumptive remedy approach allows the FS to bypass the identification and screening of remedial technologies and focus on those technologies that have proved to be most effective in the past. The presumptive remedy selected for detailed evaluation in the FS was soil vapor extraction (SVE). SVE from the VOC source area forms the basis of Alternative 2.

As part of the RI/FS process, SVE pilot tests were conducted to evaluate the efficiency of using SVE to remove VOCs at Site 24. The first pilot test, conducted for 19 days, removed approximately 225 pounds of TCE and 50 pounds each of 1,1-DCE and Freon 113 from one SVE well. The influence of the well was estimated to be approximately 280 feet. Additional 1-day tests confirmed that many of the other SVE wells had a similar influence. Based on the 1-day test data, an initial VOC mass removal rate of about 190 pounds per day was estimated from 20 SVE wells. The test data show that SVE is a promising technology for removing VOCs at Site 24.

Alternative 1

In Alternative 1, no action is required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to provide a basis from which to develop and evaluate the other remedial alternatives. Under the no action alternative, no remedial activities would be initiated at Site 24. Although groundwater monitoring is not a part of Alternative 1, sampling and analysis of groundwater would continue under the Long-Term Groundwater Plan. With no action, VOCs in the soil beneath Site 24 would continue to contaminate the shallow groundwater at levels exceeding the federal maximum contaminant levels for drinking water and would cause the eventual cleanup of groundwater to be more costly and time consuming. There is no direct cost associated with Alternative 1.

Alternative 2

Alternative 2 removes VOCs from soil using SVE, the United States Environmental Protection Agency presumptive remedy for VOC-contaminated soil (U.S. EPA 1993b). SVE is the most frequently selected innovative treatment at Superfund sites. It is a relatively simple process that physically separates contaminants from the soil. As the name suggests, SVE extracts contaminants from the soil in the vapor form. Therefore, SVE systems are best suited to contaminants that have a tendency to volatilize or evaporate easily, such as VOCs. By applying a vacuum to a network of SVE wells, VOCs are pulled to the surface as a vapor or gas. This vapor is then filtered with activated carbon to trap the VOCs before the air is discharged to the atmosphere. When the activated carbon filters become saturated with VOCs, the carbon is sent back to the

manufacturer where it is regenerated and the VOCs destroyed. By removing VOCs from the soil, further groundwater contamination is prevented or minimized, thereby reducing the time required for groundwater cleanup. Remedial actions for groundwater at Site 24 will be described in a separate FS.

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, the remedial alternatives developed in this FS were evaluated on the basis of seven criteria: overall protection of human health and the environment; compliance with federal and state applicable or relevant and appropriate requirements; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; and cost. Following review of this report by state environmental agencies, state concerns will be addressed; following public review and comment, the concerns of the public will be addressed.

RESULTS OF REMEDIAL ALTERNATIVE EVALUATION

Alternative 2 is the preferred remedial alternative. Performing soil cleanup using SVE at Site 24 would eliminate most of the TCE contamination and other VOCs that serve as the source of the regional groundwater contamination. With most of the soil contamination eliminated, time required for follow-up groundwater cleanup will be reduced. Soil and groundwater cleanup will be conducted independently. This strategy coincides with the goal of conducting expedited efforts to clean up the Station in support of eventual closure and reuse of the property.

In summary, the preferred remedial alternative includes the following:

- construction, operation, and maintenance of an SVE system using a phased-approach to remediation;
- performance monitoring to be conducted throughout the predicted 2 years of remediation;
- treatment of VOC-contaminated soil gas with activated carbon prior to discharge to the atmosphere;
- reduction of VOC concentrations in the soil gas to levels that will not contaminate groundwater above their respective MCLs; and
- confirmation soil-gas sampling using direct-push technology.

The estimated present-worth cost for Alternative 2 is approximately $3.5 to $5 million. Some uncertainty is estimated because the exact number and locations of SVE wells will be determined during the remedial design phase of the project. Alternative 2 protects human health and the environment by removing VOCs from the soil before they further contaminate the groundwater. Alternative 2 also complies with applicable or relevant and appropriate requirements. SVE is an established remedial technology that has been successfully pilot tested at Site 24.

United States
Environmental Protection
Agency

Solid Waste and
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A Citizen's Guide to Soil Vapor Extraction *and Air Sparging*

Technology Innovation Office

Technology Fact Sheet

What is soil vapor extraction?

Soil vapor extraction, known as SVE, is the most frequently selected innovative treatment at Superfund sites. It is a relatively simple process that physically separates contaminants from soil. As the name suggests, SVE *extracts* contaminants from the *soil* in *vapor* form. Therefore, SVE systems are designed to remove contaminants that have a tendency to *volatilize* or evaporate easily. SVE removes *volatile* organic compounds (VOCs) and some *semi-volatile* organic compounds (SVOCs) from soil beneath the ground surface in the unsaturated zone—that part of the subsurface located above the water table. By applying a vacuum through a system of underground wells, contaminants are pulled to the surface as vapor or gas. Often, in addition to vacuum extraction wells, air *injection* wells are installed to increase the air flow and improve the removal rate of the contaminant. An added benefit of introducing air into the soil is that it can stimulate *bioremediation* of some contaminants.

SVE is sometimes called in situ volatilization, enhanced volatilization, in situ soil venting, forced soil venting, in situ air stripping, or soil vacuum extraction.

What is air sparging?

Used alone, soil vapor extraction cannot remove contaminants in the *saturated* zone of the subsurface, the water-soaked soil that lies below the water table. At sites where contamination is in the saturated zone, a process called air sparging may be used along with the SVE system. Air sparging means pumping air into the saturated zone to help flush (bubble) the contaminants up into the unsaturated zone where the SVE extraction wells can remove them (Figure 1).

For air sparging to be successful, the soil in the saturated zone must be loose enough to allow the injected air to readily escape up into the unsaturated zone. Air sparging, therefore, will work fastest at sites with coarse-grained soil, like sand and gravel.

A Quick Look at Soil Vapor Extraction

- Pulls contaminants from soil in vapor-form.
- Provides an oxygen source which may stimulate bioremediation of some contaminants.
- Most frequently used innovative treatment technology.

A Quick Look at Air Sparging

- Extends the effectiveness of soil vapor extraction to include contaminants that exist in ground water.
- Can accelerate cleanup at pump-and-treat sites.
- Provides an oxygen source which may stimulate bioremediation of some contaminants.

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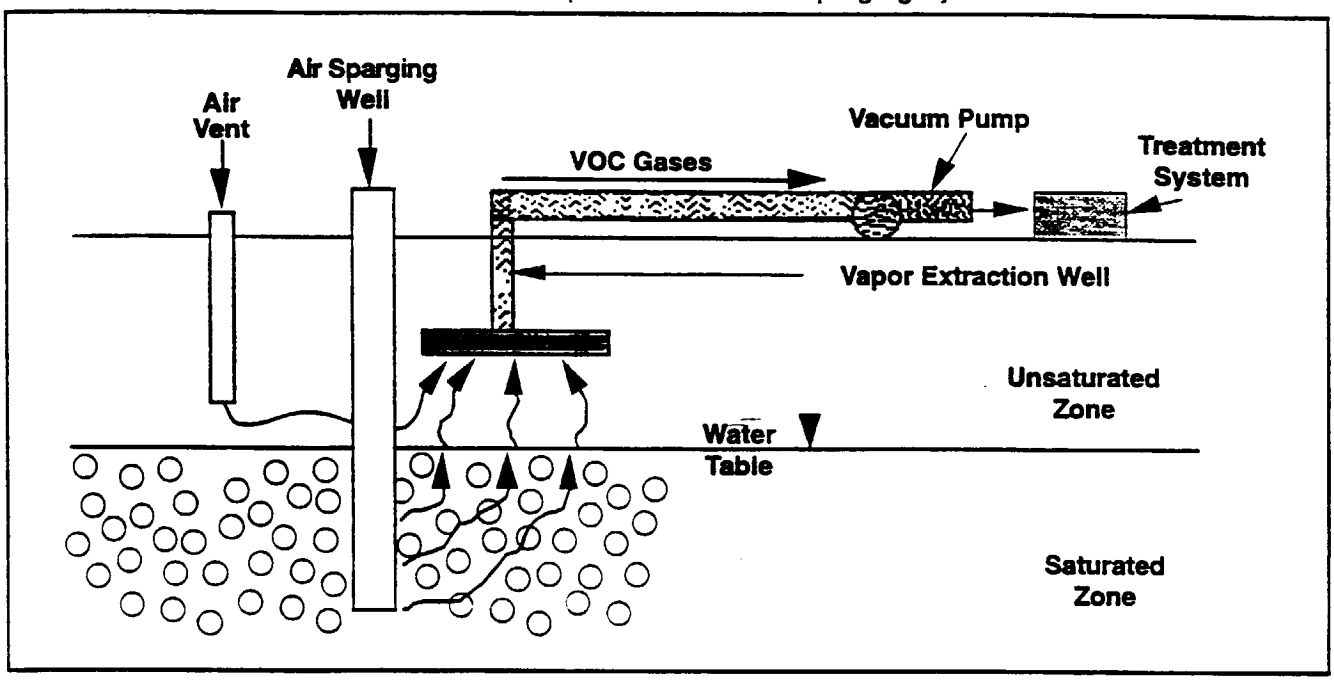
Figure 1
A Combined Soil Vapor Extraction/Air Sparging System



As with SVE, an added benefit of air sparging is that it provides an oxygen source that helps stimulate the *bioremediation* of some contaminants. Bioremediation is an innovative treatment technology that uses microorganisms, such as bacteria, that live in the soil or groundwater to break down contaminants into harmless substances. (Bioremediation is explained in detail in another Citizen's Guide. See the "For More Information" box on page 4.) Air sparging also can be a quick and effective treatment for VOCs in groundwater.

How does an SVE system work?

The first step to constructing an SVE system is to install vapor extraction wells and injection wells (or air vents) in the contaminated area. Air injection wells use air compressors to force air into the ground. Air vents serve the same function as air injection wells, but are passive—instead of pumping air they just provide a passage for air to be drawn into the ground. When incoming air passes through the soil on its way to the extraction wells, contaminants evaporate out of the spaces between the soil particles and are pulled by the air to the wells and removed.

Vapor extraction wells can be placed either vertically or horizontally. Typically, they are placed vertically and are designed to penetrate the lower portion of the unsaturated zone.

Vapors extracted by the SVE process are typically treated using carbon adsorption, incineration, catalytic oxidation, or condensation. Other methods, such as biological treatment and ultraviolet oxidation, also have been used with SVE systems. The type of treatment chosen depends on which contaminants are present and their concentrations.

Carbon adsorption is the most commonly used treatment for contaminated vapors and is adaptable to a wide range of volatile organic compounds.

When properly designed and operated, SVE is a safe, low maintenance process. Explosion-proof equipment is available to handle the potentially explosive mixtures of extracted gas that may be encountered on some landfill or gasoline spill sites.

SVE with thermal enhancement. SVE performance can be *enhanced* or improved by injecting heated air or steam into the contaminated soil through the injection wells. The heated air or steam helps to "loosen" some less volatile compounds from the soil. Researchers have done large-scale demonstrations of SVE with steam injection at several sites. In

addition to heated air or steam, another enhancement of SVE is the use of radio-frequency (RF) heating to better vaporize or volatilize compounds in clay and silt-type soils. Demonstrations of RF heating are underway.

Dual phase extraction. Dual phase extraction is a treatment system similar to SVE, but the extraction wells are sunk more deeply into the ground—below the water table into the saturated zone. Strong vacuum is applied through the extraction wells to simultaneously remove groundwater and vapors from the subsurface. Once above ground, the extracted vapors and groundwater are separated and treated. Dual phase extraction is more effective than SVE at sites with dense, clayey soil. When dual-phase extraction is combined with bioremediation, air sparging or bioventing, it can shorten cleanup times.

Why consider SVE or air sparging?

SVE is very effective at removing VOCs from the unsaturated zone. With the addition of an air sparging system, contaminants can be removed from the saturated zone as well. Neither technique requires excavation of the contaminated soil. (Excavation is undesirable because it is expensive, creates dust, and allows volatile contaminants to escape untreated into the atmosphere.) The extracted vapors usually require treatment, but costs for treating extracted vapors and liquids are low compared to the costs of technologies requiring excavation. The technologies are relatively simple to install, can be used effectively in combination with other treatment technologies, and are effective under a variety of site conditions.

Will SVE or air sparging work at every site?

SVE and air sparging may be good choices at sites contaminated with solvents and other volatile organic compounds (such as trichloroethane, trichloroethylene, benzene, toluene, ethylbenzene, and xylene) and fuels. Because properties of the soil have such an important effect on the movement of soil vapors, the performance and design of SVE and air sparging systems depend greatly on the properties of the soil. SVE is best used at sites with loose unsaturated soil, such as sand, gravel, and coarse silt or fractured bedrock. However, it has been applied to sites with denser soils, although treatment may take longer. Also, the higher the moisture content of the soil, the slower SVE works.

Where are SVE and air sparging being used?

SVE has been used at many Superfund and other hazardous waste sites. The Verona Well Field in Michigan is a Superfund site at which SVE was used to treat a one-half acre area to a depth of 20 feet contaminated with trichloroethene, tetrachloroethylene, and "BTEX," a mixture of benzene, toluene, ethylbenzene, and xylene. The SVE system removed and treated a total of 45,000 pounds of contaminants from the treatment area. EPA set target cleanup levels for 19 different contaminants at the site and the SVE system successfully met the goals for all the contaminants. Table 1 on page 4 lists other Superfund sites at which SVE, air sparging, and dual-phase extraction are planned or have been used.

What Is An Innovative Treatment Technology?

Treatment technologies are processes applied to hazardous waste or contaminated materials to permanently alter their condition through chemical, biological, or physical means. Treatment technologies are able to alter, by destroying or changing, contaminated materials so they are less hazardous or are no longer hazardous. This may be done by reducing the amount of contaminated material, by recovering or removing a component that gives the material its hazardous properties or by immobilizing the waste. *Innovative treatment technologies* are technologies that have been tested, selected or used for treatment of hazardous waste or contaminated materials but still lack well-documented cost and performance data under a variety of operating conditions.

Some innovative treatment technologies, such as SVE and thermal desorption, are so widely used that the term "innovative" may seem inappropriate. However, innovative variations on these technologies are still being developed and EPA still is not able to predict with certainty the time and cost required to clean up a site using them. For these reasons, EPA continues to track these technologies and collect data about them.

Table 1
Examples of Superfund Sites Using Soil Vapor Extraction (SVE), Air Sparging (AS), or Dual Phase Extraction (DPE)*

Name of Site	Technology	Status**	Contaminants
Fairchild Semiconductor (San Jose), CA	SVE	Completed	Volatile organic compounds (VOCs), benzene, toluene, ethylbenzene & xylene (BTEX)
Garden State Cleaners, NJ	SVE	Completed	VOCs
Defense General Supply Center, VA	SVE	Completed	VOCs
Hollingsworth Solderless, FL	SVE	Completed	VOCs
Rocky Mountain Arsenal, CO	SVE	Completed	VOCs
Lindsay Manufacturing, NE	SVE	Operational	VOCs
Applied Environmental Services, NY	SVE/AS	Operational	BTEX, VOCs, semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs)
Wayne Reclamation and Recycling, IN	SVE/AS	Operational	VOCs, BTEX
Sand Creek Industrial, CO	SVE/DPE	Predesign	VOCs, PAHs, BTEX
Linemaster Switch Corporation, CT	SVE/DPE	In design	VOCs
Rochester Property, SC	AS	Operational	VOCs
Fairchild Air Force Base, WA	AS	Operational	VOCs, BTEX

For a listing of Superfund sites at which innovative treatment technologies have been used or selected for use, contact NCEPI at the address in the box below for a copy of the document entitled ***Innovative Treatment Technologies: Annual Status Report (7th Ed.)*, EPA 542-R-95-008.** Additional information about the sites listed in the Annual Status Report is available in database format. The database can be downloaded free of charge from EPA's Cleanup Information bulletin board (CLU-IN). Call CLU-IN at 301-589-8366 (modem). CLU-IN's help line is 301-589-8368. The database also is available for purchase on diskettes. Contact NCEPI for details.

