Proposed Plan/Draft Remedial Action Plan for Operable Unit 1B Marine Corps Air Station Tustin

April 2002 Tustin, California

Hydraulic Containment with Hot Spot Removal Proposed for Groundwater Cleanup at Two IRP Sites

The Marine Corps is requesting comments from the public on cleanup alternatives for two Installation Restoration Program (IRP) sites (IRP-3 and IRP-12) at Marine Corps Air Station (MCAS) Tustin. This Proposed Plan/Draft Remedial Action Plan (referred to as the Proposed Plan) summarizes the Marine Corps' preferred remedy for the sites and provides the supporting information that forms the basis for this recommendation. The Proposed Plan also notifies the public of opportunities to review and comment on these alternatives and provides an overview of the environmental investigation results for the two sites.

The IRP is a comprehensive environmental investigation and cleanup program that provides a structure to identify, investigate, and clean up chemical contamination that resulted from past Station operations that at one time were acceptable practices (see page 17). The two sites addressed in this Proposed Plan comprise Operable Unit 1B (OU-1B), a key component of the IRP at MCAS Tustin (see map on page 3). The Marine Corps' cleanup recommendation for OU-1B is based on the results of extensive field investigations, laboratory analyses, examination of current and future conditions, and a thorough assessment of potential human health risks at each location. [Technical terms used in this Proposed Plan are highlighted in **bold** the first time they appear and are defined on page 5.]

ON JULY 2, 1999, OPERATIONAL CLOSURE OF MCAS TUSTIN WAS COMPLETED. THE MARINE CORPS' MISSION WAS INCORPORATED INTO MCAS MIRAMAR OPERATIONS IN SAN DIEGO, CALIFORNIA.

Cleanup is recommended for IRP-3 and IRP-12 because **volatile organic compounds** (VOCs), principally from industrial solvents, were found in **groundwater** at concentrations that could result in adverse effects to human health if this water were extracted from the ground and directly used for domestic purposes such as drinking or bathing. (Groundwater at OU-1B is not currently used for such purposes.) The remedial action objectives for groundwater cleanup are to: reduce concentrations of VOCs in groundwater to levels consistent with **site cleanup goals**; control VOC migration; and prevent domestic use of groundwater containing VOCs above water quality standards until site cleanup goals are achieved.

Nine remedial (cleanup) alternatives were developed and evaluated for cleaning up contaminated groundwater at OU-1B. Alternative 7, the Marine Corps' preferred remedy, involves a combination of hydraulic containment and removal of **hot spots** in soil and groundwater. Cleanup of soil was included because if soil is left untreated it would continue to contaminate groundwater. Extracted soil would be treated to

CONTINUED ON PAGE 2 ▶

Opportunities for Community Involvement

Public Meeting **Thursday, April 23, 2002 6:00–7:30 p.m.**
Location: Tustin Senior Center, Classroom 3, 200 South C Street, Tustin

You are invited to this community meeting to discuss the information presented in this Proposed Plan for the OU-1B sites. Marine Corps representatives will provide visual displays and information on the environmental investigations and the cleanup alternatives evaluated. You will have an opportunity to ask questions and formally comment on the cleanup alternatives summarized in this Proposed Plan and the information presented in the Remedial Investigation and Feasibility Study Reports for OU-1B.

Public Comment Period **April 10–May 9, 2002**

We encourage you to comment on this Proposed Plan and supporting documents during the 30-day public comment period. Comments may be submitted orally or in writing at the public meeting, or you can mail written comments **postmarked no later than May 9, 2002** to: Base Realignment and Closure, Attn: Jerry Dunaway, MCAS Tustin, BRAC Environmental Coordinator, P.O. Box 51718, Irvine, CA 92619-1718. Comments may also be sent to Mr. Dunaway by fax [(949) 726-6586] or e-mail [dunawayjt@efdsw.navfac.navy.mil] **no later than May 9, 2002.** Public comments received during this period, or in person at the public meeting mentioned above, will be considered in the final decision-making process for IRP-3 and IRP-12.

CONTINUED FROM PAGE 1

remove VOCs and used to backfill the hot spot excavations. The extracted groundwater would be treated to remove VOCs until site cleanup goals are met and then discharged to Peters Canyon Channel. The preferred alternative also includes institutional controls to protect groundwater extraction and monitoring equipment, prevent inadvertent use of contaminated groundwater, and allow access for monitoring, maintenance, and any additional remediation. These institutional controls are not expected to adversely impact reuse or property transfer.

The MCAS Tustin Base Realignment and Closure (BRAC) Cleanup Team (BCT), made up of representatives from the Marine Corps, U.S. Environmental Protection Agency (U.S. EPA), and California Environmental Protection Agency (Cal/ EPA), has carefully evaluated the investigation results and concurs with the Marine Corps' preferred remedy.

We invite you to review and provide input on this Proposed Plan during the April 10–May 9, 2002 public comment period. For locations where you can review environmental investigation reports, see page 6. A final decision will be made after the public comment period has ended and all comments have been reviewed and considered. The selection of the final remedy for cleanup of IRP-3 and IRP-12 will be documented in a Record of Decision/Remedial Action Plan (ROD/RAP). Public comments will be addressed in the Responsiveness Summary section of the ROD/RAP, see page 16.

Environmental Investigation Overview

The MCAS Tustin sites that are the focus of this Proposed Plan are IRP-3 and IRP-12 (see Figure 1 on page 3), which comprise OU-1B. Operable Units are areas or sites where similar contamination exists and similar cleanup activities can be implemented (see page 17). An overview of the environmental investigation results is presented below.

HISTORY OF MCAS TUSTIN

MCAS Tustin (the Station) encompasses about 1,600 acres within central Orange County, California and is located approximately 40 miles south of downtown Los Angeles. Most of the Station lies within the city of Tustin. Portions of the Station border on the cities of Santa Ana and Irvine.

MCAS Tustin was commissioned in late 1942. During its operational life, the Station served as a major center for U.S. Marine Corps blimp and helicopter aviation on the Pacific Coast. The installation provided operational training facilities for the Marine Corps, helicopter landing sites, an air traffic control facility, and operational, logistics, and administrative support. Physical improvements installed over the years to support the mission of MCAS Tustin include more than 200 buildings and structures, a 3,000-foot-long runway, aircraft parking aprons, and numerous aircraft maintenance shops.

All military units were transferred from MCAS Tustin to other Marine Corps installations effective November 1998. MCAS Tustin ceased active military operations in July 1999 and is being closed in accordance with the federal BRAC Act of 1991 and 1993.

In 2001, Operable Unit 1 was separated into OU-1A (IRP-13S) and OU-1B (IRP-3 and IRP-12). This was done to maintain the cleanup schedule at OU-1B and evaluate a time critical removal action at OU-1A.