** Not all waste types and site conditions are comparable. Each site must be individually investigated and tested. Engineering and scientific judgment must be used to determine if a technology is appropriate for a site.*
***As of August 1995*

For More Information

The publications listed below can be ordered free of charge by calling NCEPI at 513-489-8190 or faxing your request to 513-489-8695. If NCEPI is out of stock of a document, you may be directed to other sources. Write to NCEPI at:

National Center for Environmental Publications and Information (NCEPI)
P.O. Box 42419
Cincinnati, OH 45242

- *Selected Alternative and Innovative Treatment Technologies for Corrective Action and Site Remediation: A Bibliography of EPA Resources*, January 1995, EPA 542-B-95-001. **A bibliography of EPA publications about innovative treatment technologies.**
- *Soil Vapor Extraction Treatment Technology Resource Guide*, September 1994, EPA 542-B-94-007. **A bibliography of publications and other sources of information about SVE, air sparging and other innovative treatment technologies.**
- *In Situ Remediation Technology Status Report: Thermal Enhancements*, April 1995, EPA 542-K-94-009.
- *Technology Assessment of Soil Vapor Extraction and Air Sparging*, September 1992, EPA 600-R-92-173.
- *Superfund Innovative Technology Evaluation Program: Technology Profiles (7th Ed.)*, EPA 540-R-94-526.
- *A Citizen's Guide to Bioremediation*, EPA 542-F-96-007.
- WASTECH® Monograph on Vacuum Vapor Extraction, *ISBN #1-883767-08-3. Available for $49.95 from the American Academy of Environmental Engineers, 130 Holiday Court, Annapolis, MD 21401. Telephone 410-266-3311.*

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United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

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EPA

User's Guide to the VOCs in Soils Presumptive Remedy

Office of Emergency and Remedial Response

User's Guide

In order to expedite remedy selection at similar types of sites, EPA recommends the use of presumptive remedies — preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. This User's Guide recommends the soil vapor extraction (SVE) technology as the preferred presumptive remedy for sites where volatile organic components (VOCs) are present in soil and treatment is warranted, although the thermal desorption and incineration technologies may be selected as presumptive remedies at sites where conditions are appropriate. Presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances. This guide is based on the VOCs in Soils Presumptive Remedy Guidance, *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils*, OSWER 9355.0-48FS. Please refer to that guidance for a more detailed description of how the presumptive remedy can be applied at sites where volatile organic components (VOCs) are present in soil.

PURPOSE

This User's Guide is intended to aid the site manager. It:

- Explains the benefits of using the "presumptive remedy approach";
- Highlights how to decide if the presumptive remedy approach can be applied to your site;
- Explains which presumptive remedy approach to select for your site (the preferred presumptive remedial alternative for sites with VOCs in the soils is soil vapor extraction (SVE));
- Describes how to write the feasibility study (FS) or engineering evaluation/cost analysis (EE/CA) for a presumptive remedy; and
- Outlines administrative record requirements.

WHY USE THE PRESUMPTIVE REMEDY APPROACH?

Time and cost savings can be realized by following the presumptive remedy approach during a remedial investigation/feasibility study (RI/FS). First, since a preferred cleanup technology can be identified prior to or early in the RI, technology-specific remedial design data can be collected and analyzed sooner. In addition, use of the presumptive remedy approach eliminates the need to:

- Identify potential treatment technologies
- Screen technologies in your site-specific FS or EE/CA.

In addition, the steps of assembling technologies into alternatives and reducing alternatives are streamlined since the number of technologies under consideration have been minimized. Figure 1 presents the presumptive remedy technologies for VOCs in soils and important features of each.

Figure 1. Presumptive Remedies for VOCs in Soils

Soil Vapor Extraction (SVE): ***The preferred presumptive remedy***
- In-situ process
- Removes contaminants from vadose zone soils by inducing air flow through the soil
- Highly cost effective alternative
- Vapor treatment may be required

Thermal Desorption
- Soil excavation required
- Uses direct or indirect heat to vaporize VOCs from soil
- Vapor treatment may be required

Incineration
- Soil excavation required
- Employs thermal decomposition via oxidation
- Destroys the organic fraction of the waste
- Vapor treatment may be required

CAN YOU APPLY THE VOCS IN SOILS PRESUMPTIVE REMEDY APPROACH TO YOUR SITE?

In order to determine if you can use the presumptive remedy approach at your site, you need to answer the following questions. Regardless of the status of your RI or removal evaluation, these questions can be addressed once you establish the nature of any VOC and non-VOC waste contained in the soil, where treatment is warranted.

Are VOCs present in soil or sludge?

VOCs include halogenated and non-halogenated organics such as trichloroethylene, carbon tetrachloride, acetone and benzene. A complete a list of typical VOCs is found in the master VOCs presumptive remedy guidance referenced on page 1. If your site does not have VOCs in the soil, then this User's Guide is not applicable for use in remedy selection at the site.

Are non-VOCs present that will preclude the use of the presumptive remedy guidance?

For sites with a mixture of VOCs and other contaminants in soil, the presumptive remedies should be considered only if they also can also be effective in removing the non-VOC contaminants, or can be used in combination with other remedies. For combination remedies, this presumptive remedy approach can be used to select the VOC portion of the remedy. For example, sites with VOCs and metals commingled in soil may be effectively remediated by employing SVE to remove VOCs and fixation or solidification to address the metal contamination. The presumptive remedy approach can still be used for the selection of the SVE remedy whereas a traditional FS analysis would be necessary for the treatment of metals.

In conclusion, if VOCs are present in soils and non-VOCs do not preclude a VOC remedy, you may also select the presumptive remedy for the VOC component of the site.

Have all key stakeholders been notified?

Please keep in mind that it is important to notify the community, (especially any community working groups) the State, and any PRPs that a presumptive remedy is being considered at your site. It is important to get their buy-in early in the cleanup process.

This notification should begin as early as possible and can continue to occur throughout the RI/FS in the form of fact sheets and agenda items during public meetings. Early discussions about the rationale for presumptive remedies creates confidence in both the technology and remedy selection process.

> Once a candidate presumptive remedy site has been identified and a response action involving treatment is warranted under the NCP, you can decide which of the 3 VOCs in soils presumptive remedy technologies to select.

WHICH VOCs IN SOILS PRESUMPTIVE REMEDY IS BEST FOR MY SITE?

Once you have determined that your site is a candidate for a presumptive remedy, SVE should be analyzed first since it is the preferred presumptive remedial alternative. In most cases, SVE is extremely cost effective and can be implemented in-situ. The SVE Checklist (Figure 2) can help you decide if SVE is appropriate at your site[1]. The questions posed in the SVE Checklist provide a preliminary "first-cut" assessment of basic site characteristics that relate to potential SVE treatment effectiveness. Your site is a strong candidate for SVE if you answer "yes" to all of these questions. At this point, you may wish to assume SVE as the preferred technology for VOC remedial action at your site. Therefore, you may immediately proceed to an SVE Pilot Study and a Presumptive Feasibility Study (see p. 3).

For the purposes of this User's Guide, the terms "Presumptive FS or EE/CA" refer to the FS or EE/CA developed at sites where the presumptive remedy is applied. The SVE Checklist is not a definitive screening test for SVE. So, even if you answer "no" to one or more of these questions, SVE may still be an appropriate presumptive technology for your site, but greater technical analysis may be warranted. Considerations such as best professional judgment and community opinion should guide your decision to proceed with an SVE Pilot Study to confirm the appropriateness of the SVE technology at your site.

If SVE is determined to be ineffective based on site-specific circumstances, thermal desorption is the next technology that should be assessed for use at your site. Thermal Desorption is the primary VOC presumptive remedy at sites where soil excavation is required to remediate a non-VOC contaminant. At some sites, public perception is that incineration can be disruptive to a community, and it has been ruled out due to that perception. Be aware of this if you prove incineration as a remedy. For a complete discussion of the characteristics that affect the use of SVE, thermal desorption and incineration technologies, refer to Tables 3 and 4 of the master VOC presumptive remedy guidance.

Figure 2. SVE Checklist

Site Characteristics[2]	Yes	No
Soil Permeability > 10^{-4} cm^2		
Soil Moisture Content < 50%?		
VOC Vapor Pressure > 0.5mm Hg?		
Dimensionless Henry's constants > 0.01?		
Soil/Air Filled Porosity < 40%?		
Low organic carbon content?		

[1] If you are scoping an RI or a removal evaluation, the information requested in Figure 2 should be identified as a "presumptive remedy data need" along with common data needs for an RI/FS. As you develop the RI/FS Work Plan, you should establish site-specific data quality objectives for each set of RI data needs. All presumptive remedy data needs should be collected during the first round of environmental data collection of the RI if not before.

[2] See Table 4 of the VOCs in Soils Presumptive Remedy Guidance for a description for each of the terms listed in Figure 2.

HOW DO I WRITE THE FS OR EE/CA FOR A PRESUMPTIVE REMEDY?

After determining that your site can use a VOCs in soils presumptive remedy, the next step is to prepare a presumptive FS or EE/CA. Note that for non-time-critical removals, you can prepare an EE/CA. Regardless of the status of your RI or removal evaluation, the Presumptive FS or EE/CA for the soil remedy should begin immediately.

As highlighted on page 1, the presumptive remedy approach allows you to streamline and focus the FS or EE/CA by eliminating the technology screening step because EPA has already conducted this step on a generic basis in the document *Feasibility Study Analysis for VOCs in Soils Sites.* Basically, only the "No- Action" alternative and presumptive remedy alternative require further consideration. If SVE is appropriate, the other presumptive technologies (thermal desorption and incineration) may be eliminated from further consideration. To tailor the Presumptive FS to the specific conditions at your site, you may first need to refine the presumptive remedy alternative, as necessary. For example, if off gas treatment is required, the technology for off gas treatment is not selected presumptively and should be addressed in the FS. As shown in Figure 3, the presumptive technology should be matched with an appropriate mix of conventional and innovative vapor treatment technologies. The final step of the Presumptive FS would consist of analyzing the No-Action and Presumptive Remedy alternatives against the nine NCP evaluation criteria.

An example format for critical elements of a Presumptive FS is provided in Figure 4. Please note that it is advisable to expand the Introduction Chapter of your Presumptive FS or EE/CA to include a brief discussion of the presumptive remedy approach and justification for using this approach at your site.

You may wish to consider technologies that enhance the performance of the presumptive remedy based on site-specific conditions. For example, SVE enhancements include bioventing, capping, hot air injection, steam injection, and subsurface mining. Additionally, you may consider using a phased approach to designing and implementing an SVE system similar to EPA's suggested phased approach to characterizing and remediating contaminated groundwater sites. In order to maximize engineering flexibility during remedial design and remedial action, it is not always necessary to address potential enhancements in your Presumptive FS. Only where: (a) there is a high degree of confidence that the enhancement is essential for cost-effective remediation; or, (b) the addition of the enhancement significantly changes the cost or scope of the base SVE alternative, should such enhancements be included in the Presumptive FS. For more information on whether to include enhancements in your FS and determining what would require changes to a ROD, see "Guide to Addressing Pre-ROD and Post-ROD changes, OSWER 9355.3-02FS-4, April 1991.

Figure 3. Example of a Possible SVE Alternative Refinement

Alternative 1 - No Action

Alternative 2 - SVE with No Off Gas Treatment

Alternative 3 - SVE with Off Gas Treatment (e.g. activated carbon, catalytic oxidation, flameless thermal oxidation, resin adsorption, etc.)

Alternative 4 - SVE with Off Gas Treatment and Capping

Figure 4. Example Format For Critical Elements of A Presumptive FS

I. Introduction
   A. Background to the Site
   B. Introduction to the Presumptive Remedy Approach
   C. Determination to use the Presumptive Remedy Approach

II. Description of the No Action Alternative, the Presumptive Remedy Alternatives, and ARARs

III. Detailed (Nine Criteria) Analysis of the No Action Alternative and the Presumptive Remedy Alternative

IV. Description of the Preferred Alternative
   A. Rationale for the Preferred Alternative

ADMINISTRATIVE RECORD REQUIREMENTS

You must compile an administrative record in accordance with the *Final Guidance on Administrative Records for Selecting CERCLA Response Actions*, OSWER Directive 9833.3A.1. The administrative record must contain both EPA guidance and site-specific information documenting the selection of the VOCs in soils presumptive remedy. Other required EPA guidance documents include:

- *Presumptive Remedies: Policies and Procedures*, OSWER 9355.0-47FS
- *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with VOCs in Soils*, OSWER 9355.0-48FS
- *Feasibility Study Analysis for VOCs in Soils Sites*, OSWER 9356.0-01. [Note: The administrative record file index should include a notice specifying the location of and times when public access is available to the generic file of backup materials used in developing this document. The generic file contains background materials such as technical references and previous feasibility studies. Each EPA Regional office has a copy of this file.]
- *"Guide to Principal Threat and Low Level Threat Wastes*, OSWER 9380.3-06FS

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

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PB 93-963346
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EPA

Presumptive Remedies: Site Characterization and Technology Selection For CERCLA Sites With Volatile Organic Compounds In Soils

Office of Emergency and Remedial Response
Hazardous Site Control Division 5203G

Quick Reference Fact Sheet

Since Superfund's inception in 1980, the remedial and removal programs have found that certain categories of sites have similar characteristics, such as types of contaminants present, types of disposal practices, or how environmental media are affected. Based on information acquired from evaluating and cleaning up these sites, the Superfund program is undertaking an initiative to develop presumptive remedies to accelerate future cleanups at these types of sites. The presumptive remedy approach is one tool of acceleration within the **Superfund Accelerated Cleanup Model (SACM).**

Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. The objective of the presumptive remedies initiative is to use the program's past experience to streamline site investigation and speed up selection of cleanup actions. Over time presumptive remedies are expected to ensure consistency in remedy selection and reduce the cost and time required to clean up similar types of sites. Presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances.

This directive identifies the presumptive remedies for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites with soils contaminated by ***volatile organic compounds (VOCs).*** In addition, EPA is developing guidance on presumptive remedies for wood treatment, municipal landfill, PCB, grain storage, coal gasification, and contaminated ground-water sites. EPA has also developed a directive entitled *Presumptive Remedies: Policy and Procedures*, (Directive 9355.0-47FS) which outlines and addresses the issues common to all presumptive remedies (e.g., role of *innovative technologies*, consistency with the NCP, State, community involvement).

PURPOSE

The purpose of this directive is to provide guidance on selecting a presumptive remedy at sites with soils contaminated with VOCs. Specifically this guidance:

- Presents the presumptive remedies for this site type;
- Describes the presumptive remedy process in terms of site characterization and technology screening steps; and
- Outlines the data required to select these presumptive remedies.

Since a presumptive remedy is a technology that EPA believes, based upon its past experience, generally will be the most appropriate remedy for a specified type of site, the presumptive remedy approach will accelerate site-specific analysis of remedies by focusing the feasibility study efforts. Where several presumptive remedies are identified, EPA believes that all deserve substantial consideration before utilizing the presumptive remedy approach. EPA personnel should review the directive entitled *Presumptive Remedies: Policy and Procedures* (Directive 9355.0-47FS) for general information on the presumptive remedy process.

Soil-vapor extraction (SVE), thermal desorption, and **incineration** are the presumptive remedies for Superfund sites with VOC-contaminated soil assuming the site characteristics meet certain criteria. Table 1 provides a brief description of each of these presumptive remedies.

The decision to establish these technologies as presumptive remedies for this site type is based on EPA's collective knowledge about site investigation and remedy selection for VOC-contaminated soils,

TABLE 1 Presumptive Remedies for VOCs in Soil
Soil Vapor Extraction - Soil vapor extraction (SVE) is an in-situ or ex-situ process which physically removes contaminants from ***vadose zone*** soils by inducing air flow through the soil matrix. The flowing air strips volatile compounds from the solids and carries them to extraction wells. The recovered vapors may require further treatment. In-situ SVE is the primary focus of this document. **Thermal Desorption** - Thermal desorption is an ex- situ process that uses direct or indirect heat exchange to vaporize organic contaminants from soil, sediment, sludge or other solid and semisolid matrices. The vapors are then condensed or otherwise collected for further treatment. **Incineration** - Incineration is an ex-situ engineered process that employs thermal decomposition via oxidation at temperatures usually greater than 900 °C to destroy the organic fraction of the waste. The major difference between thermal desorption and incineration is that incineration oxidizes organic compounds, thereby destroying the hazardous material. Thermal desorption volatilizes contaminants, then concentrates them. Thermal desorption reduces the volume of contamination, but the concentrated waste stream still requires treatment. Disposal or treatment of residual waste stream, ash, and concentrated VOC effluent is not covered by this directive. Options such as off-site disposal/regeneration or reuse should be considered.

including field experience from the Superfund, Resource Conservation and Recovery Act (RCRA), and Underground Storage Tank (UST) programs. In addition, EPA conducted an analysis of FY86 to FY91 Records of Decision (RODs) for sites where VOC contamination drove remedy selection. The results of this analysis, which are provided in Appendix A, demonstrate that these three technologies represent over 90% of the remedies selected in the RODs analyzed.

USE OF DOCUMENT

This directive is primarily intended for use by Superfund site managers. However, site managers in other programs (such as RCRA corrective action, the UST program, States), and the private sector, may also use this directive.

This directive is not a "stand alone" document. To ensure a full understanding of VOC site characterization and remedy selection, site managers should refer to all documents cited in the directive. For assistance in understanding complex site conditions, an experienced site manager, the presumptive remedy expert team, the Superfund Technical Assistance and Response Team (START) team, or the Environmental Response Team should be consulted.

ANTICIPATED BENEFITS OF PRESUMPTIVE REMEDIES

Use of this directive will reduce cost and time in remedy selection at VOC sites in the following ways:

1. The directive facilitates identification of the presumed or likely remedial options early in the investigation process, hence allowing for a more focused collection of data during the remedial investigation (RI) or removal site evaluation. In addition, knowledge of the presumptive remedy may facilitate collection of some remedial design data before the ROD or action memo, thereby allowing the action to proceed more quickly after signature of the decision document.

2. This directive eliminates the need for the initial step of identifying and screening a variety of alternatives during the Feasibility Study. Additionally, it will reduce the number of technologies identified and analyzed in the EE/CA. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Section 300.430(e)(1)) states that "the lead agency shall include an alternatives screening step, when needed, (emphasis added) to select a reasonable number of alternatives for detailed analysis." EPA's analysis of feasibility studies for VOC-contaminated soil sites (see Appendix A) found that certain technologies are routinely screened out based on effectiveness, implementability, or excessive costs, consistent with NCP Section 300.430(e)(7). Accordingly, EPA has determined that, when using presumptive remedies at VOC-contaminated sites, site-specific identification and screening of alternatives is not necessary. However, this directive and supporting documentation (see "Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils") should be included in the Administrative Record for all sites that use the presumptive remedy(ies) to document the basis for eliminating the "site-specific identification and

TABLE 2
Typical VOCs Addressed by this Directive

Halogenated Volatile Organics

Carbon Tetrachloride
Chlorobenzene
Chloroethane
Chloroform
1,1-Dichloroethane
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloroethylene
1,2-Dichloropropane
1,4-Dichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
Ethylene Dibromide
Methylene Chloride
Tetrachloroethylene
Trichloroethylene
Vinyl Chloride

Non-Halogenated Volatile Organics

Ketones/Furans
Acetone
Methyl Ethyl Ketone
Methyl Isobutyl Ketone

Aromatics
Benzene
Ethyl Benzene
Styrene
Toluene
m-Xylene
o-Xylene
p-Xylene

Note: Other compounds that have physical/chemical characteristics similar to the compounds listed may also be addressed by the presumptive remedy process.

screening of technologies" section. In addition, other supporting materials (e.g., FS reports included in the analysis, technical reports) will be made available at EPA Headquarters and are available for inclusion in the Administrative Record if needed.

3. This directive streamlines the detailed analysis portion of the FS. Remedial alternatives developed for a site must be evaluated against the nine criteria (required under NCP Section 300.430(e)(9)). Under this presumptive remedy approach, the detailed analysis can be limited to the three presumptive remedies (in addition to the no-action alternative), thereby streamlining that portion of the FS. Appendix B provides a generic evaluation of the presumptive remedies for seven of the nine criteria. This evaluation may serve as a basis for each detailed analysis conducted under the presumptive remedy process and should be augmented, as needed, to address site-specific conditions.

One of these presumptive remedies is expected to be used for all VOC sites except under unusual circumstances. Such circumstances may include unusual site soil characteristics, demonstration of significant advantages of alternate (or other innovative) technologies over the presumptive remedies, or extraordinary community and state concerns. If such circumstances are encountered, additional analyses may be necessary or a more conventional detailed RI/FS may be performed.

PRESUMPTIVE REMEDIES PROCESS

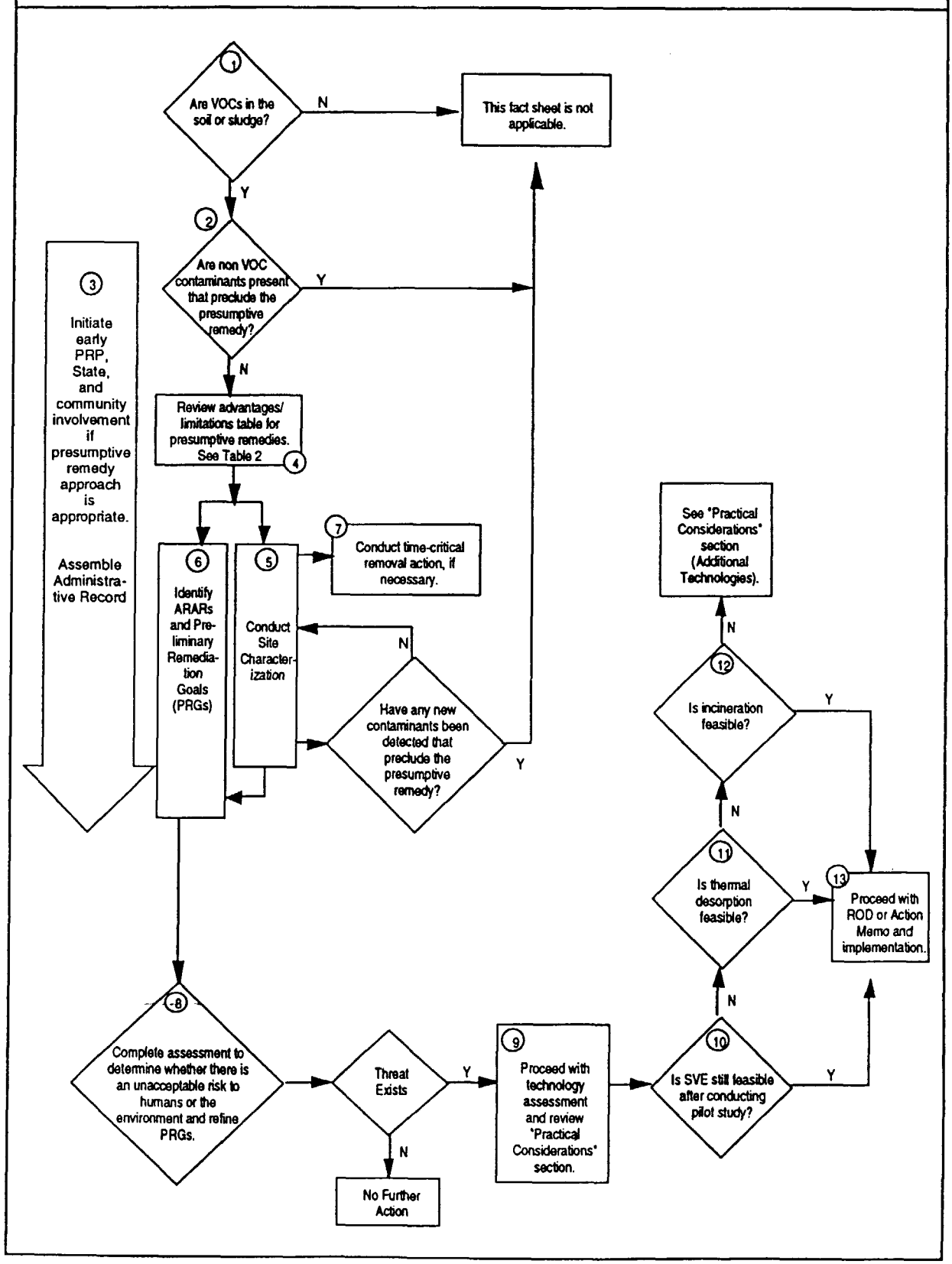
This section and the accompanying diagram (Figure 1) describe the sequence of steps involved in the presumptive remedy process (site characterization and technology selection) for sites containing soil contaminated with VOCs. While the process is not mandatory, EPA believes that following the steps outlined below will expedite the clean-up process for this category of sites.

SVE is the primary presumptive remedy. SVE has been selected most frequently to address VOC contamination at Superfund sites and initial performance data indicate that it effectively treats waste in place at a relatively low cost. In cases where SVE will not work or where there is very highly concentrated contamination, thermal desorption may be the more appropriate response technology. In a limited number of situations, incineration may be more appropriate.

The numbered paragraphs below correspond to the numbered steps in Figure 1 and provide a detailed discussion of each step.

1. *Are VOCs Present in the Soil?* The first step is to determine whether VOCs are the major contaminant present in soil at the site. Table 2 lists the VOCs that are amenable to the presumptive remedies outlined in this directive. If VOCs are present at levels of concern (see forthcoming guidance on soil screening levels), then the presumptive remedies outlined in this directive may be applicable. However, if it is confirmed (at this point or at any later point during the presumptive remedy process) that there are no VOCs present in the soil, then this directive is not applicable for use in technology selection at the site.

FIGURE 1
Decision Tree for Investigating and Selecting a Remedy at Solvent Sites



Most likely, this analysis will occur during scoping of the RI/FS or EE/CA. However, there may be only limited information available at that time about the site. Therefore, whatever information is available should be used to determine whether VOCs are present or suspected in the soil based on prior use. Chemical use at a site can be ascertained from a number of sources such as facility records, previous sampling efforts by local or State agencies or through Information Request letters.

2. *Are Non-VOC Contaminants Present That Preclude the Use of Presumptive Remedies?* In addition to determining whether VOCs are present in the soil, it is also necessary to identify other non-VOC contaminants, if any, present in the soil.

   The site characterization and technology selection procedures outlined in this directive are recommended for use primarily on soil containing VOCs only. See Table 2 for VOCs that are amenable to the presumptive remedies.

   For sites containing a mixture of VOCs and other contaminants in soil, the presumptive remedies should be considered only if they can also be effective in removing the non-VOC contaminants or combined with other, non-presumptive remedies in a treatment train, assuming the presumptive remedies do not exacerbate the problems presented by the non-VOCs. For example, sites with VOCs and metals commingled in soil may be effectively remediated by employing SVE to remove VOCs followed by fixation or solidification to address the metal contamination. In contrast, a VOC and polyaromatic hydrocarbons (PAHs) contaminant combination may be treated more appropriately with a single biological treatment scheme that would be effective for both the VOCs and PAHs. Note that sites containing mixtures of VOCs and non-VOCs are varied, and, for this reason, remedy selection may be more complicated than the framework presented in this directive; therefore, the presumptive remedy analysis may need to be supplemented or modified on a site-specific basis.

3. *Initiate Early Community, State, and Potentially Responsible Party (PRP) Involvement.* As early in the clean-up process as possible, EPA should notify the community, State, and any PRPs that a presumptive remedy is being considered for the site. It is important for all stakeholders to understand completely how the presumptive remedy process varies from the usual clean-up process and the benefits of using the presumptive remedies process.

   Early identification of State applicable or relevant and appropriate requirements (ARARs) also is a critical part of this process. Because the presumption set forth in this directive is national in scope, it does not take into account State ARARs. For this reason, State ARARs relating to the presumptive remedies should be considered on a site-specific basis. Regions may want to supplement this directive by compiling the requirements of the States in their Regions that are likely to be associated with the use of the presumptive remedies and placing them in the administrative record for a site where presumptive remedies are being considered. This directive along with the "Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils" should be included in the administrative record for the site if one of the presumptive remedies is proposed for a particular VOC-contaminated site.

4. *Review Advantages/Limitations of the Presumptive Remedies.* During initial site characterization, Table 3 should be reviewed to consider the advantages and limitations of the presumptive remedies. This information may be useful in preparing for and/or modifying the site characterization or alternatives analysis process. The "Practical Considerations" section of this directive should also be reviewed at this time to ensure a comprehensive site characterization and remedy evaluation.

5. *Conduct Site Characterization.* Site characterization for sites using VOC presumptive remedies should be designed to:

   - Positively identify the site type (i.e., VOC site);
   - Obtain data to determine whether the presumptive remedy is feasible for the site;
   - Focus (and possibly streamline) site characterization by collecting data to support the selection of presumptive remedy(ies) only (e.g., volume and cost information); and,
   - Collect some design data (i.e., pilot studies to determine radius of influence and flow rates of SVE), thereby streamlining data collection during the remedial design stage.

   Table 4 lists the data that are required for characterization of sites with soil contaminated with VOCs. This table also includes the rationale for collecting these data and references for established collection methods. Note that bench-scale and pilot/treatability studies should be performed whenever possible concurrent with site characterization to define the parameters that will be important to designing the system.

   In areas with low organic content soil (e.g., alluvial basins), or where there are impediments to obtaining soil samples (e.g., under buildings), soil gas sampling

is highly recommended as a site characterization technique. In addition, the use of soil gas sampling during implementation of SVE and confirmatory soil sampling afterward is less expensive than constantly installing new soil borings, especially for deep contamination.

If incineration or thermal desorption is under serious consideration, bench-scale treatability studies may be conducted, especially if metals or other inorganic compounds are present. Thermal desorption generally should be considered if concentrations of VOCs are less than 5 to 10 percent; incineration may be appropriate if VOC concentrations exceed 5 to 10 percent. Note that excavation and mixing of soil can produce a desorber input of less than 10 percent contaminant concentration and allow thermal desorption to be chosen.

Additionally, the feasibility of excavation should be determined by evaluating surface conditions and depth of contaminants as well as the potential for any air emissions associated with the excavation. Test digs should be monitored closely to assure protection of the public and the environment.

It is important to note that during the site characterization, the volume and concentration of waste constituting the principal threats at the site should be identified. The NCP (Section 300.430(a)(l)(iii)(A) and *A Guide to Principal Threat and Low Level Threat Wastes*, Superfund Publication: 9380.3-06FS, November 1991, define principal threats as source materials, including liquids, that are highly toxic or highly mobile wastes which generally cannot be reliably contained or would present a significant risk to human health and or environment should exposure occur. In accordance with NCP expectations, waste constituting "principal threats" posed by a site generally are expected to be treated. The site manager is encouraged to characterize the site in terms of principal and low-level threat areas to determine materials to be targeted for treatment and containment.

6. *Identify Potential ARARs, To Be Considered (TBCs), and Preliminary Remediation Goals (PRGs).* Potential Federal and State ARARs and pertinent TBCs information should be identified on a chemical-, location-, and action-specific basis concurrent with site characterization. For a more detailed ARARs discussion, refer to the various ARARs fact sheets. (See *Compendium of CERCLA ARARs Factsheets and Directives*, EPA Publication 9347.3-15, October 1991).

   At this step, PRGs should also be identified (NCP Section 300.430(e)(2)(c)). Note that different health risk-based PRGs are often set for soils, depending on depth. Shallow soil levels are usually based both on direct contact exposure and protection of ground water, while levels for deeper soils are generally based only on mass transport modeling of effects on ground water. Ecological effects may also be important to consider in setting PRGs.