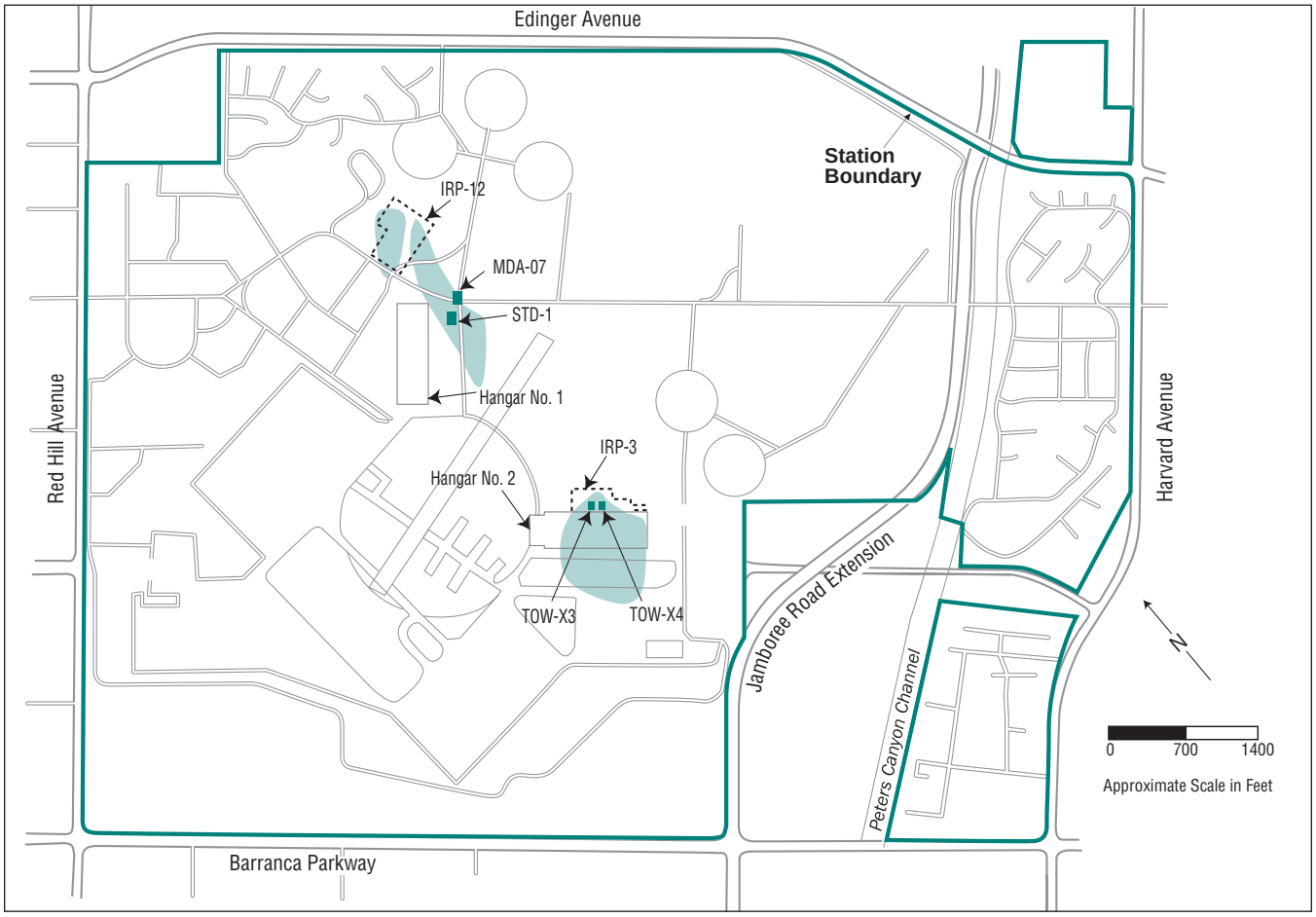
In November 1993, the Marine Corps organized the BCT to manage and coordinate the environmental cleanup and closure activities which will ultimately lead to transferring the land to various stakeholders. The city of Tustin's Reuse Plan for the Station includes development of commercial and residential areas, schools, child care facilities, parks, and other recreational facilities. Future land uses, including residential redevelopment, are key considerations in conducting human health risk assessments for the IRP-3 and IRP-12 sites and developing and analyzing OU-1B remedial alternatives.

STUDIES CONDUCTED

The **Remedial Investigation (RI)** Report for MCAS Tustin OU-1 was issued in November 1997. RI field activities primarily involved sampling and analysis of soil and groundwater. The RI Report included a detailed assessment of the nature and extent of potential soil, surface water, and groundwater contamination at several IRP sites.

Elevated concentrations of VOCs were identified in groundwater **plumes** originating at IRP-3 and IRP-12 (see map on page 3). The groundwater plumes originated when VOCs present in soil migrated downward into the groundwater. (Detailed descriptions of the IRP sites are presented on pages 4 and 5.)

Figure 1 MCAS Tustin –
Location of OU-1B Sites IRP-3 and IRP-12 and Groundwater Plumes



Legend

IRP Sites | Areas of Concern | Groundwater Plumes | Roads | Station Boundary

Note: The hangars are shown as reference points and are not associated with IRP-3 and IRP-12.

Acronyms/Abbreviations

IRP — Installation Restoration Program
MDA — Blimp and Vehicle Washing Area
STD — Hazardous Waste Storage Area
TOW — Oil/Water Separator

As part of the RI, a baseline risk assessment was conducted to evaluate risks to human health from exposure to soil and groundwater at the two IRP sites. The baseline risk assessment concluded that the groundwater contamination represented a potential human-health concern if the shallow groundwater underlying OU-1B were to be used as a source of drinking water. However, the RI Report concluded that direct human contact with VOC-affected soil at the OU-1B IRP sites did not pose a significant health risk. Therefore, the RI Report recommended that remedial (cleanup) actions be initiated to address groundwater contamination at IRP-3 and IRP-12.

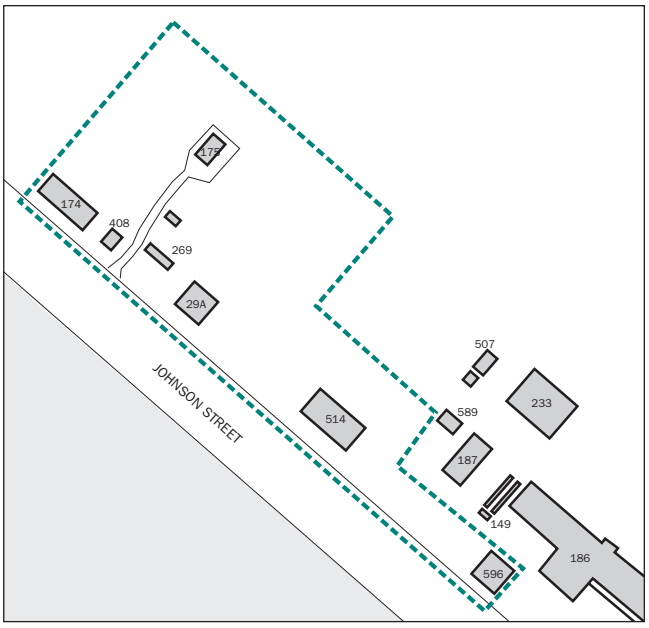
As part of the **Feasibility Study (FS)**, a second baseline risk assessment was performed that expanded upon the risk assessment performed during the RI. This assessment incorporated data from investigations performed under the Resource Conservation and Recovery Act (RCRA) at four **Areas of Concern (AOCs)** that overlie the groundwater plumes associated with IRP-3 and IRP-12 (see Figure 1 above). The RCRA program, a parallel program to the IRP, focuses on compliance with environmental laws and regulations and the management of hazardous wastes from "cradle to grave," including tracking, monitoring, disposal and any necessary environmental investigation and cleanup of chemicals and substances used for industrial-type activities. The AOCs were incorporated into the FS risk assessment. This assessment was performed to estimate the total risk to human health from exposure to all affected environmental media (soil and groundwater) at the two IRP sites including the above mentioned AOCs. Risk was calculated under current and future conditions (at the conclusion of remedial action). Future risk reflects the reduction in risk that would be achieved after completion of the proposed remedial actions. The FS risk assessment concluded that risks to human health arise primarily from potential exposure to shallow groundwater and that inhala-

tion of groundwater vapors would be the dominant pathway for exposure. For additional information on the risk assessment, see page 6.

The key component of the FS is the development and evaluation of remedial action alternatives to mitigate risks to human health. The alternatives for OU-1B are comprised of combinations of cleanup technologies that prevent migration or use of contaminated groundwater, reduce concentrations of VOCs in groundwater to the more stringent of federal or state water quality standards, and remediate contaminated soil that acts as a continuing source of groundwater contamination. The remedial action alternatives are summarized on page 9.