7. *Conduct Time-Critical Removal Action (if necessary).* During initial site characterization, data will be gathered to determine whether a time-critical removal action will be needed and to determine whether the contaminants present are amenable to the presumptive remedies. Time-critical removal actions, such as drum removal or actions addressing highly contaminated (typically small volumes) of soil, should be conducted in accordance with current guidance and regulations. The decision to take a time-critical removal action may be made by the Regional Decision Team (RDT) or if time does not permit, by an On-Scene Coordinator (OSC) or a Remedial Project Manager (RPM) in consultation with an OSC.

8. *Is There a Threat Posed by the Site?* A risk assessment must be conducted to determine if a sufficient health or environmental threat exists to warrant a removal or remedial action. (Refer to *Risk Assessment Guidance for Superfund, Volumes I and II*, EPA/540/1-89/002 and EPA/540/1-89/001). Where it is determined that such a threat exists, site-specific exposure data can be used to modify the PRGs identified in Step 6 (NCP Section 300.430(e)(2)(i)). If it is determined that such a threat does not exist, no further action at the site will be required.

9. *Proceed With Technology Assessment and Review "Practical Considerations" section.* If the analysis described in step 8 confirms that the contaminants are a threat to human health and/or the environment, a proposed remedy should then be identified.

   If this project is a remedial action, a detailed analysis using the nine criteria will be required under NCP Section 300.430(e)(9)) to justify the selection of remedy decision. Appendix B provides an analysis of SVE, thermal desorption, and incineration against seven of the nine selection criteria. In addition to the seven criteria discussed in Appendix B, community, and State acceptance must also be evaluated. If a non-time critical removal action is planned, the streamlined analysis described in the EE/CA guidance will be required that uses the three criteria of effectiveness, implementability, and cost. During the technology assessment, the factors listed in the "Practical Considerations" section of this directive should be reviewed to ensure a comprehensive evaluation of alternatives.

10. *Does the Pilot /Treatability Study Indicate that SVE is Feasible?* SVE is the primary presumptive remedy. Pilot/treatability study testing of SVE should be conducted prior to final remedy selection. Such testing will provide information on the rate of removal of contaminants. EPA/540/2-91/091A cited in the References section of this directive provides guidance on conducting the pilot/treatability study. Removal efficiencies and treatment effectiveness must be carefully considered alongside the PRGs identified in the FS to estimate the potential for successful remedial action using SVE.

11. *Is Thermal Desorption Feasible?* If SVE will not be sufficiently effective in achieving PRGs due to low permeability, lithology or insufficient removal of contamination during the pilot study, thermal desorption should be considered as the primary ex-situ presumptive remedy.

    Thermal desorption technologies cover a variety of vendors and processes. However, ample data are available to substantiate remedy selection of thermal desorption for soil contaminated solely with VOCs.

12. *Is Incineration Feasible?* If contaminant concentrations and bench-scale testing indicate thermal desorption will not achieve desired PRG levels, incineration is the second ex-situ presumptive remedy.

    If incineration is planned, and a substantial number of inorganic contaminants are expected to be present based on site characterization data, materials handling problems, or slagging problems are likely.

    If none of the three presumptive remedies is considered to be feasible at a particular site, it will be necessary to consider other technologies. (For more information, refer to the Practical Considerations section below.)

13. *Select Remedy for Remedial/Removal Action.* At this point, there should be enough data to identify a preferred remedy in the proposed plan and distribute the plan for public comment. Once the remedy has been selected in the ROD, the user can proceed to do a limited design which relies largely on the substantial amount of design-related data collected during the RI. The extent of additional or supplemental data required will be determined on a site-specific basis.

Practical Considerations

The following factors should be considered prior to taking any remedial action.

Enforcement: This directive applies to fund-lead sites as well as to sites where a PRP is conducting the investigation and/or response action. In the event that there is an ongoing PRP-lead RI/FS, the scope of work may be amended to reflect the presumptive remedy approach to site characterization and remedy selection. The potential savings in time and money to be gained by using the presumptive remedy approach are expected to outweigh the burden of modifying the scope of work in many cases.

Initial Site Actions: If the VOC material is still in original, intact containers, it may be returned to the manufacturer (if the manufacturer is willing to accept these containers), assuming this response is a cost-effective and feasible action as opposed to treating the material. Reuse of material (i.e., process liquids and relocation of equipment to other permitted facilities) should also be considered. Further, phase separation should be conducted and recycling considered depending on the purity of the recovered phase or for any existing liquids that are high enough in concentration. Refer to Appendix C for a list of the currently recognized waste exchanges.

Site Characterization: Site characterization should proceed as a single, multi-media activity whenever possible. Field screening methods should be integrated into the sampling and analysis plan in order to accelerate information gathering. Data quality must reflect the ultimate use of the information.

Ground Water: The decision maker should consider the ground-water strategy for the site since soil clean-up levels are often set to protect ground-water quality. Therefore, ground-water clean-up levels may have a direct impact on the selected clean-up levels for soil. (See forthcoming guidance on Soil Screening Levels and the directive entitled *Presumptive Remedies: Remedial Strategy and Treatment Technologies for CERCLA Sites with Contaminated Ground Water.*) It should be noted that, of the VOC-type contaminants, listed in Table 2, the halogenated volatiles are dense nonaqueous phase liquids (dense NAPLs or DNAPLs) and many of the others are light NAPLs (LNAPLs) in their pure liquid form. If LNAPLs are present, it may be possible to address them by lowering the water table, removing free product (if present), and applying SVE. To address DNAPLs contamination, refer to the above mentioned ground-water guidance.

Management of Different Soils: A situation may arise where highly contaminated shallow material cannot be addressed by SVE. The action to address this contamination may differ from the rest of the soil contamination and will most likely involve incineration or thermal desorption. If it is suspected that soil contamination existing at greater depths will also be treated in this manner, then the excavated shallow material should be staged and stored in order to treat it with the deep material.

Another situation may arise where VOCs are mixed with metals, and none of the presumptive remedies can address both sets of contaminants. The action to address this situation may consist of a treatment train where VOCs are

addressed through SVE or thermal desorption and the metals are addressed through fixation.

Finally, the site manager should be aware of situations where a mixture of principal and low-level threat wastes call for the use of treatment (i.e., SVE or thermal treatment) of principal threat waste and containment (capping) of low-level contamination. (See *A Guide to Principal Threat and Low-Level Wastes* in Reference Section).

Off-Site Disposal: In general, it may not be cost-effective to ship quantities of contaminated soil in excess of 5,000 cubic yards for off-site disposal. For this reason, pretreatment of soil and water may be required prior to shipment or discharge to another treatment facility.

Capping: Capping alone is not recommended to control the migration of VOCs. However, capping can improve the effectiveness of SVE by decreasing the rate of infiltration of residual VOCs through the vadose zone into the ground water as well as possibly increasing the radius of influence and preventing "short circuiting" of air pathways in the vicinity of the extraction well. Capping can also be used to address non-principal threat waste unless it is more cost-effective to treat this waste along with more highly contaminated materials.

Patents: SVE is a patented technology. Royalty payments may be required under certain conditions of implementation.

Attainment of Remediation Goals: It should be noted that, like other in-situ technologies, it is difficult to ascertain with confidence whether SVE will attain remediation goals until the action is actually implemented. However, the lower cost and ease of SVE implementation will often weigh heavily in its favor, as long as protection of human health and the environment is ensured.

Additional Technologies: If for some reason none of the presumptive remedies is applicable to a particular site, the site manager is encouraged to refer to EPA's forthcoming document entitled *Contaminants and Remedial Options at Solvent Sites* for a discussion of additional VOC treatment technologies. It should be noted that this comprehensive document, which identifies additional VOCs and technologies, may be appropriate to consider on a site-specific basis.

Thermal Treatment Technologies: The site manager should refer to EPA's Draft Strategy for Combustion of Hazardous Waste (May 18, 1993) when considering any thermal treatment technologies at a particular site.

Conclusion

For sites containing VOC-contaminated soil and appropriate soil characteristics, SVE is a relatively inexpensive and efficient technology. If material needs to be excavated, thermal desorption is preferred. In a few cases, incineration may be the most appropriate remedy -- for example, where SVE and thermal desorption will not meet clean-up criteria based on contaminant concentrations or composition.

As remedies other than SVE, thermal desorption and incineration become more widely used in the future, this directive may be modified to reflect these trends. For further assistance on presumptive remedy related activities consult the Regional Presumptive Remedies contact.

Notice:

The policies set out in this document are intended solely as guidance to the U.S. Environmental Protection Agency (EPA) personnel; they are not final EPA actions and do not constitute rulemaking. These policies are not intended, nor can they be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this document, or to act at variance with the guidance, based on an analysis of specific site circumstances. EPA also reserves the right to change this guidance at any time without public notice.

TABLE 3
Comparison of Technologies for VOC Sites

	PERFORMANCE[1]	ADVANTAGES	LIMITATIONS	COSTS[1]
Soil Vapor Extraction	Can be as high as 99% removal of VOC contaminants but is typically lower than other technologies with range of 85-99%	• High level of effectiveness in removing VOCs. • Relatively inexpensive. • Little site disturbance; no excavation required. • Effective for waste under buildings or other construction.	• Soil that is tight or has high moisture content (>50%) has a reduced permeability to air, hindering the operation of SVE. • Soil with a high degree of heterogeneity has highly variable permeabilities, resulting in uneven delivery of gas flow to the contaminated regions, which in turn reduces removal rates by SVE. • Soil with high organic content or that is extremely dry has a high sorption capacity for VOCs, which results in reduced removal rates. • SVE may require treating residual soil tailings, liquids, and spent activated carbon. • Air emissions must be controlled to eliminate possible harm to the public and the environment. • SVE is not effective in the saturated zone. However, lowering the aquifer can expose more media to SVE (this may address concerns regarding LNAPLs).	$10 - 150/ton
Thermal Desorption	95-99% removal of VOCs	• All compounds that are listed on Table 2 are readily treated by thermal desorption. • Because of lower treatment temperatures and often lower oxygen levels, thermal desorbers should produce less nitrogen oxides and sulfur dioxide than incinerators. • Process can be performed onsite or offsite. • Lower temperatures produce fewer products of incomplete combustion (PICs).	• Requires excavation. If contamination is very deep or below the water table, excavation may be difficult and expensive. • Mercury, if present, can be removed from soil by thermal desorption and impose additional treatment costs for the offgas. • Soil containing high fractions of clay or silt may result in a high percentage of particulate carry-over from the desorber into downstream treatment devices. • Soil that contains constituents greater than 1 to 2 inches in diameter will require screening or crushing to prevent jamming the mechanical equipment. • Soil with a high moisture content (>30%) can result in low processing rates, high operating costs, and difficulty in materials handling. • High or low pH wastes may corrode the metal components of the system, requiring pretreatment. • Potential process residuals are treated solids, oversized debris, condensed contaminants and water, particulate control system solids, and contaminated activated carbon. • Air pollution control system required.	$200-300/ton
Incineration	>99% removal of VOCs	• Capable of accepting a wide range of media. • Processes can be performed onsite or offsite. • Metals can be concentrated in the residuals.	• Requires excavation. If contamination is very deep or below the water table, excavation may be difficult and expensive. • Soil containing high fractions of clay or silt may result in a high percentage of particulate carry-over from the incinerator into downstream treatment devices. • Air pollution control equipment is required. • High treatment temperatures, as compared to thermal desorption, can produce nitrogen oxides, sulfur dioxides, and PICs. • Solids with volatile metals may require additional treatment or more elaborate air pollution equipment.	$200 - 1700/ton

NOTES:

(1) Actual performance and cost for any remediation technology is highly site specific. Both depend upon the original and target clean-up level concentrations of contaminants, soil quantity to be treated, soil characteristics, and the design and operation of the remediation technology equipment used.

TABLE 4
Information Required for Characterization and Technology Selection at VOC Sites

INFORMATION	RATIONALE FOR COLLECTING INFORMATION	REFERENCE
All Technologies:		
Site Geology	SVE is most effective in porous, permeable, homogeneous soil. Highly heterogeneous soil (i.e., fractured porous rock or sands interspersed with clay lenses) may exhibit air flow channeling through highly permeable soils. Also, desorption kinetics may be slow in some situations (i.e., high organic content or high clay content soil). In these cases, mass transfer kinetics may reduce the rate of removal of SVE below that which is expected by calculations with a local equilibrium model or pilot scale experiments carried out for only a few days. Often diffusion kinetics limitations can be substantially reduced by proper design of the SVE facility.	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
USGS Soil Classification	For SVE to be effective, the soil must have sufficient pneumatic permeability ($>10^{-6}$ cm^2) to permit air to move through the medium. Sandy, gravely soils are the most conductive to SVE, while clays and silts are less conductive. However, remediations using SVE in clays and silts have been successful. Soil permeability may need to be measured in the field.	ASTM D 2487 ASTM D 2488
Soil Moisture	High moisture content in soil may drastically decrease its air permeability and, thus, the effectiveness of SVE. The site must be sufficiently well drained to prevent the severe reduction in air permeability, which occurs when the percent water saturation of the soil is greater than 50%. Conversely, organics can be strongly adsorbed onto extremely dry soils, which also impedes SVE. The moisture content of the soil will affect the amount of energy required to heat the soil, the target temperature and the handling properties of fine-grained soil. Thermal desorption requires that the moisture content of the soil be less than 30%.	ASTM D 2216 ASTM D 3017
Depth to Ground Water	SVE is not effective in saturated soil. However, the water table can be lowered by pumping. Thermal desorption and incineration are more expensive for high moisture soil.	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Contaminant Identity and Properties	Boiling Point - Thermal desorption target temperature is dependent on contaminant boiling point. Vapor Pressure - SVE is effective for compounds with a vapor pressure greater than 0.5 mm Hg at soil temperatures. Dimensionless Henry's Constant - SVE is effective for compounds with a dimensionless Henry's constant higher than 0.01 at soil temperatures. Water Solubility - SVE is more successful for compounds with lower solubilities. Liquid and Vapor Density - A contaminant with a density greater than water may form a DNAPL. A contaminant with a density less than water may form an LNAPL. The flow characteristics of a compound's vapor for SVE is a function of its vapor density.	CRC Chemical Handbook

TABLE 4
Information Required for Characterization and Technology Selection at VOC Sites
(Continued)

INFORMATION	RATIONALE FOR COLLECTING INFORMATION	REFERENCE
All Technologies: (continued)		
Contaminant Concentration, Location, Volume, and Depth	These data can be gathered via soil matrix and/or soil gas sampling. Soil gas sampling, both shallow and at depths, may be more appropriate, given depth to ground water and stratigraphy.	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Presence of Pipes or Subsurface Material	The presence of water or electrical conduits, soil fracture lines, debris, or any other objects that are more permeable than the surrounding soil will be the preferred pathway for the advecting gases.	Geotechnical Techniques
SVE Only:		
Soil/Air Filled Porosity	Porosity should be less than 40% for SVE to be effective.	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Soil/Air Permeability	Soil/air permeability should be greater than 10^{-6} cm^2 for air to move throughout the contaminated soil. SVE is potentially effective in less permeable soil (i.e., between 10^{-6} to 10^{-10} cm^2), but further pilot-scale testing and/or mathematical modeling is recommended to better predict the time for cleanup (which is likely to be prolonged for lower permeability soil).	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Soil Temperature	Contaminant vapor pressure, dimensionless Henry's Law constant, water solubility, and phase density are strong functions of temperature.	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Soil Humic Content	Solvents adhere strongly to soil with high humic content, which decreases the effectiveness of SVE.	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Contaminant Soil Sorption Coefficient Kd (Since Kd is less readily available, Koc, the equilibrium between contaminants sorbed onto organic carbon versus the ground water is used.)	This parameter describes the tendency of the solvent to sorb onto soil or organic matter in the soil. Higher Koc's indicate that a subsurface is more likely to bind to carbon rich media (i.e., soil) than to remain in water.	RREL Treatability Database
Contaminant Adsorption Characteristics on Activated Carbon	This parameter is related to the feasiblity of removing contaminants from residuals by carbon adsorption. This parameter is important since compounds such as MEK become unstable as they are adsorbed onto carbon.	RREL Treatability Database

TABLE 4
Information Required for Characterization and Technology Selection at VOC Sites
(Continued)

INFORMATION	RATIONALE FOR COLLECTING INFORMATION	REFERENCE
Incineration and Thermal Desorption Only:		
Soil Plasticity	Plastic soil, when subjected to compressive forces, can become molded into large particles that are difficult to heat.	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (pp. 3-3 to 3-20) EPA/540/G-89/004
Soil BTU Content	The soil BTU content determines the fuel requirements for thermal desorption and incineration.	ASTM D 3286
Contaminant Combustion Characteristics	Information on combustion characteristics of a VOC is required in order to determine the combustion characteristics of the incinerator.	Bench/Pilot Testing
Soil Particle Size Distribution	Thermal desorption usually requires that soil be pretreated to a maximum soil particle size ranging from 1 to 2 inches.	ASTM D 422
Alkaline Metal Salts (e.g., $NaSO_4$, KSO_4)	Alkaline metal salts may cause refractory attack and slagging at high temperatures.	Percentage of Na, K
Volatile Metals Content (e.g., Hg, Pb, Cd, Zn, Sn)	High metal content may cause ash leaching and stack emissions problems.	Heavy Metals Analysis

BTU = British Thermal Units
LNAPL = Light Nonaqueous Phase Liquid
DNAPL = Dense Nonaqueous Phase Liquid
mm Hg = millimeters of mercury pressure
NAPL = Nonaqueous Phase Liquid
PIC = Products of Incomplete Combustion

APPENDIX A
TECHNICAL BASIS FOR PRESUMPTIVE REMEDIES

This Appendix summarizes the analyses that EPA conducted of Record of Decision (ROD) and Feasibility Study (FS) data from VOC-contaminated sites which led to establishing soil vapor extraction (SVE), thermal desorption, and incineration as the presumptive remedies for Superfund sites with VOC-contaminated soil. The analyses consisted of:

- Identifying VOC-contaminated sites
- Determining the frequency of technology selection for VOC sites
- Identifying sites for the feasibility study (FS) analysis
- Conducting the FS analysis.

Results of these analyses, along with the scientific and engineering analysis of the performance data on technology application (Primary Reference document), provide a support for the decision to eliminate the initial alternatives identification and screening step for this site type. These technical reviews found that certain technologies are appropriately screened out based on effectiveness, implementability, or excessive costs. Review of technologies against the nine criteria led to elimination of additional alternatives. Provided below is a discussion of each analysis.

Identification of VOC-Contaminated Sites

The first analysis involved generating a list of signed Records of Decision (RODs) (post-SARA), documenting VOC contamination, from which data could be used for subsequent analyses. The ROD Information Directory database was used for this purpose. Of the 821 signed FY86-FY91 RODs, 418 are identified in the database as containing VOC contamination in source material. This list of RODs was subsequently divided into two lists: RODs where VOCs were the only contaminants of concern identified in the source material and RODs containing VOCs, as well as other contamination, in source material. For those RODs involving VOC plus other contaminants, a review of the ROD document was conducted to identify cases where only VOCs were driving the selection of remedy. To make this determination, the Remedial Response Objectives and Selected Remedy sections of the ROD were reviewed to identify specific language indicating that the remedial action was designed to address only the VOCs at the site. In addition, if cleanup goals were specified only for VOCs, the assumption was made that VOCs were driving the remedy.

As a result of this analysis, 88 RODs were identified as VOC-only RODs or VOCs plus other contaminants RODs where a clear determination could be made that VOCs were driving the selection of remedy.

Frequency of Technology Selection for VOC-Contaminated Sites

Table 1 presents the distribution of the 88 FY86-FY91 RODs among the treatment technologies used to address VOCs in soil. This table demonstrates that the three presumptive remedies (SVE, thermal desorption, and incineration) together were selected more often (over 90% of the RODs analyzed) than the other applicable technologies. Presumptive Remedies were also those remedies where a fair amount of performance data on technology implementation was available. Furthermore, SVE, chosen in over two-thirds of the RODs analyzed, was the primary presumptive remedy selected.

Identification of Sites for Feasibility Study Analysis

The purpose of the FS analysis was to document the technology screening step in FSs of VOC-contaminated soil/sludge sites and identify the principal reasons given for eliminating technologies from further consideration. To achieve a representative sample of FSs for the analysis, sites were selected using ROD data according to the following criteria:

APPENDIX A
TECHNICAL BASIS FOR PRESUMPTIVE REMEDIES
(Continued)

Table 1

Presumptive Remedy VOC Site Treatment Summary Table, FY86-FY91*

TECHNOLOGIES USED TO ADDRESS VOCs IN SOIL	TOTAL
Bioremediation (1)	3
Incineration	11
Soil Flushing/Washing (1)	3
Soil Vapor Extraction	62
Thermal Treatment (2)	9
Total	88

Source: ROD Information Directory (RID), FY86 - FY91

Notes:
(1) Relatively limited amount of performance data available for these technologies versus the presumptive remedies.
(2) Thermal treatment includes RODs employing thermal desorption, thermal aeration, low-temperature thermal desorption, and the generic remedy "thermal treatment".

* A population of 418 RODs was identified for this study based on the parameters: FY 1986-1991, and VOC contamination of source media.

- Sites were chosen, based on the selected remedy, to ensure an even distribution among the five treatment technologies for VOCs in soil (i.e., bioremediation, incineration, SVE, soil flushing, and thermal treatment).
- Whenever possible, both VOC-only sites and VOC and other contamination sites were represented under each technology.
- Sites were selected to ensure an even distribution in geographic location, ROD signature date, and site size.

Feasibility Study Analysis

The FS analysis involves a review of the technology screening phase, including any pre-screening steps, followed by a review of the detailed analysis and comparative analysis phases in each FS and ROD. Information derived from each review was documented on site-specific data collection forms, which are available for evaluation as part of the Administrative Record for this directive. (See "Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils", September 1993, available at EPA Headquarters and Regional Offices.)

APPENDIX A
TECHNICAL BASIS FOR PRESUMPTIVE REMEDIES
(Continued)

For the screening phase, the full range of technologies considered was listed on the data collection forms, along with the key reasons given for eliminating technologies from further consideration. These reasons were categorized according to the screening criteria: cost, effectiveness, or implementability. The frequency with which specific reasons were given for eliminating a technology from further consideration was then tallied and compiled into a screening phase summary table (Table 2).

For the detailed analysis and comparative analysis, information on the relative performance of each technology/alternative with respect to the nine NCP criteria was documented on the site-specific data collection forms. The advantages and disadvantages associated with each clean-up option were highlighted. In some cases, a VOC technology was combined with one or more technologies that address minor site contaminants into one or more alternatives. Only the component of the alternative which addressed the VOC contamination was evaluated in this analysis. The disadvantages of a technology/ alternative were then compiled into a detailed analysis/comparative analysis summary table, under the assumption that these disadvantages contributed to non-selection. All summary tables are available for review as part of the Administrative Record.

The FS analysis has been completed for 21 sites (representing approximately 25% of universe studied). The information from these FSs has been compiled and summarized in Table 2. Additional FS analysis is planned and will be added to the Administrative Record, when available. Table 2 demonstrates that technologies, other than the presumptive remedies, are consistently eliminated from further consideration in the screening phase due to effectiveness, implementability, or excessive costs. In addition, the analysis indicates that, although certain technologies routinely passed the screening phase, these technologies were selected infrequently because they did not provide the best overall performance with respect to the nine criteria. Together these analyses (Appendix A to this directive and "Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils"), along with the scientific analysis of performance data (USEPA (In Progress) Contaminants and Remedial Options at Solvent Sites) will support the decision of using presumptive remedies and bypassing the technology identification and screening step for a particular site. As previously indicated, this factsheet and accompanying analysis should be part of the Administrative Record for the site. Further supporting materials, not found in the Regional files, can be provided by Headquarters, as needed.

TABLE 2 • SUMMARY OF SCREENING AND DETAILED ANALYSIS FOR VOC SITES[1]

Remedial Technology Or Treatment [2]	# FSs Where Technology Considered	# FSs Tech. Passed Screening	# FSs Tech. Screened Out	Tech. Not Primary Component of Alternative	#FSs Where Criterion Contributed To Screening Out [3]			# RODs Tech. Selected	# RODs Tech. Not Selected	# RODs Where Criterion Contributed to Non-Selection								
					Cost	Effectiveness	Implement			Protect	ARARs	TMV Through Treatment	Long-term Effect.	Short-term Effect.	Cost	Implem.	State [4] Concerns	Community [4] Concerns
Capping	21	8	7	6	1	6	2	0	8	5	3	7	6	6	3	1	--	--
Offsite Nonhazardous Landfill	4	0	2	2	0	2	1	0	0	0	0	0	0	0	0	0	--	--
Offsite RCRA Disposal	18	12	4	2	1	3	3	2	10	3	6	7	3	9	5	7	--	--
Onsite Encapsulation	3	1	2	0	1	1	0	0	1	0	0	1	0	0	0	0	--	--
Onsite Nonhazardous Landfill	2	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	--	--
Onsite RCRA Landfill	14	1	11	2	0	8	7	0	1	0	0	1	0	1	1	0	--	--
Activated Sludge	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	--	--
Composting	4	1	3	0	0	3	0	0	1	0	0	0	0	1	0	1	--	--
Land Farming	3	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0	--	--
Bioremediation (unspecified)	6	0	6	0	0	5	4	0	0	0	0	0	0	0	0	0	--	--
Ex-situ Bioremediation	7	1	6	0	2	5	2	1	0	0	0	0	0	0	0	0	--	--
In-situ Bioremediation	11	1	10	0	2	9	4	0	0	0	0	0	0	0	0	0	--	--
Dechlorination/ APEG	3	0	3	0	0	3	1	0	0	0	0	0	0	0	0	0	--	--

TABLE 2 • SUMMARY OF SCREENING AND DETAILED ANALYSIS FOR VOC SITES (Continued)[1]

Remedial Technology Or Treatment[2]	# FSs Where Technology Considered	# FSs Tech. Passed Screening	# FSs Tech. Screened Out	Tech. Not Primary Component of Alternative	#FSs Where Criterion Contributed To Screening Out[3]			# RODs Tech. Selected	# RODs Tech. Not Selected	# RODs Where Criterion Contributed to Non-Selection								
					Cost	Effectiveness	Implement			Protect	ARARs	TMV Through Treatment	Long-term Effect.	Short-term Effect.	Cost	Implem.	State[4] Concerns	Community[4] Concerns
Other Chemical Destruction	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	--	--
Reduction	7	0	6	1	0	5	1	0	0	0	0	0	0	0	0	0	--	--
Neutralization	6	0	6	0	0	5	0	0	0	0	0	0	0	0	0	0	--	--
Oxidation	6	1	5	0	0	4	0	0	1	0	0	0	0	1	1	1	--	--
Offsite Incineration (unspecified)	16	7	8	1	5	5	2	0	7	2	0	1	0	7	6	2	--	--
Onsite Incineration (unspecified)	7	1	6	0	2	3	5	0	1	0	0	0	0	1	1	0	--	--
Fluidized Bed	5	0	4	1	3	1	2	0	0	0	0	0	0	0	0	0	--	--
Infrared	5	1	4	0	2	2	1	1	0	0	0	0	0	0	0	0	--	--
Pyrolysis	3	0	3	0	2	1	1	0	0	0	0	0	0	0	0	0	--	--
Multiple Hearth	5	0	4	1	2	4	1	0	0	0	0	0	0	0	0	0	--	--
Rotary Kiln	11	6	3	2	3	2	3	2	4	1	0	0	0	5	3	4	--	--
Other Incineration	13	1	12	0	5	6	5	1	0	0	0	0	0	0	0	0	--	--
Other Thermal Treatment	6	0	6	0	2	4	3	0	0	0	0	0	0	0	0	0	--	--

TABLE 2 • SUMMARY OF SCREENING AND DETAILED ANALYSIS FOR VOC SITES (Continued)[1]

Remedial Technology Or Treatment[2]	# FSs Where Technology Considered	# FSs Tech. Passed Screening	# FSs Tech. Screened Out	Tech. Not Primary Component of Alternative	#FSs Where Criterion Contributed To Screening Out[3]			# RODs Tech. Selected	# RODs Tech. Not Selected	# RODs Where Criterion Contributed to Non-Selection								
					Cost	Effectiveness	Implement			Protect	ARARs	TMV Through Treatment	Long-term Effect.	Short-term Effect.	Cost	Implem.	State[4] Concerns	Community[4] Concerns
Vitrification	12	0	11	1	2	8	5	0	0	0	0	0	0	0	0	0	--	--
Wet Air Oxidation	6	1	5	0	1	4	3	0	1	0	0	0	1	1	1	0	--	--
Low Temperature Thermal Desorp/ Stripping	13	10	3	0	1	1	2	3	7	2	1	1	2	7	3	4	--	--
In-situ Steam Stripping	3	2	1	0	0	1	0	2	0	0	0	0	0	0	0	0	--	--
Soil Flushing	15	3	12	0	0	9	5	0	3	1	1	1	2	2	1	3	--	--
Soil Washing	14	2	12	0	1	10	9	0	2	0	0	1	0	2	2	1	--	--
In-situ Vacuum Extraction	17	11	6	0	0	6	2	10	2	0	0	0	1	0	0	2	--	--
B.E.S.T. Process	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	--	--
Liquified Gas	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	--	--
Other Physical Extraction	4	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0	--	--
Fixation	7	1	6	0	0	6	0	0	1	0	0	1	1	0	1	1	--	--
Stabilization/ Solidification	13	2	7	4	0	6	2	0	2	0	0	2	2	2	0	2	--	--
Aeration	12	2	10	0	1	9	2	1	1	0	0	0	1	1	1	0	--	--

TABLE 2 • SUMMARY OF SCREENING AND DETAILED ANALYSIS FOR VOC SITES (Continued)[1]

Remedial Technology Or Treatment[2]	# FSs Where Technology Considered	# FSs Tech. Passed Screening	# FSs Tech. Screened Out	Tech. Not Primary Component of Alternative	#FSs Where Criterion Contributed To Screening Out[3]			# RODs Tech. Selected	# RODs Tech. Not Selected	# RODs Where Criterion Contributed to Non-Selection								
					Cost	Effectiveness	Implement			Protect	ARARs	TMV Through Treatment	Long-term Effect.	Short-term Effect.	Cost	Implem.	State[4] Concerns	Community[4] Concerns
In-situ Hydrolysis	4	0	4	0	0	3	2	0	0	0	0	0	0	0	0	0	--	--
Soil Slurries	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	--	--

1 This study was conducted on 21 RODs and their corresponding FSs.
2 This does not the include the no-action or institutional control only alternatives. No RODs selected either of these as remedies.
3 FSs and RODs may contain more than one criterion for screening or non-selection of technology. Also, some FSs did not fully explain the criteria for screening out a technology. Thus, the totals for screening and non-selection criteria are not equal to the number of FSs and RODs considered.
4 Information on State and community concerns was not included in this analysis because FSs do not contain this information and RODs generally only reference supporting documentation (i.e., State concurrence letter and responsiveness summary).