SITE DESCRIPTIONS/EXTENT OF CONTAMINATION

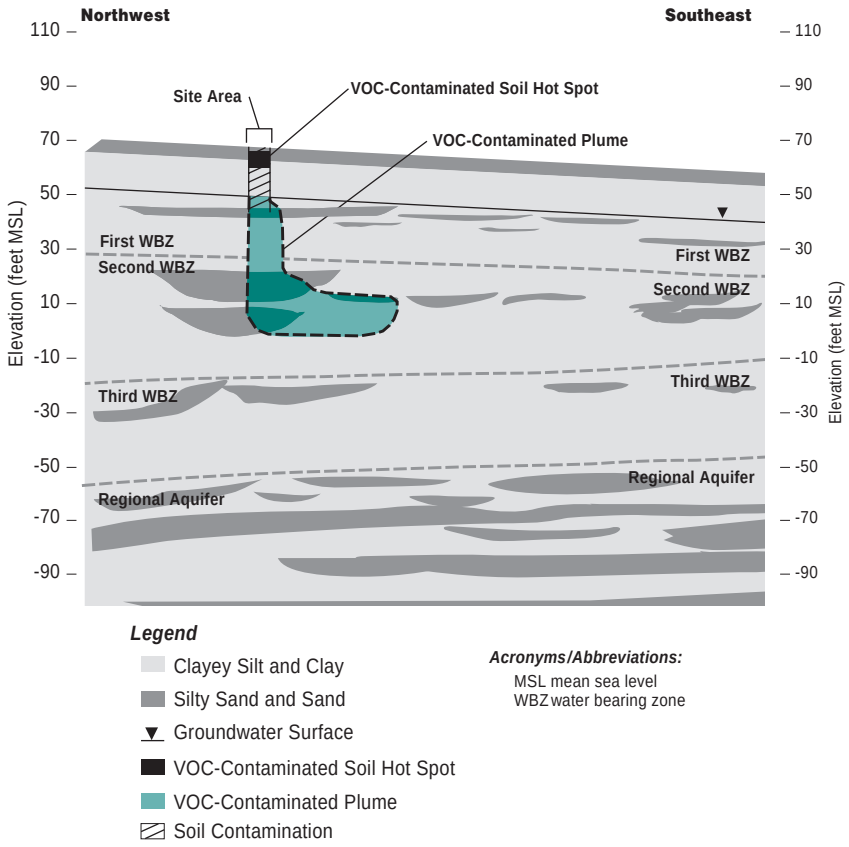
IRP-3 (Paint Stripper Disposal Area) occupies approximately 1.4 acres. The site includes seven buildings, several of which were used for chemical storage, painting, and paint stripping operations from 1967 to 1999 when military activities were discontinued. Solvents, paint strippers, battery acids, and water used for washing inactive oil/water separators were reportedly poured directly onto the ground outside



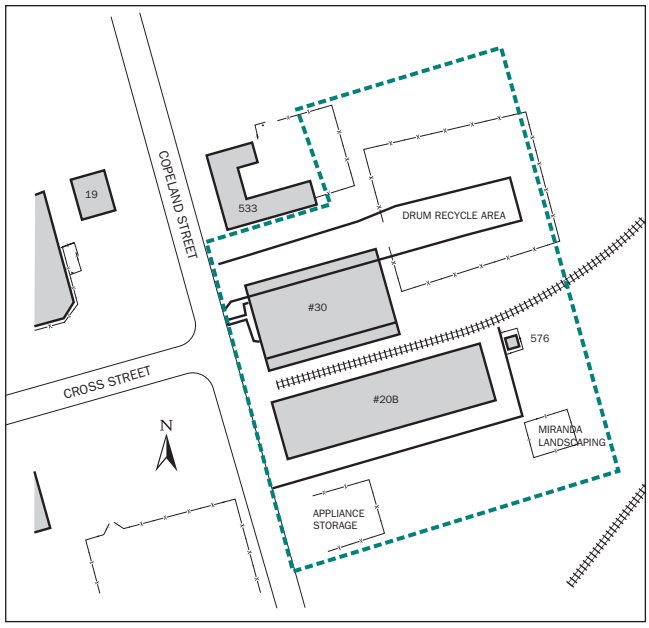
IRP-3 — Paint Stripper Disposal Area

some of the buildings. The oil/water separators are identified as AOCs TOW-X3 and TOW-X4. Sampling performed during and subsequent to the RI delineated five distinct areas of VOC-contaminated soil, including soil at TOW-X3 and TOW-X4. A concrete

Figure 2 Underground View of the OU-1B VOC Groundwater Plumes



Shallow groundwater beneath MCAS Tustin is divided into three water bearing zones (WBZs), rather than one vertically continuous aquifer. The first and second WBZs are hydraulically interconnected. The third WBZ appears to be hydraulically separated from the second WBZ by clayey silt and clay layers across most of the base. The third WBZ is also an apparent transition zone between the shallow aquifer and the underlying regional aquifer. This figure shows the link between VOC-contaminated soil and groundwater at the OU-1B sites, the WBZs, and the underlying deeper regional aquifer.



IRP-12 — Drum Storage No. 2

LEGEND

Building or Structure

IRP Site Boundary

Railroad

Fence

vault and surrounding soil at TOW-X3 were excavated and disposed of in 2000. TOW-X4 will be addressed as part of the proposed remedial action. VOC contamination at IRP-3 has also migrated from soil to groundwater where it has been identified in the first and second water bearing zones (WBZs) (see Figure 2). VOC plumes in groundwater delineated in these WBZs cover approximately 10.5 and 3 acres, respectively. There is no evidence that contamination has impacted the third WBZ or the deeper regional aquifer at IRP-3.

IRP-12 (Drum Storage Area No. 2) occupies a total area of about 3.5 acres. The site was used by the Marine Corps primarily for materials storage and warehouse functions from the mid-1960s to 1975. Solvents, motor oil, and hydraulic fluids were stored in this area. VOCs were detected in soil during the RI and four distinct source areas of contamination were identified. VOCs are also present in groundwater at the site. VOC plumes delineated in the first and second WBZs cover approximately 10.3 acres and 1 acre, respectively.

There is no indication that VOC releases from IRP-12 have impacted either the third WBZ or the deeper regional aquifer. Two AOCs, MDA-07 (a blimp and vehicle washing area) and STD-1 (a hazardous wastes storage area), are located south of the IRP-12 site boundary and above one of the VOC plumes in groundwater associated with the site.

Glossary of Technical Terms

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

Area of Concern (AOC): A particular area or site where military or industrial activities were conducted that are the responsibility of MCAS Tustin's Environmental Compliance Program, a parallel program to the Installation Restoration Program. Investigation and cleanup of AOCs generally falls under the federal Resource Conservation and Recovery Act (RCRA).

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

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

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

Hot Spots: Areas of soil or groundwater contamination that are characterized by the highest concentrations of chemicals. (Hot spots at the OU-1B sites contain volatile organic compounds.)

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

Plume: A localized zone of groundwater containing contaminants that generally move in the direction of, and with, groundwater flow.

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

Response Action: A general term used to describe technologies or actions implemented to contain, collect, or treat hazardous wastes to protect human health and the environment. Examples include groundwater extraction wells and treatment systems.

Site Cleanup Goals: Cleanup levels for groundwater are established based on a comparison and evaluation of various health-based criteria and are implemented to protect human health and the environment.

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

Water Bearing Zone: A distinct underground stratum in which water fills the pores in soil or openings in rocks. The boundary among water bearing zones (WBZs) at MCAS Tustin varies from location to location.

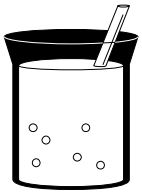
Human Health Risk Assessment

The Marine Corps conducted human health risk assessments for the two IRP sites and four AOCs at OU-1B in accordance with Federal and State guidelines. The final human health risk assessment conducted as part of the FS for OU-1B estimates the likelihood of health problems occurring under current conditions (if no cleanup actions were taken) and future conditions (at the conclusion of remedial actions). To estimate the human health risks for IRP-3, IRP-12 and the four AOCs, the Marine Corps undertook a four-step process.

- **Step 1: Analyze Contamination**
- **Step 2: Estimate Exposure**
- **Step 3: Assess Potential Health Risks**
- **Step 4: Characterize Site Risks**

ANALYZE CONTAMINATION

IN STEP 1, the Marine Corps studied chemicals and associated concentrations found at the sites and AOCs. Information on the types and quantities of chemicals present in the soil and groundwater at the two IRP sites was collected during the RI. A subsequent RCRA investigation provided further information on chemicals present in the soil at the four AOCs.



ESTIMATE EXPOSURE

IN STEP 2, the Marine Corps considered different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. To support possible future uses at IRP-3 and IRP-12, three exposure scenarios were analyzed: children and adult residents, industrial workers, and construction workers. The residential scenario is considered to be the "worst case scenario" because exposure of potential residents is assessed as being greater than other potential receptors. Sites that do not pose an unacceptable risk under residential exposure conditions will not pose an unacceptable risk under industrial or construction land-use scenarios.

Health risks were calculated under current conditions assuming that residents live at a site for 30 years and are exposed to the chemicals identified in soil and groundwater at the sites daily. Future risk to hypothetical residents at the conclusion of the proposed remedial actions was also calculated. Human heath risk under current and future conditions was estimated for IRP-3 and IRP-12 with and without their associated AOCs.

The risk assessments for the OU-1B sites estimated risks for potential residents exposed to on-site chemicals in soil and groundwater through ingestion (drinking

Investigation Reports and Risk Assessment Results Available for Review and Comment

The collection of reports and historical documents used by the Marine Corps in the selection of cleanup or environmental management alternatives is the Administrative Record (AR). The AR file provides a record of decisions and actions by the Marine Corps for the two IRP sites discussed in this Proposed Plan. The AR includes the draft final Remedial Investigation Report for Operable Units 1 and 2 and the draft final Feasibility Study Report for OU-1B, the key documents that form the basis for the recommendation made regarding these sites. Other supporting documents and data pertaining to these sites are also contained in the AR file.

Administrative Record File Location:
The complete AR file index and a site-specific index for the OU-1B IRP sites are available for public review at MCAS Tustin. To arrange a time to review documents during the public comment period (April 10–May 9, 2002), contact the MCAS Tustin BRAC Environmental Coordinator, Mr. Jerry Dunaway at (949) 726-5398 or (619) 532-0786.

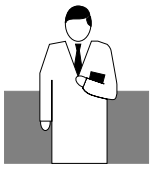
Information Repository Location:
Community members can also find key supporting documents that pertain to these OU-1B IRP sites, and a complete index of all MCAS Tustin AR documents, at the Information Repository located at the University of California at Irvine Main Library, Government Publications Department. The telephone number is (949) 824-7362 or (949) 824-6836.

the water; children eating soil), indoor inhalation of VOC vapors (from steam during showering, washing dishes) and dust (breathing), and direct skin contact with soil or groundwater (touching).

To determine potential current risks from exposure to untreated groundwater, the human health risk assessments assumed that untreated groundwater from IRP-3 and IRP-12 would serve as a source of water for domestic use. This hypothetical assumption is considered conservative because this groundwater is not currently used for domestic purposes and water supplied by local municipal water districts is readily available. Potential risks from direct exposure to soil and vapors from the soil hot spots were also examined. For the calculation of potential future risks, it was assumed that groundwater and soil had been cleaned up, and that groundwater would serve as a water source for domestic use.

ASSESS POTENTIAL HEALTH RISKS

IN STEP 3, the Marine Corps used the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. U.S. EPA considers two types of risk: cancer risk and non-cancer risk.



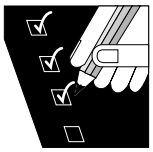
The likelihood of any kind of cancer resulting from exposure to chemicals at a site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chance." [Numerical equivalent is $1x10^{-4}$.] In other words, for every 10,000 people that could be exposed, one additional cancer case may occur as a result of exposure to site contaminants. One additional cancer case means that one more person could get cancer from chemicals present at a site than would normally be expected to get cancer from all other causes.

For non-cancer health effects, U.S. EPA calculates a "hazard index." A hazard index of 1 or greater indicates that a lifetime of exposure to the chemical(s) may have potential for causing adverse health effects (e.g., respiratory or kidney problems) and should be evaluated further.

Calculated risk levels are an indication of potential risks, and are not absolute predictions that risk will occur at a certain level. Actual human exposures and risks are likely to be less than those calculated for the risk assessment. Assumptions made during the risk assessment process are designed to lead to an overestimation of potential risk and provide a margin of safety to protect public health and the environment.

CHARACTERIZE SITE RISKS

IN STEP 4, the Marine Corps and regulatory agencies determine whether site risks are great enough to cause health problems for people at these sites. The results of the three previous steps are combined, evaluated, and summarized.



The National Oil and Hazardous Substances Contingency Plan (NCP), the regulation established for assessing hazardous waste sites, provides guidelines to be used to assess the types of chemicals, degree of exposure to the chemicals, and potential toxic effects of the chemicals of concern. To assist with the characterizing of risks, federally established risk ranges have been developed to protect human health. These ranges are presented in Table 1 below.

RISK ASSESSMENT RESULTS

The baseline risk assessment performed during the FS evaluated the total risk to human health from exposure to all affected media including groundwater and soil within the boundaries of each IRP site and the associated AOCs under current and future conditions. Estimates of cancer risks and the non-cancer risks hazard indexes were based on available sampling and analysis data from the RI, RCRA investigation, and routine quarterly groundwater monitoring. Risks from inhalation of volatile emissions from soil and

Table 1 Risk Ranges to Protect Human Health

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

groundwater into indoor air under the residential scenario were also evaluated and included in the risk estimates. Indoor inhalation of volatile emissions refers to inhalation of VOC vapors (from steam during showering or washing dishes) and dust (breathing). Risk assessment results for the residential scenario are shown on Table 2 below. The results are based on Cal/EPA criteria for chemicals of concern, which are more stringent than U.S. EPA criteria for assessing exposure risk to certain chemicals.

Current Conditions (No Cleanup Actions Taken) — Risk estimates were made for hypothetical residents living at the sites for 30 years assuming no cleanup actions are conducted. Under these conditions, total cancer risks exceed the generally allowable cancer risk range and non-cancer risks exceed the hazard index of 1. Both cancer and non-cancer risks are associated with exposure to VOCs and metals in groundwater. The majority of the cancer and non-cancer risk under current conditions is associated with potential exposure to VOCs in shallow groundwater. Inhalation of groundwater vapors is the dominant risk pathway. Soil presents a much lower risk that was evaluated during the RI and found to be acceptable. Using the conservative risk assessment approach, current human health risks at IRP-3 and IRP-12 warrant remedial action to reduce concentrations of VOCs in groundwater to meet water quality standards.

Future Conditions (After Cleanup is Complete)— Estimates of future risks were made for hypothetical residents living at the sites for 30 years after cleanup alternatives developed in the FS have been implemented. Under these conditions, if the preferred alternative is implemented at IRP-3 and IRP-12, total cancer risks would be reduced to within the generally allowable risk range. Non-cancer risks would still exceed the hazard index of 1. Chemicals contributing to the hazard index were predominately metals, including thallium, selenium, antimony, and manganese. A detailed evaluation of each of these chemicals was performed in the FS. This evaluation showed that the metals were apparently present at naturally occurring concentrations and were not the result of activities that took place at either site. On this basis, once cleanup is complete, the future hazard index for each site will essentially equal that for background conditions. Therefore, no further response actions will be required.