APPENDIX B
Criteria Evaluation forTechnologies Used to Treat VOC-Contaminated Soil

	CRITERIA						
	Overall Protection of Human Health and the Environment	Compliance With Federal ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost [1]
SOIL VAPOR EXTRACTION	• Provides both short- and long-term protection by reducing concentration and exposure to VOCs in soil. • Depending on site-specific conditions, prevents further ground water contamination.	• Does not trigger LDRs because it does not involve placement of waste. • Because waste is removed in place through limited construction and no excavation, few impacts to wetlands, floodplains, or water quality are likely. • Depending on site-specific conditions, treats wastes to levels that will prevent exceedance of groundwater clean-up levels. • Emission controls are needed to ensure compliance with air quality standards.	• Effectively removes contamination source. • Is a well-demonstrated technique for removing VOCs from soil/sludge. • Requires some treatment of residuals (spent carbon or concentrated VOC waste stream) generally through regeneration or disposal. • Hazardous wastes left in place will require 5-year review.	• Significantly reduces toxicity, mobility, or volume through treatment. • Produces few waste streams.	• Does not present substantive risks to onsite workers or community; potential for some dust generation during well installation. • Potential air emissions are easily controlled through activated carbon adsorption or other technologies. • Generally involves relatively short time frame to achieve clean-up levels; however, difficulty in estimating timeframe may exist due to site uncertainties (e.g., irregular soil permeabilities). • Effective for treating waste under buildings. Can be performed on active facilities. • Hardware, such as vacuum blower, is readily available from many sources, but SVE system performance is highly dependent upon the lithology of the site and system design.	• Few administrative difficulties. Technology is readily available from many sources. • Used successfully at numerous Superfund sites to address VOC contamination. • Installing and operating extraction wells requires fewer engineering controls than other technologies (i.e., excavation and incineration). • Requires series of soil gas sampling to determine when clean-up levels are achieved.	$10 - 150/ton $50/ton avg.

1. Note: Actual cost of a remediation technology is highly site-specific. It is dependent upon the original and target clean-up level concentrations of contaminants, soil characteristics, and the design and operation of the remediation technology used.

APPENDIX B
Criteria Evaluation for Technologies Used to Treat VOC-Contaminated Soil
(continued)

	CRITERIA						
	Overall Protection of Human Health and the Environment	Compliance With Federal ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost (1)
THERMAL DESORPTION	• Provides both short- and long-term protection by eliminating exposure to VOCs in soil/sludge. • Prevents further groundwater contamination and offsite migration. • Requires measures to protect workers and community during excavation, handling, and treatment.	• Requires compliance with RCRA removal, treatment, transportation (if offsite treatment), and land disposal regulations (if a hazardous waste). • Excavation, construction, and operation of onsite treatment unit may require compliance with wetlands and other location-specific ARARs. • Treats hazardous waste to BDAT levels; thus, there is no LDR problem with residuals. • Generally, treats wastes to levels that will prevent exceedance of ground-water clean-up levels. • Emission controls are needed to ensure compliance with air quality standards.	• Effectively removes contamination source. • Is a well-demonstrated technique for removing VOCs from soil/sludge. • Involves some treatment or disposal of residuals generally through use of carbon adsorption/ regeneration or disposal.	• Significantly reduces toxicity, mobility, or volume of contaminants through treatment. • Generally requires test runs to ensure effective treatment.	• Presents potential short-term risks to workers and community from air release during excavation and treatment (if onsite treatment). • Involves potential short-term risks from handling and transporting waste (if offsite treatment). • Relatively short timeframe to achieve clean-up levels.	• Construction and substantive permit requirements of an onsite treatment unit may present some difficulties. Mobile incineration units for onsite treatment are available. • Limited offsite treatment capacity exists. • Used successfully at other Superfund sites to address solvent contamination. • Requires engineering measures to control air emissions, fugitive dust, run-off, erosion and sedimentation, site access, and transportation.	$200 - 300/ ton $250/ton avg.

1. Note: Actual cost of a remediation technology is highly site-specific. It is dependent upon the original and target clean-up level concentrations of contaminants, soil characteristics, and the design and operation of the remediation technology used.

APPENDIX B
Criteria Evaluation for Technologies Used to Treat VOC-Contaminated Soil
(continued)

	CRITERIA						
	Overall Protection of Human Health and the Environment	Compliance With Federal ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost [1]
INCINERATION	• Provides both short- and long-term protection by eliminating exposure to solvent contaminants in soil. • Prevents further ground-water contamination and offsite migration. • Requires measures to protect workers and community during excavation, handling, and treatment.	• Requires compliance with RCRA removal, treatment, transportation (if offsite treatment), and land disposal regulations (if a hazardous waste). • Excavation, construction, and operation of onsite incinerators may require compliance with wetlands and other location-specific ARARs. • Treats hazardous waste to BDAT levels; thus, there is no LDR problem with residuals. • Treats wastes to levels that will prevent exceedance of ground-water clean-up levels. • Emission controls may be needed to ensure compliance with air quality standards during excavation and construction.	• Effectively destroys source of contamination. • Is a well-demonstrated technique for treating VOCs in soil/sludge. • No organic residuals contamination will exist if treating soil/sludge contaminated only with VOCs.	• Significantly reduces toxicity, mobility, or volume of contaminants through treatment.	• Presents potential short-term risks to workers and community from air release during excavation and treatment (if onsite treatment). • Involves potential short-term risks from handling and transporting waste (if offsite treatment). • Relatively short timeframe to achieve clean-up levels.	• Construction and substantive permit requirements of an onsite incinerator may be somewhat difficult. Mobile incinerators are readily available. • Limited offsite incineration capacity exists. • Used successfully at other Superfund sites to address VOC contamination.	$200 - 1700/ton $400/ton avg.

1. Note: Actual cost of a remediation technology is highly site-specific and dependent upon the original and target clean-up level concentrations of contaminants, soil characteristics, and the design and operation of the remediation technology used.

APPENDIX C
U.S. Waste Exchanges

CALIFORNIA WASTE EXCHANGE
Robert McCormick
Department of Health Services
Toxic Substances Control Division
400 P Street
Sacramento, CA 95812
(916) 324-1807

INDIANA WASTE EXCHANGE
Environmental Quality Control
1220 Waterway Boulevard
P.O. Box 1220
Indianapolis, IN 46206
(317) 232-8188

INDUSTRIAL MATERIAL EXCHANGE SERVICE
Diane Shockey
2200 Churchill Road, #31
Springfield, IL 62794-9276
(217) 782-0450
FAX: (217) 782-9142

INDUSTRIAL MATERIALS EXCHANGE
Bill Lawrence
172 20th Avenue
Seattle, WA 98122
(206) 296-4899
FAX: (206) 296-0188

PACIFIC MATERIALS EXCHANGE
Bob Smee
1522 North Washington Street, Suite 202
Spokane, WA 99205
(905) 325-0551
FAX: (509) 325-2086

NATIONAL WASTE EXCHANGE NETWORK
1-800-858-6625

RENEW
Hope Castillo
Texas Water Commission
P.O. Box 13087
Austin, TX 78711
(512) 463-7773
FAX: (512) 463-8317

INDUSTRIAL WASTE INFORMATION EXCHANGE
William E. Payne
New Jersey Chamber of Commerce
5 Commerce Street
Newark, NJ 07102
(201) 623-7070

MONTANA INDUSTRIAL WASTE EXCHANGE
Don Ingles
Montana Chamber of Commerce
P.O. Box 1730
Helena, MT 59624
(406) 442-2405

NORTHEAST INDUSTRIAL WASTE EXCHANGE
Lewis M. Culter
90 Presidential Plaza, Suite 122
Syracuse, NY 13202
(315) 422-6572
FAX: (315) 422-9051

SOUTHEAST WASTE EXCHANGE
Maxi May
Urban Institute
Department of Civil Engineering
University of North Carolina
Charlotte, NC 28223
(704) 547-2307

SOUTHERN WASTE INFORMATION EXCHANGE
Gene Jones
P.O. Box 960
Tallahassee, FL 32313
(904) 644-5516
FAX: (904) 574-6704

APPENDIX D
GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARARs) - CERCLA Section 121(d) and the NCP require that onsite remedial actions must attain (or justify a waiver of) requirements of environmental laws that are determined to be Federal or more stringent State applicable or relevant and appropriate requirements.

Dense Non-Aqueous Phase Liquid (DNAPL) - DNAPLs are immiscible hydrocarbon liquids that are denser than water, such as chlorinated solvents (either as a single component or as mixtures of solvents), wood preservative wastes, coal tar wastes, PCBs and some pesticides. DNAPLs can sink to great depths, can penetrate into bedrock fractures, can move as a liquid in a direction different from the flow of groundwater and can act as a continual source of groundwater contamination over time.

Engineering Evaluation/Cost Assessment (EE/CA) - An analysis of removal alternatives for non-time critical removal actions.

Ex-Situ Treatment - Removal of material from the ground for treatment.

Feasibility Study (FS) - A description and analysis of the potential clean-up alternatives for a site. It is generally conducted concurrently with the remedial investigation (RI); together the studies are referred to as an RI/FS. (See remedial investigation.)

In-Situ Treatment - The treatment or remediation of media occurring in-place.

Innovative Treatment Technologies - Technologies that have been tested, selected, or used for treatment of hazardous substances or contaminated materials but lack well-documented cost and performance data under a variety of operating conditions.

Land Disposal Restrictions (LDRs) - The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) include specific restrictions on the land disposal of RCRA hazardous wastes. These restrictions, known as LDRs, prohibit the land disposal of restricted RCRA hazardous wastes unless these wastes meet treatment standards specified in 40 CFR 268 or other compliance options.

Light Non-Aqueous Phase Liquids (LNAPL) - Like DNAPLs, LNAPLs are immiscible liquids, but are lighter than water and therefore float on water. As they are lighter than water, they are most frequently found at the groundwater table/vadoze zone interface.

Record of Decision (ROD) - A public document that explains the basis for selecting the clean-up alternative(s) that will be taken or served under CERCLA.

Remedial Design (RD) - The remedial action that involves designing and testing to determine whether the remedy will be effective at a site.

Remedial Investigation (RI) - An in-depth study designed to gather the data necessary to determine the nature and extent of the threat posed by contamination at a Superfund site. It also helps to establish the preliminary criteria for cleaning up the site in the FS and supports the technical and cost analyses of the alternatives. It is generally completed and combined with the FS and referred to as the RI/FS.

Risk Assessment - The qualitative and/or quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by actual and potential exposures to specific pollutants in air, water, soil or other media.

Superfund Accelerated Cleanup Model (SACM) - An initiative designed to accelerate all aspects of the Superfund clean-up process.

Vadose Zone - The zone in soil that lies above the permanent water table.

Volatile Organic Compounds (VOCs) - Any organic compound which readily dissipates into the air.

REFERENCES

Primary Reference:

U.S. EPA (In-Progress). Contaminants and Remedial Options at Solvent Sites.

Compound Properties:

RREL Treatability Data Base - Available through ATTIC (Contact Glenn Shaul (513) 569-7408)

General Site Investigations:

U.S. EPA, 1986. A Compendium of Superfund Field Operation Methods. EPA/540/87/001.

U.S. EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/G-89/004, October.

U.S. EPA, 1989. Guide for Conducting Treatability Studies Under CERCLA, Interim Final. EPA/540-2-89/058.

U.S. EPA, 1991. Soil Sampling and Analysis for Volatile Organic Compounds. EPA/540/4-91/001.

Incineration:

Dempsey, C.R. and Oppett, E.T., "Incineration of Hazardous Waste: A Critical Review Update", International Journal of Air Pollution Control and Hazardous Waste Management, Volume 43, January 1993, pp. 25-73.

U.S. EPA, 1990. Mobile/Transportable Incineration Treatment Engineering Bulletin. EPA/540/2-90/014, February.

Presumptive Remedies:

U.S. EPA (In-Progress). Presumptive Remedies: Policy and Procedures.

U.S. EPA (In-Progress). Presumptive Remedies: Remedial Strategy and Treatment Technologies for CERCLA Sites with Contaminated Groundwater.

Soil Vapor Extraction:

U.S. EPA, 1991. Soil Vapor Extraction Technology Reference Handbook. EPA/540/2-91/003, February.

U.S. EPA, 1991. In-Situ Soil Vapor Extraction Treatment Engineering Bulletin. EPA/540/2-91/006, May.

U.S. EPA, 1991. Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction. EPA/540/2-91/091A, September.

U.S. EPA, 1992. A Technology Assessment of Soil Vapor Extraction and Air Sparging. EPA/600/R-92/173, September

Thermal Desorption:

U.S. EPA, 1991. Thermal Desorption Treatment Engineering Bulletin. EPA/540/2-91/008, February.

U.S. EPA, 1991. Guide for Conducting Treatability Studies Under CERCLA: Thermal Desorption Remedy Selection - Interim Guidance. EPA/540/R-92/074A, September.

Additional References:

U.S. EPA, 1991. A Guide to Principal Threat and Low Level Threat Wastes. Superfund Publication 9380.3-06FS.

U.S. EPA, 1991. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A. EPA/540/1-89/002, December.

U.S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume II: Environmental Evaluation Manual. EPA/540/1-89/001, March.

U.S. EPA, 1991. Compendium of CERCLA ARARs Factsheets and Directives. EPA Publication 9347.3-15, October.

United States
Environmental Protection
Agency
Washington, D.C. 20460

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Results of Remedial Investigation

Phase I Remedial Investigation (1992-1993)

The Phase I Remedial Investigation (RI) investigated the nature and extent of groundwater contamination at the Station, demonstrating that the highest volatile organic compounds (VOC) concentrations, particularly trichloroethene (TCE), have contaminated groundwater beneath Site 24. It also shows that a plume of TCE in groundwater extends off-site and downgradient of MCAS El Toro for approximately 3 miles. The Phase I RI also detected TCE in soil gas overa large area beneath Buildings 296 and 297 at Site 24 (approximately 35 acres).

Phase II Remedial Investigation (1995-1996)

The Phase II RI was conducted using a seven-step data quality objectives (DQO) process developed by the U.S. EPA. Using the DQO process, the investigation team developed seven decisions that formed the basis for the investigation. The goals of the Phase II RI were accomplished by successfully addressing each of the seven decisions as discussed below.

1. Is VOC-contaminated soil beneath Site 24 an active source of the regional VOC groundwater contamination?

Yes. VOC-contaminated soil beneath Site 24 is an active source of the regional VOC groundwater contamination. The existing groundwater plume was traced back to contaminated soil beneath Buildings 296 and 297. This soil will continue to act as a VOC contamination source in the future. There are two areas of contaminated soil that have the ability to elevate groundwater above the federal and state drinking water standard, referred to as the maximum contaminant level (MCL): a primary source beneath the Building 296 and 297 area and a secondary source west of Building 297. The primary source is composed mostly of TCE and apparently is the source of the regional VOC groundwater contamination. The secondary source represents an area of perchloroethene (PCE) contamination that has the potential to contaminate groundwater above its MCL.

2. Does the continued release of VOCs from subsurface soil to groundwater contribute to an unacceptable risk to human health or the environment?

Yes. The continued release of VOCs from subsurface soil to groundwater does contribute to a risk to human health but only if a receptor uses the groundwater for all consumptive purposes. The primary source of TCE-contaminated soil beneath Buildings 296 and 297 and the smaller, secondary source of PCE-contaminated soil located approximately 500 feet west of Building 297 are capable of contaminating groundwater above the MCLs.

3. Does VOC-contaminated shallow soil present an unacceptable risk to human health or the environment?

No. VOCs present in shallow soil do not present an unacceptable risk to human health. The health risks associated with exposure and toxicity of chemicals were estimated for cancer-causing (carcinogenic) and noncancer-causing (noncarcinogenic) effects. The carcinogenic risk expressed in terms of the chance of humans contracting cancer as a result of being exposed to VOCs from the site for 30 years. To manage carcinogenic risk and protect public health the U.S. Environmental Protection Agency (U.S. EPA) has set a protective risk level not to exceed the range at *one person in a population of ten thousand to one person in one million.* T'he risk assessment concluded that the chance of contracting cancer over a 30-year period from exposure to VOCs in the soil at Site 24 is approximately *five chances in one billion.* This is well below the U.S. EPA range for protection of public health for carcinogens. Concentrations of VOCs in soil are not high enough to cause noncarcinogenic effects in workers or possible future residents.

4. Is the horizontal and vertical extent of VOC-contaminated groundwater sufficiently characterized to evaluate response actions?

Yes. The horizontal and vertical extent of VOC-contaminated groundwater on-site is sufficiently characterized to evaluate response actions. Horizontally, the groundwater with the highest concentrations of TCE extends from beneath Building 296 approximately 2,800 feet to the northwest site boundary. Vertically, the groundwater is limited to the top 100 feet of the shallow aquifer on Site 24.