Table 2
Risk Assessment Results — Under Current and Future Conditions[a] for Residential Exposure Scenarios

	CURRENT CONDITIONS (No Cleanup Actions Taken)		FUTURE CONDITIONS (After Cleanup is Complete)	
IRP SIte and AOCs	Total Cancer Risk[b]	Hazard Index/ Total Non-Cancer Risk[c]	Total Cancer Risk[b]	Hazard Index/ Total Non-Cancer Risk[c]
IRP-3	1.5 additional cases in 10,000 (1.5×10^{-4})	8.4	4 additional cases in 100,000 (4×10^{-5})	7.5
TOW-X3 within IRP-3[d]	1.5 additional cases in 10,000 (1.5×10^{-4})	6.0	4 additional cases in 100,000 (4×10^{-5})	4.6
TOW-X4 within IRP-3[d]	1.6 additional cases in 10,000 (1.6×10^{-4})	6.4	4 additional cases in 100,000 (4×10^{-5})	4.6
IRP-12	1.9 additional cases in 10,000 (1.9×10^{-4})	29	8.9 additional cases in 100,000 (8.9×10^{-5})	9.9
STD-1 within IRP-12[d]	1.6 additional cases in 10,000 (1.6×10^{-4})	42	6.2 additional cases in 100,000 (6.2×10^{-5})	23
MDA-07 within IRP-12[d]	2 additional cases in 10,000 (2×10^{-4})	27	9.8 additional cases in 100,000 (9.8×10^{-5})	8.2

Notes: Risk assessment results are based on Cal/EPA criteria for chemicals of potential concern, which are more stringent than U.S. EPA criteria for assessing exposure risk to certain chemicals.

a — Future risks were estimated at 30 years after the implementation of Alternative 7, Hydraulic Containment with Hot Spot Removal. Alternatives 4, 4A, 6, and 6A are expected to achieve similar risk reductions. Reductions in risk achieved under Alternatives 2, 3, and 5 are expected to be less but should lower the overall risk over time. Please see page 9 for a summary of the remedial action alternatives evaluated in the FS.

b — Total cancer risk is calculated for an adult resident, which is more conservative than for a child resident. Adult exposure was assumed for a total of 30 years, 6 years as a child plus 24 years as an adult. Child exposure was assumed to be 6 years.

c — Hazard index/non-cancer risk is calculated for a child resident, which is more conservative than for an adult resident.

d — Combined risk calculated for IRP and the AOC.

Summary of Groundwater Remedial Action Alternatives

The Marine Corps' remedial action objectives identified in the FS for OU-1B are to:

- *Reduce the concentrations of VOCs in groundwater to levels consistent with **site cleanup goals** and prevent or limit VOC migration beyond the current OU-1B plume boundaries.*
- *Protect human health by preventing extraction of VOC-impacted shallow groundwater for domestic use until site cleanup goals are achieved.*
- *Protect potential ecological receptors in Peters Canyon Channel and Barranca Channel by preventing the off-base migration of groundwater containing VOCs at concentrations exceeding site cleanup goals.*
- *Implement appropriate remedial actions as necessary to facilitate transfer and reuse of those portions of the MCAS Tustin property actually or potentially affected by the OU-1B plumes.*

These objectives shaped the development of several remedial (cleanup) alternatives that prevent exposure to contaminated groundwater, minimize further migration of already-contaminated groundwater, and reduce the concentrations of VOCs in groundwater.

FEASIBILITY STUDY—DEVELOPMENT OF ALTERNATIVES

Remedial alternatives are developed and evaluated by performing a feasibility study (FS). An FS for OU-1B was conducted to look at a range of possible alternatives and to determine the most effective methods for meeting the remedial action objectives. Alternatives were developed and evaluated in the draft final OU-1B FS Report that was issued in October 2001.

The first step in the FS process was to identify and evaluate a wide range of potential technologies to accomplish the cleanup objectives. This evaluation included technologies to prevent or minimize the migration of contaminants in groundwater, treat the groundwater in place (*in situ* treatment), or treat the groundwater once it has been extracted to the surface (*ex situ* treatment). The Marine Corps also evaluated a variety of technologies to use or dispose of the extracted and treated groundwater. Technologies that address cleanup of contaminated soil that is a source of contamination to groundwater were also screened and evaluated. Each of these technologies was screened on the basis of its effectiveness, implementability, and cost, consistent with U.S. EPA and NCP guidance. The most effective technologies were developed into remedial alternatives and subjected to further evaluation. Table 3 on page 10 lists the technologies evaluated for groundwater at OU-1B.

Computer modeling was used to evaluate the effectiveness of the remedial alternatives. By simulating *in situ* techniques and varying the location and number of extraction wells, the model was used to compare the relative rate of contaminant removal, amount of migration of contaminants, and time to reach site cleanup goals for all the alternatives. Results of modeling are shown in Table 4 on page 11.

REMEDIAL ALTERNATIVES

The remedial alternatives developed in the FS consist of a No Action alternative and a variety of alternatives that actively treat contaminated areas. A common element of each active alternative is the use of institutional controls (see page 15) such as deed restrictions to protect the remedial equipment (extraction wells, groundwater treatment systems, thermal systems for treating soil) and prevent inadvertent use of contaminated groundwater until remediation is complete. Institutional controls also ensure that provisions exist for access by the Department of the Navy and the regulatory agencies to conduct or oversee monitoring and maintenance activities. Summarized below are the alternatives that underwent detailed evaluation in the FS. Each alternative is potentially applicable to both IRP sites. The remedial alternatives developed in this FS are conceptual in nature. Design details such as number and location of wells, pumping rates, and area of hot spot removal will be addressed in the remedial design phase of this project. Table 4 on page 11 provides a summary comparison of the OU-1B alternatives.

Alternative 1—No Action

By law, the No Action alternative is used as a baseline against which the other alternatives are evaluated. With Alternative 1, there are no **response actions.** Such actions are conducted to collect, contain, or treat contaminated groundwater to protect human health and the environment. Also, there would be no institutional controls to prevent use of groundwater, protect equipment, or control site access.

Alternative 2—Monitored Natural Attenuation

Monitored natural attenuation would not entail any engineered response actions to collect, contain, or treat the contaminated groundwater. Instead, this

alternative relies on natural processes occurring in the subsurface by which chemical compounds are reduced over time to reach the cleanup goals. Alternative 2 also includes groundwater monitoring, and institutional controls that restrict development of new water supply wells and excavations within the groundwater plume areas. The institutional controls would be implemented to minimize the potential for human exposure to contaminated groundwater, ensure access for monitoring and maintenance, and protect the **monitoring wells.** Monitoring would be used to track VOC migration and support future evaluations of the protectiveness of the natural attenuation processes.

Alternative 3—Hydraulic Containment

Hydraulic containment would use a combination of response actions and institutional controls to limit further migration of the OU-1B groundwater plumes and prevent human exposure to VOC-contaminated groundwater. One or two **extraction wells** would be placed along the leading edge of each plume identified in the first and second WBZs. Removal of groundwater using these wells would create a hydraulic barrier to effectively restrict further migration of VOCs within the shallow aquifer. Contaminated groundwater would be extracted and treated to remove VOCs at a facility located near IRP-3. After treatment, the clean water would be discharged to a nearby storm drain that eventually empties into Peters Canyon Channel.

Alternatives 4 and 4A—Aggressive Groundwater Extraction

Aggressive groundwater extraction includes contaminated groundwater removal using a network of groundwater extraction wells to contain the OU-1B plumes, and excavation to remove soil that is acting as a source of contamination to groundwater. After the extracted groundwater is treated, it would be pumped back into the shallow aquifer through a series of injection wells.

The purpose of the soil removal is to accelerate the rate of cleanup in the underlying permeable sand layers and improve the overall efficiency of the remedial action.

The extraction wells would be configured to control the potential for VOC migration to the third WBZ. Injecting treated groundwater will flush the aquifer and speed up the cleanup process. Groundwater extraction would continue until contaminant levels in the first two WBZs meet site cleanup goals or until the extraction wells are no longer effective. After the extraction systems are shut down, natural processes would continue to reduce the concentrations of VOCs to site cleanup goals. Alternatives 4 and 4A are identical except contaminated soil in Alternative 4 is disposed of at a landfill, and 4A uses on-site thermal treatment of the soil.

Alternative 5—Permeable Reaction Wall

In Alternative 5, permeable reactive iron walls would be installed below ground in the shallow aquifer to remediate the OU-1B contaminant plumes. Studies have shown that chlorinated VOCs can be completely degraded to non-toxic reaction products as groundwater flows through a wall of reactive iron. In Alternative 5, slurry walls (subsurface trenches filled with low-permeable material) would be used to direct the contaminated groundwater through permeable sections of reactive iron. The slurry and permeable reaction walls are configured such that all groundwater within the plumes eventually passes through the reactive iron. The technology relies on natural groundwater flow for contaminant transport to the reactive walls.

Table 3
Technologies Evaluated for OU-1B Feasibility Study

Containment
Hydraulic Containment (wells)
Physical Barriers (slurry wall)
Sheet Piling
Grout Curtain
Removal of Contaminants
Groundwater Extraction (wells)
Vacuum-Enhanced Groundwater Extraction
Excavation
Soil Vapor Extraction
***In Situ* Treatment (performed in place)**
Monitored Natural Attenuation
Treatment of Groundwater in Place (air sparging or bioremediation)
Six phase Electrical Heating
In Situ Chemical Oxidation
Permeable Iron Reaction Wall
Bioremediation (air sparging, hydrofracturing)
***Ex Situ* Treatment (remove and treat above ground)**
Physical Treatment of Extracted Groundwater (carbon adsorption, air stripping, filtration)
Chemical Treatment of Extracted Groundwater (oxidation)
Biological Treatment of Extracted Groundwater (bioremediation)
Air Emission Controls and Treatment (adsorption, catalytic conversion, thermal destruction)
Reactive Iron Treatment of Extracted Groundwater (dechlorination)
Discharge/Use
Permitted Discharge to Publicly Owned Treatment Works
Permitted Discharge to Surface Waters
Reinjection of Treated Groundwater
Off-site Disposal

Alternative 6, 6A—Vacuum-Enhanced Extraction

Alternative 6 is a refinement of Alternative 4 that uses a vacuum on the extraction wells in the first WBZ to increase the groundwater extraction rate and improve VOC removal. The use of vacuum-enhanced extraction (VEE) wells would remove additional contaminants present in the soil vapor as the groundwater table is lowered and VOCs are stripped from the newly exposed subsurface soil. Conventional groundwater extraction wells would be installed to remove VOCs from the second WBZ. The extracted groundwater would be treated by a granular activated carbon system to remove organic contaminants, and the treated groundwater would be discharged to a storm drain that eventually reaches Peters Canyon Channel.

As with Alternative 4, the VEE system would consist of a network of extraction wells located to capture the VOC plumes in the first and second WBZs. The extraction wells would be configured to control the potential for VOC migration to the third WBZ. Extraction would continue until contaminant levels in the first two WBZs reach site cleanup goals or the extraction wells are no longer effective. After the extraction systems are shut down, natural processes (dilution, dispersion, and adsorption) would continue to reduce the concentrations of VOCs to site cleanup goals.

Alternative 6 also uses soil excavation to reduce the contaminant mass in the first WBZ. Alternative 6 and 6A are identical except contaminated soil in Alternative 6 is disposed of at a landfill, and 6A uses onsite thermal treatment of the soil.

Alternative 7—Hydraulic Containment with Hot Spot Removal (Preferred Alternative)

Alternative 7 uses the same extraction wells as Alternative 3 to prevent migration of the VOC plumes. To increase the effectiveness of the remedy and reduce the amount of time required to reach cleanup goals, soil and groundwater hot spots are also addressed. Contaminated soils characterized by the highest VOC concentrations that contribute to groundwater contamination (hot spots) would be excavated at both of the OU-1B sites. Contaminated soil would be thermally treated on-site and reused to backfill the hot spot excavations. In addition, VOC hot spots in groundwater would be removed using extraction wells. Extracted groundwater would be treated using a granular activated carbon treatment system to remove VOCs. After treatment, the clean water would be discharged to a storm drain that eventually leads to Peters Canyon Channel. The hot spot extraction wells would be operated until contaminant concentrations are reduced and the wells are no longer effective.

Table 4
Summary of OU-1B Remedial Alternatives

Computer modeling was used to evaluate the effectiveness of remedial alternatives. Models simulated and compared the rate of contaminant removal, amount of contaminant migration, and time to reach site cleanup goals for all the alternatives.

Alternative	Cleanup Time (Years)	Residual VOC Contamination (lbs)[a]		Total Cost[b]
		IRP-3	IRP-12	
Alternative 1—No Action	>100	40	13	$0
Alternative 2—Monitored Natural Attenuation	>100	40	13	$2.1 million
Alternative 3—Hydraulic Containment	>100	18	9	$3.5 million
Alternative 4—Aggressive Groundwater Extraction with Off-Site Soil Disposal	40–50	8	5	$7.5 million
Alternative 4A—Aggressive Groundwater Extraction with On-Site Soil Treatment	40–50	8	5	$5.8 million
Alternative 5—Permeable Reaction Wall	>100	16	8	$11.5 million
Alternative 6—Vacuum-Enhanced Extraction with Off-Site Soil Disposal	40–50	1	2	$7.8 million[c]
Alternative 6A—Vacuum-Enhanced Extraction with On-Site Soil Treatment	40–50	1	2	$5.9 million[c]
Alternative 7—Hydraulic Containment with Hot Spot Removal	30	8	4	$4.5 million

Notes:
a Residual VOC contamination is the amount of mass remaining at the end of 30 years.
b Net present value in 2001 dollars.
c Cost of Alternatives 6 and 6A may increase by up to $0.5 million if additional vacuum-enhanced extraction (VEE) wells are required. Actual extraction rates in the first WBZ could be as low as 5 gallons per minute (gpm) per well, as obtained in a recent VEE field test, rather than the 12 gpm per well estimated by the computer model presented in Appendix B in the Feasibility Study Report.

Evaluation of the OU-1B Groundwater Cleanup Alternatives

Each OU-1B alternative has undergone detailed evaluation and analysis, following the nine criteria developed by the U.S. EPA. These criteria are categorized into three general groups: threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria must be satisfied in order for an alternative to be eligible for selection. Primary balancing criteria are used to weigh major tradeoffs among alternatives. Generally, modifying criteria are taken into account after public comment is received on the Proposed Plan and reviewed with the various State regulatory agencies to determine if the preferred alternative remains the most appropriate remedial action. Table 5 on page 13 summarizes the comparative analysis of all the OU-1B remedial alternatives.

A. THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment—assesses whether an alternative provides for adequate protection of public health and the environment by eliminating, reducing or controlling risks through treatment, engineered response actions or controls, or institutional and regulatory controls.

Alternative 1, No Action, does not protect human health and the environment because risk associated with contaminated groundwater is not reduced. Alternatives 2, 3, 4/4A, 5, 6/6A, and 7 protect human health through institutional controls that prevent exposure to untreated groundwater. However, Alternative 2 does not protect the environment because VOC-contaminated groundwater is expected to eventually migrate into Peters Canyon Channel.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)—evaluates whether an alternative complies with all federal, state and local environmental statutes, regulations, and other requirements, or whether a waiver is justified. ARARs are discussed in greater detail on page 18 and 19.

Potential ARARs do not apply to Alternative 1 because no action is being taken. Alternatives 2, 3, 4/4A, 5, 6/6A and 7 comply with all ARARs.

B. PRIMARY BALANCING CRITERIA

Long-Term Effectiveness and Permanence—considers the ability of an alternative to maintain protection of human health and the environment over time after remediation is complete.

Alternative 1 is not effective at protecting human health or the environment. Alternative 2 protects human health but does not protect the environment because it allows VOCs to migrate to Peters Canyon Channel. Alternatives 3, 4/4A, 5, 6/6A, and 7 are considered effective and permanent in the long term. Of these Alternatives, Alternatives 4/4A, 6/6A, and 7 would provide the best overall long-term permanence, because they are most effective at reducing VOC concentrations in groundwater. While maximum VOC concentrations would decline slightly faster with Alternative 6/6A, the performance of Alternatives 4/4A and 7 is generally expected to be similar to Alternative 6/6A after 15 years to 20 years of remediation.

Until cleanup levels are reached, institutional controls are used by all the action alternatives to prevent human exposure to VOCs. Alternatives 3 and 7 would prevent further migration of VOCs and maintain site cleanup goals at the existing plume margins. Alternatives 4/4A, 5, and 6/6A would allow some areas of the plume with low concentrations of VOCs to continue to migrate and be remediated by natural processes. These alternatives could be modified by changing the number and location of wells to prevent the predicted migration of low concentrations of VOCs.