5. Does VOC-contaminated groundwater beneath Site 24 contribute to an unacceptable risk to human health or the environment?

Yes. The risk presented by exposure to VOCs in groundwater to a possible future resident of the property is on the order of *one chance in one thousand.* The results also showed that under the same scenario, VOC concentrations are high enough to potentially cause noncarcinogenic effects to the future resident. These risks are considered high only if the groundwater from the contaminated aquifer does not undergo any treatment and is used for drinking and bathing. Groundwater at the site is not currently used for domestic or agricultural purposes. Existing wells installed at Site 24 are only used to monitor site conditions.

6. Does the area being evaluated for a response action qualify for Early Action?

No. Site 24 is being recommended for long-term remedial (cleanup) action. The focus of this public meeting is to discuss the proposed alternative for long-term cleanup.

7. Are pilot tests necessary to evaluate remedial alternatives as part of the RI/FS process?

Yes. Pilot tests were performed to evaluate effectiveness of soil vapor extraction technology. For more information, visit Table No. 4.

Table 2-4
Remediation of Deep Soil
Identification and Preliminary Screening of Remedial Technologies and Process Options

General Response Action	Remedial Technology	Process Options	Description of Process Options Numbers in parentheses correspond with more detailed descriptions in Appendix B, Part I	Effectiveness	Implementability	Cost	INITIAL SCREENING RESULTS Applicable	Potentially Applicable	Not Applicable
No action	No action	No action	This alternative is considered throughout the FS[a], as required under CERCLA[b]. (BI.1.1)	No action does not reduce the mass, volume, or toxicity of contamination.	This is the most easily implementable of all alternatives. No action requires no effort to implement.	There are no costs associated with no action.	X		
Institutional controls	Administrative controls	Deed restrictions	Restrictions are placed on property deed to prevent future use of land. (BI.2.1)	Not applicable. Surface and near-surface soil VOC[c] contamination concentrations do not exceed regulatory or risk-based action levels.					X
	Physical controls	Fencing and signs	Fencing is constructed around areas associated with surface contamination points and warning signs are posted. (BI.2.2)	Not applicable. Surface and near-surface soil VOC contamination concentrations do not exceed regulatory or risk-based action levels.					X
Containment	Physical barriers	RCRA[d] type cap	Capping consists of placing a layer of protective cover over the contaminated area to prevent contact and minimize infiltration, erosion, and mobilization or migration of contaminants. (BI.3.1)	Not effective at reducing volume of contamination and not among the U.S. EPA[e] list of presumptive remedies for VOC-contaminated soil.					X
		Barrier Walls	Vertical barriers and walls may be installed to prevent lateral migration of VOC vapors in the vadose zone. (BI.3.2)	Not effective at reducing the volume of contamination.	Not implementable at Site 24 due to the large areal extent of VOCs and the depth to water, approximately 110 feet bgs[f].				X
		Grouting	Grouting is used to immobilize contaminants in the vadose zone on a very localized scale. (BI.3.3)	Not considered effective for Site 24, due to the large extent of VOCs in the vadose zone, and the heterogeneity of the soil.					X
Removal	Excavation	Excavation	Approximately 28.6 million cubic yards of soil would be generated from Site 24. (BI.4.1).	By itself, excavation does not reduce the mass, volume, or toxicity of contaminants.	This option would be difficult to implement due to the depth and volume of contaminated soil and the presence of aboveground infrastructure.	Including profiling, transport, and disposal, this option is cost-prohibitive.			X
	Extraction	SVE[g]	VOCs are removed by drawing air from vacuum extraction well(s) screened through areas of contaminated soil in the vadose zone. (BI.4.2)	Complete mitigation of VOCs would require adding treatment and/or disposal to the process.	SVE is a U.S. EPA-approved presumptive remedy for deep VOC-contaminated soil.	SVE has been documented at many sites to be a cost-effective option.	X		

(table continues)

Table 2-4 (continued)

General Response Action	Remedial Technology	Process Options	Description of Process Options Numbers in parentheses correspond with more detailed descriptions in Appendix B, Part I	Effectiveness	Implementability	Cost	INITIAL SCREENING RESULTS Applicable	Potentially Applicable	Not Applicable
		Thermally Enhanced SVE	A full-scale technology that may use steam, hot air, electrical, or radio-frequency heating to increase the mobility of VOCs and facilitate their extraction. (BI.4.3)	Thermally enhanced SVE is normally designed to treat SVOCs[h] but will also treat VOCs.	This option requires more equipment and is therefore slighty harder to implement then SVE.	Additional cost over SVE not justified considering successful SVE pilot tests.			X
Treatment	*In situ* biological	Bioventing	Bioventing provides oxygen to existing soil microorganisms through direct air injection into residual contamination in soil. Adsorbed contaminants are degraded and VOCs are also biodegraded as vapors move slowly through biologically active soil. (BI.5.1)	Most effective on nonvolatile organics that cannot be treated by vapor extraction technologies.	Has been successfully demonstrated on TCE[i] Navy plans a demonstration project for NAS[j] North Island in 1996.	Could potentially be cost effective compared to other options. Retained for further evaluation.		X	
	Ex situ physical	Thermal Desorption	Process that separates VOCs from excavated soil by physically super heating VOCs, thus transferring them from an adsorbed to a vapor phase. Complete mitigation of VOCs would first require excavation of affected soil. (BI.5.2)	A presumptive remedy for VOCs in soil.	Because excavation is screened out, so is this technology.				X
	Ex situ thermal	Incineration	Process that destroys VOCs by thermal decomposition at temperatures usually greater than 900°C[k]. Process is applied to excavated soil. (BI.5.3)	A presumptive remedy for VOCs in soil.	Because excavation is screened out, so is this technology.				X
Disposal	Landfill disposal	Excavation, transport, and disposal of soil	Approximately 28.6 million cubic yards of soil would be generated from Site 24. (BI.6.1)	This technology does not reduce the mass, volume, or toxicity of contaminants.	Extremely difficult due to depth of contaminated soil and existing infrastructure.	Including profiling, transport, and disposal, this option is cost-prohibitive.			X
		Residuals from removal and treatment (e.g., carbon)	Residuals from VGAC[l] treatment, such as spent carbon, are disposed or regenerated. (BI.6.2)	Disposal of residuals from VGAC effectively reduces the volume of contamination that has to be disposed of by concentrating the contaminant into a smaller package.	Multiple-service contractors are available to manage the disposal of residuals as a regular part of the operation and maintenance of an SVE system.	Much lower volume and costs than disposal of contaminated soil mass.	X		

Notes:
- [a] FS – Feasibility Study
- [b] CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- [c] VOC – volatile organic compound
- [d] RCRA – Resource Conservation and Recovery Act
- [e] U.S. EPA – United States Environmental Protection Agency
- [f] bgs – below ground surface
- [g] SVE – soil vapor extraction
- [h] SVOC – semivolatile organic compound
- [i] TCE – trichloroethene
- [j] NAS – Naval Air Station
- [k] °C – degrees Celsius
- [l] VGAC – vapor-phase granulated activated carbon

Define Media-Specific Remedial Action Objectives

Environmental Medium of Interest

· Soil between the ground surface and the water table (also called the vadoze zone).
· Concentrations of volatile organic compounds (VOCs) in the shallow soil (less than 10 feet below the ground surface) are very low and cleanup action is not required.
· VOC-contaminated deep soil (from 10 feet below ground surface to the water table) is a continuing source for contamination of the shallow groundwater. VOCs in deep soil have the potential to contaminate shallow groundwater above federal and state drinking water standards. These standards are called maximum contaminant levels or MCLs.
· VOCs consist of industrial solvents, primarily, trichloroethene (TCE). Other VOCs present are perchloroethene (PCE), carbon tetrachloride, 1,1-dichloroethene (1,1-DCE), and Freon 113.

Remedial (Cleanup) Action Objectives for Site 24 Soil

· Reduce VOC concentrations in the deep soil to prevent or minimize further degradation of shallow groundwater.
· Perform cleanup of deep soil until average VOC concentrations are below levels that are capable of contaminating groundwater above the federal and state drinking water standards or MCLs.
· Cleanup must attain the more stringent of federal and state standards, laws and regulations that consist of all applicable or relevant and appropriate requirements (ARARs) that pertain specifically to soil at Site 24.
· ARARs are divided into three categories: chemical-specific, location-specific, and action-specific (turn over for definitions).

Specific Cleanup Goals

· Cleanup goals for Site 24 VOC-contaminated soil are defined as threshold soil vapor concentrations. Concentrations above threshold levels reflect soil conditions that have the potential to contaminate groundwater above the MCLs.
· Threshold concentrations for soil are calculated based on site- and chemical-specific factors presented in the Draft Final Remedial Investigation/Feasibility Study Reports.
· These cleanup goals for soil will meet groundwater MCLs at the point of compliance for groundwater cleanup. The point of compliance is located to the west of Site 24 between the site and the Station boundaries.

Site 24 Soil Cleanup Concentration Threshold Calculations

VOC[a] Species	Highest Soil Vapor Concentration Detected (μg/L)	Soil Vapor Concentration Threshold Result (μg/L)	U.S. EPA MCL[b] (μg/L)[c]
Trichloroethene (TCE)	6,120	27	5
Perchloroethene (PCE)	192	69	5
Carbon tetrachloride	31	61	5
1,1-dichloroethene (1,1-DCE)	447	563	6
Freon 113	2,520	234,000	1,200[d]

[a] VOC - Volitile Organic Compound [c] μg/L - micrograms per liter [d] California MCL
[b] U.S. EPA MCL - United States Environmental Protection Agency maximum contaminant level

Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) states that remedial actions at CERCLA sites must, upon completion, attain any federal (or state if more stringent) environmental standards, requirements, criteria, or limitations that are determined to be legal ARARs.

In addition to ARARs, the National Contingency Plan (NCP) provides that where ARARs do not exist, agency advisories, criteria, or guidance are to be considered (TBC) useful in helping to determine what is protective at a site or how to carry out certain actions or requirements (55 *Federal Register* 8745). The NCP preamble states, however, that provisions in the TBC category "should not be required as cleanup standards because they are, by definition, generally neither promulgated nor enforceable, so they do not have the same status under CERCLA as do ARARs."

Requirements of ARARs and TBCs are divided into three categories:

- **Chemical-specific ARARs** are health- or risk-based numerical values for various environmental media, specified in state or federal statutes or regulations. These numerical values establish the acceptable amount or concentration of a chemical that may be present in a specific medium at a site, or that may be discharged to the site or the ambient environment during remedial activities.
- **Location-specific ARARs** address the areas in which remedial action takes place. Identified regulations that are potential ARARs 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 ARARs** are regulations that apply to specific activities or technologies used to remediate a site. They can include design criteria and performance requirements.

Source

Draft Final Phase II Vadoze Zone Feasibility Study - Site 24,

MCAS El Toro

Section 2 Identification and Screening of Technologies

Assemble Remaining Technologies Into Remedial Action Alternatives

Alternative 1: No Action

By law, the No Action alternative must be considered as a baseline against which other alternatives are compared. Under the No Action alternative, no activities would be initiated to clean up the soil at Site 24. With no action, VOCs in the soil would continue to contaminate the shallow groundwater. The levels of VOCs in groundwater would continue to exceed those allowed by federal drinking water standards. This would cause the potential future cleanup of groundwater to be more costly and time-consuming. There are no direct costs associated with Alternative 1.

Alternative 2: Soil Vapor Extraction - Preferred Alternative

In Alternative 2, VOCs are removed from soil using soil vapor extraction (SVE), the U.S. EPA presumptive remedy, a relatively simple process that physically separates VOCs from the soil. SVE systems are best suited to VOCs that have a tendency to volatilize, or evaporate easily, such as solvents. As the name suggests, SVE extracts chemicals from the soil in the vapor form. By applying a vacuum to a network of SVE wells, VOCs are pulled to the surface as a vapor. This vapor is passed through an activated carbon filter to trap the VOCs before the air is discharged to the atmosphere. When the activated carbon filters become saturated with VOCs, the carbon is returned to the manufacturer where it is regenerated and the VOCs are destroyed. By removing VOCs from the soil, further groundwater contamination is prevented or minimized, thereby reducing the time required for groundwater cleanup.

Comparison of Remaining Alternatives in Terms of Technical and Administrative Feasibility

Alternative	Effectiveness	Technical Feasibility	Administrative Feasibility	Approximate Capital Cost (millions)	Retained for Evaluation?
Alternative 1 - No Action	low	not applicable	low	0	Yes
Alternative 2 - Soil Vapor Extraction	high	moderate	high	3 - 5	Yes

Evaluation of the Preferred Remedy

Each alternative considered by the Marine Corps has undergone a detailed evaluation and analysis, using a process developed by the U.S. Environmental Protection Agency. The cleanup remedy selected for a site must meet all nine evaluation criteria, or standards. The nine criteria are defined below and are accompanied by the key points from the evaluation of Alternative 2, Soil Vapor Extraction, the Marine Corps' preferred alternative presented in the Draft Final Feasibility Study Report. The preferred alternative already meets eight of the nine criteria. The ninth, Community Acceptance, will be determined after the close of the public comment period.

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.

- *SVE provides both short-term and long-term protection by reducing the concentration of VOCs in soil and preventing further groundwater contamination.*

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.

- *Waste is removed in place through limited construction and no excavation; few impacts to the environment are likely.*
- *Emission controls are needed to ensure compliance with air quality standards.*

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.

- *Proven to be an effective technique for removing VOCs from soil, thereby eliminating the contamination source.*
- *Requires some treatment of residual wastes (used carbon, filters, or water containing VOCs) generally through regeneration or disposal.*
- *Removes VOCs in soil to levels that will prevent exceedance of drinking water standards in shallow groundwater.*

4. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment – 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, mobility, or volume through treatment.*
- *Removal and treatment of VOCs produces few waste by-products.*

5. Short-term Effectiveness – assesses how well human health and the environment will be protected during the the period of time needed to complete construction and implement a remedy.

- *Does not present substantive risks to onsite workers or community; potential for some dust generation during well installation.*
- *Potential air emissions are easily controlled through activated carbon adsoprtion.*
- *Short time frame to achieve cleanup.*
- *Effective for treating waste under buildings and at active industrial or military facilities.*

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 also considered.

- *Few administrative difficulties; technology is readily available.*
- *Successful pilot tests demonstrate feasibility.*
- *Installing and operating extraction wells requires fewer engineering controls than do other technologies (for example, excavation and incineration).*
- *Requires soil vapor sampling to determine when cleanup is achieved.*

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

- *$4.9 million, includes capital costs and costs for operation, maintenance, and monitoring (see chart on page 6).*

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.

- *State of California representatives on the MCAS El Toro Base Realignment and Closure Cleanup Team (including Cal-EPA's Department of Toxic Substances Control and the Regional Water Quality Control Board), concur with the Marine Corps' preferred alternative.*

9. Community Acceptance – evaluates whether community concerns are addressed by the remedy and if the community has a preference for a remedy. This Proposed Plan is the Marine Corps' request to the community to comment on the proposed alternatives. Although public comment is an important part of the final decision, the Marine Corps is compelled by law to balance community concerns with all previously mentioned criteria.

- *MCAS El Toro community-based Restoration Advisory Board has had the opportunity to review and comment on the Draft Feasibility Study Report.*
- *Proposed Plan and Draft Final Feasibility Study Report currently available for public comment.*

MCAS EL TORO - SITE 24 SOIL CLEANUP
PROPOSED PLAN

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

(Attach additional pages if you need more space.)

Name: _____

Address: _____

City: _____

State: _____ **Zip Code:** _____

Telephone: ( ) _____

Mail written comments **postmarked no later than May 30, 1997** to: Mr. Joseph Joyce, Base Realignment and Closure (BRAC) Environmental Coordinator, AC/S Environment (1AU), MCAS El Toro, P.O. Box 95001, Santa Ana, CA 92709-5001. Comments may also be faxed to (714) 726-6586.