Reduction of Toxicity, Mobility, or Volume through Treatment—refers to the degree to which an alternative uses treatment technologies to reduce: 1) harmful effects to human health and the environment (toxicity), 2) contaminant's ability to move (mobility) in the environment, and 3) the amount of contamination (mass and volume).

Computer modeling performed for the OU-1B FS estimated the reduction in the contaminant mass over a 30-year period. Based on these estimates, Alternatives 4/4A, 6/6A, and 7, which involve a combination of VOC-contaminated groundwater extraction, excavation of VOC-contaminated soil, and follow-up treatment for both groundwater and soil, are the most effective at reducing the toxicity, mobility, or volume of contamination through treatment. Modeling results indicate Alternatives 6/6A would achieve the greatest reduction in contaminant mass in the OU-1B plumes. However, results of pilot tests conducted for Alternatives 6/6A indicate the estimated mass removal is probably not attainable due to unfavorable subsurface soil conditions.

Short-Term Effectiveness—considers the impact of an alternative relative to human health and the environment during the construction and implementation phase and until remedial action objectives are achieved. Also considers time to achieve cleanup goals.

Alternatives 3, 4/4A, and 7 would be the most effective in the short-term. These alternatives use proven technologies, are readily implementable, and would have minimal impact on workers or the public during implementation. Based on computer modeling, Alternative 7 requires the least time to reach site cleanup goals for VOCs (30 years) followed by Alternatives 4/4A and 6/6A (40 to 50 years). Alternatives 1, 2, 3, and 5 require over 100 years to reach cleanup goals.

Implementability considers the technical feasibility (how difficult the alternative is to construct and operate) and administrative feasibility (coordination with other agencies) of implementing an alternative.

The absence of field construction or other remedial activities under Alternative 1, and the limited scope of groundwater monitoring under Alternative 2, make each of these options readily implementable from a technical viewpoint. The technical feasibility of Alternatives 3, 4/4A, and 7 is also considered high, as each would employ reliable, widely available technologies. Alternative 5 is rated lower for implementability because reactive iron walls would be difficult to install, especially in the deeper second WBZ, and the technology may not be reliable in groundwater containing high concentrations of dissolved minerals. Pilot tests conducted for Alternatives 6/6A at IRP-3 indicate that this alternative would be only marginally more effective than standard groundwater extraction. Alternative 7 would be the most implementable followed by Alternatives 4/4A. Successful pilot tests demonstrate the feasibility and efficiency of extraction and treatment of VOC-contaminated groundwater from the OU-1B plumes. The deed restrictions required by all of the alternatives are considered administratively feasible and are not expected to prevent future redevelopment of the MCAS Tustin property.

Cost—includes estimated capital and annual operations and maintenance costs, and present worth costs. Present worth is the total cost of an alternative over time and all estimates are expressed in terms of year 2001 dollars.

In terms of total cost, the alternatives can be grouped into three categories. Alternatives 2, 3, and 7 have the lowest cost (less than $5 million). Alternatives 4/4A and 6/6A are mid-range cost options (approximately $5.8 to 7.5 million). Alternative 5 is the most expensive (over $11 million). The high capital costs of Alternative 5 are due to the materials used, transportation and off-site disposal of contaminated soils removed during the initial construction, licensing fees associated with the permeable wall technology, installation of monitoring wells, and the need to conduct an initial

Table 5
Summary of Comparative Analysis of OU-1B Remedial Alternatives

Criterion	Alternative 1 No Action	Alternative 2 Monitored Natural Attenuation	Alternative 3 Hydraulic Containment	Alternatives 4 and 4A Aggressive Groundwater Extraction	Alternative 5 Permeable Reaction Wall	Alternatives 6 and 6A Vacuum Enhanced Extraction	Alternative 7 Hydraulic Containment with Hot Spot Removal Preferred Remedy
1. Overall Protection of Human Health and the Environment	Not Protective	Not Protective	Protective	Protective	Protective	Protective	Protective
2. Compliance with ARARs	Not Applicable	Complies	Complies	Complies	Complies	Complies	Complies
3. Long-Term Effectiveness and Permanence	○	○	◒	◕	◕	◒	●
4. Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	◒	◕	◒	◕	◕
5. Short-Term Effectiveness	○	◒	◕	◒	◒	◒	●
6. Implementability	◕	◕	◕	●	○	◒	●
7. Cost	●	●	◕	◒	○	◒	◒
8. State Acceptance—State concurs with the preferred remedy, performance criteria to be determined for all other alternatives							
9. Community Acceptance—This criteria will be addressed in the Record of Decision.							

Relative Performance in Satisfying NCP Criteria

○ ◕ ◒ ◕ ●

Least → Best

pilot study to determine the site-specific effectiveness of the technology. Specific costs of each alternative are listed on Table 4 on page 11.

Alternative 7, the preferred alternative, has a higher cost than Alternatives 2 and 3, the other low-cost options, but is considered to be more cost effective because it removes more mass and achieves cleanup goals in a much shorter time than Alternatives 2 and 3.

C. MODIFYING CRITERIA

State Acceptance—considers whether the State of California's environmental agencies agree with the analysis presented in the RI/FS reports and the Marine Corps' preferred remedy.

State of California representatives from the Department of Toxic Substances Control and the Regional Water Quality Control Board (RWQCB) on the MCAS Tustin BCT concur with the selection of Alternative 7, the Marine Corps' preferred alternative.

Community Acceptance—evaluates whether the local community agrees with the Marine Corps' analysis and if the community has a preference for an alternative. Although public comment is an important part of the final decision, the Marine Corps is compelled by law to balance community concerns with other criteria.

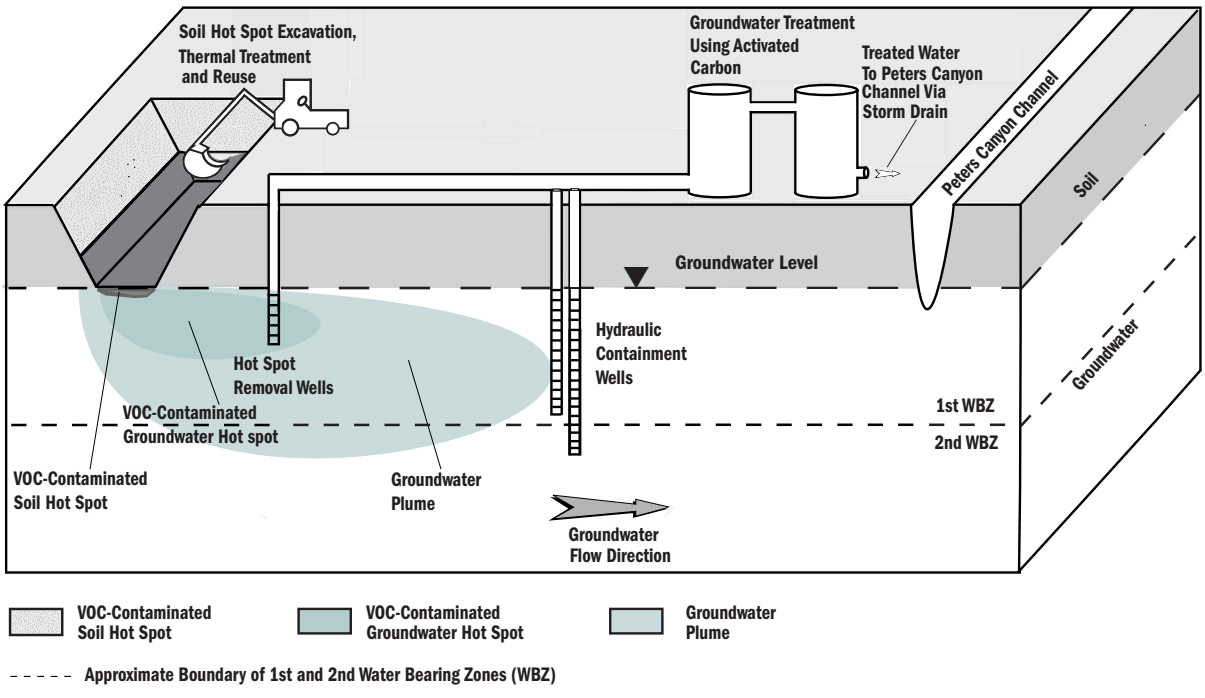
This Proposed Plan is the Marine Corps' request to the community to comment on the remedial alternatives, the preferred alternative, and the RI and FS Reports. Responses to comments received from the public will be addressed in the ROD/RAP, see page 16.