REVISED 5/28/97

MCAS EL TORO

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REVISED 5/28/97

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REVISED 5/28/97

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REVISED 5/28/97

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REVISED 5/28/97

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Footnotes:

**Paul Brady serves as alternate for Peter Hersh (City of Irvine)

**George Britton serves as alternate for Tom Mathews (Orange County Environmental Management Agency)

+Not RAB member but included on RAB member list.

MCAS El Toro
Restoration Advisory Board (RAB)
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(Individuals that represent various government agencies)

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3. George Britton, Orange County Environmental Management Agency (Alternate for Tom Mathews)
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5. Roy Herndon, Orange County Water District
6. Peter Hersh, City of Irvine
7. Glenn Kistner, U.S. EPA
8. Tayseer Mahmoud, Cal-EPA DTSC
9. Joseph Joyce, Marine Corps/Navy, RAB Co-Chair
10. Mary Aileen Mathews, Irvine Ranch Water District
11. Tom Mathews, Director of Planning, Orange County Environmental Management Agency and Co-Director, El Toro Citizens Reuse Authority, Orange County
12. Robert Merryman, Orange County Health Care Agency, Environmental Health Division (Alternate for Bob Allen)
13. Colonel E. J. Ritchie, Base Transition Coordinator, MCAS El Toro (Note: Major Baynard serves as substitute, he is not counted as a RAB member)
14. Larry Vitale, California Regional Water Quality Control Board, Santa Ana Region
15. Bob Woodings, Director of Public Works, City of Lake Forest

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

April 10, 1997

Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S, Environment (1AU)
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

Re: EPA Approval of Draft Final Phase II Feasibility Studies, Operable Unit 2B- Site 2 and Site 17, MCAS El Toro, CA

Dear Mr. Joyce:

This letter is to inform you that the United States Environmental Protection Agency (EPA) has found the above referenced reports to have satisfactorily addressed our prior comments and that the reports are hereby approved.

Thank you for addressing our comments.

Sincerely,

Glenn R. Kistner
Remedial Project Manager
Federal Facilities Cleanup Branch

cc: Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB
Andy Piszkin, SWDIV
Tom Huetteman, EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

April 16, 1997

Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S, Environment (1AU)
MCAS El Toro
P. O. Box 95001
Santa Ana, CA 92709-5001

Re: U. S. EPA Comments on Groundwater Monitoring Report, November - December, 1996 Sampling Round, Marine Corps Air Station, EL Toro, CA

Dear Mr. Joyce:

The United States Environmental Protection Agency (EPA) has reviewed the above referenced report. The attached comments provided by Herb Levine, EPA's hydrogeologist, highlight several apparent inaccuracies and inconsistencies that need to be corrected before the evaluation report is submitted to the agencies.

Please contact me at (415) 744-2110 or Herb at (415) 744-2312, if you have any questions or would like to discuss the comments.

Sincerely,

Glenn R. Kistner
Remedial Project Manager
Federal Facilities Cleanup Branch

Attachment

cc: Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB
Andy Piszkin, SWDIV
Pat Brooks, Bechtel
Herb Levine, EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco CA 94105-3901

April 15, 1997

MEMORANDUM

SUBJECT: Review of Groundwater Monitoring Report November-Decmeber 1996 Sampling Round, Marine Corps Air Station, El Toro, California

TO: Glenn Kistner, RPM
Navy Section

FROM: Herbert Levine, Hydrogeologst
Technical Support Team

Per your request I have reviewed this document. This report identifies several inconsistencies which should be clarified and/or corrected prior to writing the evaluation report.

General Comments

The statement that there is continuing input to the regional plume is not supported. One purpose of the quarterly monitoring program is to develop an historical database to evaluate trends. There has not been either a statistical nor graphical evaluation of the data collected to know whether the changes in concentration within the plume(s) are significant. I recommend removing these types of statements in this report and wait until the evaluation report to interpret data.

The project team has expressed interest in evaluating natural attenuation processes at El Toro MCAS. The dissolved oxygen and redox data are very useful for this evaluation. The dissolved oxygen and redox data presented in this report for the last two sampling efforts include some alarming discrepancies. There is a direct relationship between measured dissolved oxygen and measured redox , high redox is a direct result of dissolved oxygen. Waters with high values of dissolved oxygen should have correspondingly high values of redox. The data presented in this report shows the opposite. Also, much of the data for both dissolved oxygen and redox are beyond the range expected for natural waters. It is very likely that either the YSI meter used was not properly calibrated or that the meter needs to be calibrated at a greater frequency. Given the correspondingly unacceptable turbidity data, I recommend that these data be flagged in this report as unusable and that the Navy re-collect these data. In addition the SAP should be revised to prevent this from occurring in future sampling efforts. Given these and other descrepencies it appears that this document was not reviewed.

Specific Comments

1. Executive Summary, page ES-1. The discussion on plume migration is weak and not supported. I recommend that interpretations or conclusions made regarding data trends be removed from this document and included in the trends analysis report.

2. Section 2.4 Low Flow Purging, page 2-4. It is difficult to identify which of the 21 wells not in Site 2 were purged using the low flow method. I recommend adding a Table to identify these wells. After looking at the field logs I noticed a few inconsistencies with the low flow method. EPA (see attached) recommends using a purge rate of 0.1 - 0.5 L/min where the Navy used 0.5 Gal/min and greater. While EPA acknowledges that natural turbidity levels in ground water may exceed 10 NTU, it is likely that the high turbidity values reported are related to purge rate. The negative NTU values should be a flag to the field personnel to recalibrate their instrument. I recommend to the Navy that they include in their evaluation report an assessment of purge rates, turbidity and metals concentration. In addition the Navy should revisit their SAP to modify the low flow purge method and to address instrument calibration.

3. Section 3.0 Results of Water Level Measurements, page 3-1. The hydrographs presented are informative and useful. It is desirable to construct hydrographs for each point measured. In, addition it would be useful to add concentrations of key analytes to the hydrographs.

4. Section 8.1 General Chemistry Parameters, page 8-1. Please add a discussion on the quality of the dissolved oxygen and redox here. The SAP should be modified to include quality control while measrements are being made in the field. In addition, the field logs should be modified to include an opbservaiton of entrained air for each sample collected. Given the relatively high values of gross alpha it would be appropriate to speciate these samples to help determine anthropogenic input. In addition, it will be necessary to collect additional samples to determine background.

5. Section 9.3 Data Quality Assessment, page 9-4. Please include an assessment of field measured parameters. Please describe how sample labels might have been transposed in the laboratory. Since this report and the data contained within will become part of the historical record the Navy should modify Appendix E to correct the transposition error.

6. Section 10.1 Results Summary, page 10-1. Please remove the discussion of off-station migration of VOC. As stated above this report does not provide an evaluation of these data. The third bullet should include mention of elevated gross alpha at the Magazine Road Landfill.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

April 16, 1997

Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S, Environment (1AU)
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

Re: EPA Comments on Draft Final Phase II Remedial Investigation Report, OU3-A Sites, MCAS El Toro, CA

Dear Mr. Joyce:

The United States Environmental Protection Agency (EPA) has reviewed the document referenced above dated March, 1997. While many of our previous comments have been satisfactorily addressed, there are still some comments that need to be addressed before EPA can approve this report. Our comments are as follows:

General Comments

1. **Comment 6.** The table containing groundwater information for Site 16 was not provided.

2. **Comment 8.** The second sentence of paragraph 2 on p. 5-14 was not changed as the response indicates would be done.

General Comments on Attachments

1. **New General Comment.**

   Several appendices refer to Appendix L for the results of a habitat assessment. However, Appendix L does not contain the results of the habitat assessment.

Attachment B, Site 6

1. **Comment 2.** It may not be accurate to attribute lead to a "single point" (06-GN3), since with the exception of location 06-GN2, which is located approximately 38 feet to the northwest, and 06-GN1, located approximately 66 feet to the north northeast, no samples

were collected from within 100 feet of location of 06-GN3. The areal extent of soil containing lead above the PRG is not known, so the 95th UCL approach likely underestimates the amount of lead present in surface soil.

Attachment C, Site 8

1. This comment was misunderstood because the area of interest is located southeast of the small shed and southwest of boring 08B403. This area was not sampled and the 1952 aerial photograph shows numerous small containers or drums. The presence of these drums or containers suggests that spills may have occurred in this area, therefore, we recommend that this area be sampled.

Attachment E, Site 10

1. **Comment 1.** If waste oil that was used for dust control was contaminated with PCBs, it is likely that PCBs would only be found in surface soil. Only six Phase 1 samples were relevant surface samples, not 28 as the response indicates. Further, TRPH was only detected in three of the six samples, suggesting that half of the samples were collected from areas not impacted by waste oil. This is a very limited number of samples on which to base the conclusion that PCBs were not found at this site.

Attachment F, Site 11

1. **Comment 3.** It is likely that boring 11B202 was completed beyond the area most affected by PCBs since the results were more than 2 orders of magnitude less than those in boring 11_DD1. Thus boring 11B202 can be considered to have defined the extent of PCB contamination southeast of 11_DD1, however a single additional boring does not fully define the horizontal and vertical extent of contamination. Also, please note that neither concrete nor asphalt are barriers to PCB migration.

2. **Comment 4.** The compass heading was not added to figure as requested in the original comment.

Attachment J, Site 16

1. **Comment 1.** Please see the attached figures and transparencies. When Figure 2-1 is in scale so that the runways and taxiways can be matched when this figure is overlaid over the 1980 and 1996 aerial photographs, it is readily apparent that the area of investigation for Site 16 and the stained areas in the photographs do not coincide. Note that the large circular stained area (Figure A) is entirely outside the boundary of the area of investigation and that structures 851 and 850 on Figure 1-2 cannot be aligned with the structures on the 1996 air photo (Figure B). Also note that the area where the pits are drawn on Figure 3-1 does not correlate with the depression contour located to the northeast of the Unit 1

boundary; this deep recession contour was most likely a fire training pit (see Figure 1-2 and overlay A-1). Please discuss whether all sample points and structures were surveyed to create Figure 2-1. Either the site figure (e.g., Figure 2-1) was not drawn to scale, or the investigation missed significant stained areas. Please explain. Unless the way Figure 2-1 was drawn is found to be inaccurate, EPA recommends that the area of investigation be extended to the northeast and the groundwater investigation also be expanded.

Attachment N, Site 22

1. **Comment 1.** The response states that "Boring 22B201 was drilled immediately adjacent to the location of 22_FB201." However, the attachment figures show the borings separated by 18 feet. The comment still stands.

If you have any questions concerning the comments above, please call me at (415) 744-2210.

Sincerely,

Glenn R. Kistner
Remedial Project Manager
Federal Facilities Cleanup Branch

Attachments

cc: Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB w/o
Andy Piszkin, SWDIV w/o
Craig Carlisle, Bechtel

Glenn

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
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May 20, 1997

Mr. Joseph Joyce
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P. O. Box 95001
Santa Ana, CA 92709-5001

Re: EPA Review of MCAS El Toro Draft Final Phase II RI/FS Addendum, Site 25- Major Drainages, and Response to Comments, April 1997

Dear Mr. Joyce:

Please find attached to this cover letter, the United States Environmental Protection Agency's (EPA) review comments of the above documents. Comments have been provided by Clarence Callahan of EPA's technical support staff.

If you would like to discuss these comments, please contact me at (415) 744-2210.

Sincerely,

Glenn R. Kistner

Glenn R. Kistner
Remedial Project Manager
Federal Facilities Cleanup Branch

Attachment

cc: Clarence Callahan, EPA
Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco CA 94105-3901

May 6, 1997

MEMORANDUM

SUBJECT: Review of El Toro Site 25 Response to Comments
FS Ecological Risk Assessment

FROM: Clarence A. Callahan, Ph.D., Biologist
BTAG Coordinator
Technical Support Team (SFD8B)

TO: Glenn Kistner, Remedial Project Manager
Navy Section (SFD82)

The material presented in response to my comments is generally lacking because of the uncertainties resulting from the questionable methods used resulting in an underestimate of risk. The use of literature values to develop toxicity reference values from sources other than those approved by Region 9, the lack of data for some of the pathways (e.g., insect food for receptors) and an inadequate risk characterization are the "big picture" items that are lacking for this effort.

I would suggest that, at a minimum, a statement be placed in the Conclusions and Recommendations in Chapter 8 as follows:

"A definitive assessment of the actual ecological risk to the Site 25 receptors is not possible at this time because of remaining uncertainties with respect to the estimates of ecological impact to the site receptors. Although, chemical contamination is present at Site 25 at levels that may impact natural resources, the preferred action of the Navy is management of the residual risk."

cc: Chip Demerest
Department of the Interior
Office of Environ. Policy & Compliance
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John Christopher, Ph.D.
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Cal/EPA

Department of
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245 West Broadway,
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April 17, 1997

Pete Wilson
Governor

James M. Strock
Secretary for
Environmental
Protection

Mr. Joseph Joyce
BRAC Environmental Coordinator
U.S. Marine Corps Air Station - El Toro
P. O. Box 95001
Santa Ana, California 92709-5001

DRAFT FINAL PHASE II REMEDIAL INVESTIGATION REPORT APPROVAL: OPERABLE UNIT (OU)-3A, MARINE CORPS AIR STATION (MCAS) El TORO

Dear Mr. Joyce:

The California Environmental Protection Agency (Cal/EPA) has completed the review of the above subject document dated March 1997, prepared by Bechtel National, Inc. The report presents the results of Remedial Investigation (RI) conducted at OU-3A sites. OU-3A encompasses Sites 4, 6, 8 through 13, 15, 16, and 19 through 22.

Cal/EPA is satisfied that comments emanating from our January 17, 1997 letter on the draft report has been adequately addressed in the draft final RI report. As such, we hereby approve the document.

If you have any questions, please call Mr. Tayseer Mahmoud at (562) 590-4891.

Sincerely,

For Michael C. Hoslan
John E. Scandura, Chief
Southern California Operations
Office of Military Facilities

cc: Mr. Glenn Kistner, SFD-8-2
Remedial Project Manager
U. S. Environmental Protection Agency
Region IX
Federal Facilities Cleanup Office
75 Hawthorne Street
San Francisco, California 94105-3901

Printed on Recycled Paper

cc: Mr. Lawrence Vitale
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Mr. Craig Carlisle
Bechtel National, Inc.
401 West A street, Suite 1000
San Diego, California 92101-7905

Mr. Andy Piszkin
Remedial Project Manager
Naval Facilities Engineering Command
Southwest Division, Code 1831.AP
1220 Pacific Highway
San Diego, California 92132-5187

Cal/EPA

Department of
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245 West Broadway,
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May 12, 1997

Pete Wilson
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James M. Strock
Secretary for
Environmental
Protection

Mr. Joseph Joyce
BRAC Environmental Coordinator
U.S. Marine Corps Air Station - El Toro
P. O. Box 95001
Santa Ana, California 92709-5001

DRAFT FINAL PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT APPROVAL: SITE 25, MAJOR DRAINAGES, OPERABLE UNIT (OU)-2A, MARINE CORPS AIR STATION (MCAS) El TORO

Dear Mr. Joyce:

The Department of Toxic Substances Control and the Santa Ana Regional Water Quality Control Board has completed the review of the above subject document dated April 1997, prepared by Bechtel National, Inc. The report presents the results of remedial investigation conducted at Site 25, the Major Drainages designated as one of two sites in OU-2A. Site 25 was once thought to be a potential source of the regional groundwater volatile organic compound contamination.

We are satisfied that comments emanating from our February 20, 1997 letter on the draft report has been adequately addressed in the draft final report. As such, we hereby approve the report. If you have any questions, please call Mr. Tayseer Mahmoud at (562) 590-4891.

Sincerely,

John E. Scandura, Chief
Southern California Operations
Office of Military Facilities

cc: Mr. Glenn Kistner, SFD-8-2
Remedial Project Manager
U. S. Environmental Protection Agency
Region IX
Federal Facilities Cleanup Office
75 Hawthorne Street
San Francisco, California 94105-3901

cc: Mr. Lawrence Vitale
Remedial Project Manager
California Regional Water Quality Control Board
Santa Ana Region
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Mr. Pat Brooks
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