OU-1B Preferred Remedy — Alternative 7 Hydraulic Containment with Hot Spot Removal

The Marine Corps' preferred remedy for cleanup of IRP-3 and IRP-12 — Alternative 7 — would employ a combination of engineered response actions and institutional controls to limit further migration of the OU-1B groundwater plumes and prevent human exposure to VOC-contaminated groundwater. The preferred remedy will address contaminated groundwater and soil that is acting as a continuing source of groundwater contamination.

Groundwater — Containment wells would be placed along the leading edge of each plume in the first and second WBZs. Groundwater will be pumped at low flow rates from these containment wells in order to create a hydraulic barrier that effectively restricts further migration of VOCs within the shallow aquifer. Groundwater would also be removed via extraction wells from hot spots of VOC contamination located within the plumes. These hot spot wells would sup-

Figure 3 Alternative 7—The Preferred Remedy



Institutional Controls

Institutional controls described in this Proposed Plan include deed restrictions, established to limit human exposure to waste materials, contaminated subsurface soil, or contaminated groundwater. Institutional controls are applicable to Alternatives 2 through 7, and will be implemented through deed restrictions at the time of property transfer.

The Marine Corps plans to use institutional controls to: prevent future use of contaminated groundwater; allow access to extraction and monitoring wells and other remedial action components; and protect wells and other equipment installed at MCAS Tustin. Access provisions are needed to ensure the Department of the Navy and the regulatory agencies have access for the purpose of implementing the remedial action, performing maintenance activities, and conducting groundwater monitoring. The institutional controls shall consist of land-use restrictions that will be incorporated and implemented through two separate legal instruments: (1) a "Covenant Agreement" with Cal/EPA pursuant to state laws; and (2) a Quitclaim Deed from the Navy to the property recipient.

plement the containment wells. Hot spot extraction wells would be operated for several years and be turned off after contaminant concentrations are reduced such that hot spot extraction wells are no longer effective. Extracted groundwater from both hot spot and containment wells would be treated using granular activated carbon to remove VOCs. Treated water would be safely discharged to a storm drain and would eventually reach Peters Canyon Channel.

Soil — Hot spots of VOC contamination in soil would be excavated at both of the OU-1B sites. Excavated soil would be thermally treated on-site and the clean, treated soil would be reused to backfill the excavated area. Thermal treatment applies intense heat to destroy the VOCs present in soil.

RATIONALE FOR THE MARINE CORPS' PREFERRED REMEDY

The Marine Corps prefers Alternative 7 for remediation at IRP-3 and IRP-12 because it is protective of human health, easy to implement, and permanently reduces the toxicity, mobility and volume of contamination. It is also one of the most cost-effective alternatives evaluated. Key points that support the Marine Corps' preference for Alternative 7 are listed below.

- Protective of human health and the environment. Provides short-term protection through institutional controls that prevent exposure to and use of contaminated groundwater.
- Provides long-term protection by reducing concentrations of VOCs to meet site cleanup goals for VOCs.
- Uses proven technologies for groundwater extraction and treatment. Residual wastes present on the spent carbon filters would be thermally destroyed at a permitted off-site facility.
- Permanently removes contaminant mass and prevents further migration. Computer modeling shows that site cleanup goals for VOCs would be achieved in approximately 30 years compared to 40 years or more for the other alternatives.
- Construction is expected to be completed within one year. Construction-related impacts such as noise, dust, and increased traffic would be mitigated using routine industry practices.
- Successful pilot tests have demonstrated the feasibility and efficiency of groundwater extraction and treatment at these sites.
- Falls into the low-cost group of options and is considered to be the most cost-effective at achieving remedial action objectives.

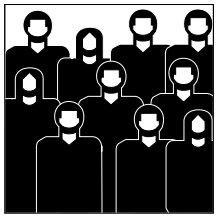
Hydraulic Containment and Hot Spot Removal — Cost Estimate Summary

Cost Category	Costs
Capital Cost	**$1.7 million**
Includes excavation and treatment of contaminated soils; design and construction of the containment and extraction system; and first year operations, maintenance, and monitoring costs (approximately 1 year).	
Operations and Maintenance (O&M) and Monitoring	**$2.8 million**
Costs to run the system, perform all maintenance, and regenerate activated carbon for an estimated period of 30 years. Also involves gauging the system's performance and using groundwater sampling to measure system effectiveness and cleanup progress during O&M (30 years).	
Total—Estimated Present-Worth Cost	**$4.5 million**
Covers all costs to complete this project and includes a 20 percent contingency because the exact number and locations of extraction wells will be determined during the remedial design phase of the project (30 years).	

Detailed information on cleanup cost estimates is presented in the Feasibility Study Report for OU-1B.

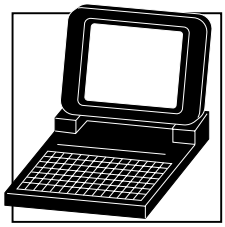
Multi-Agency Environmental Team Concurs with Preferred Remedy

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



The BCT reviewed all major documents and activities associated with IRP-3 and IRP-12, including the RI, the RCRA Investigation, the FS, and the baseline risk assessments. Based on these reviews and discussions on these key documents, the BCT concurs with the Marine Corps' recommendation of Alternative 7, Hydraulic Containment with Hot Spot Removal, as the preferred remedy for the two OU-1B sites.

Internet Connection



For more information on the closure of MCAS Tustin and the Installation Restoration Program, check out the Southwest Division Naval Facilities Engineering Command Website at:

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

MCAS Tustin Restoration Advisory Board

The community-based MCAS Tustin Restoration Advisory Board (RAB), which is made up of representatives from local agencies and members of the public, meets bimonthly with Marine Corps representatives to discuss environmental issues. The RAB has reviewed and commented on the RI and FS Reports for OU-1B. These documents form the basis for this Proposed Plan. If you are interested in becoming a member of the RAB, please complete the mailing coupon on the last page. For additional information on RAB membership, please contact Mr. Jerry Dunaway, Navy RAB Co-Chair, at (949) 726-5398 or (619) 532-0786.

Marine Corps Air Station Tustin The Next Step—Public Comments

Comments on this Proposed Plan received during the 30-day public comment period (April 10-May 9, 2002) will be considered in the final environmental determination for OU-1B. Public comments will be accepted on all of the alternatives for the OU-1B sites (IRP-3 and IRP-12) outlined in the Proposed Plan and on information presented in the RI/FS reports. During the public comment period, community members may submit comments by mail to: Jerry Dunaway, MCAS Tustin, BRAC Environmental Coordinator, P.O. Box 51718, Irvine, CA 92619-1718 **postmarked no later than May 9, 2002.** Comments may also be sent to Mr. Dunaway by fax [(949) 726-6586] or email [dunawayjt@efdsw.navfac.navy.mil] **no later than May 9, 2002.** The next step in the IRP is the ROD/RAP that formally documents the selected remedy for IRP-3 and IRP-12. A Responsiveness Summary will accompany the ROD/RAP. The Responsiveness Summary will contain responses to comments provided by the public at the public meeting and during the public comment period.

After the ROD/RAP is signed by the BCT members the Remedial Design/Remedial Action phases begin. Remedial design involves developing detailed designs for the selected remedy. Design documents undergo BCT review. Remedial action refers to the construction, testing, and operation of the selected remedy. BCT members also provide oversight during this phase. After the Remedial Design is completed, it will be described in a fact sheet produced for the general public.

Status of Other Installation Restoration Program Activities

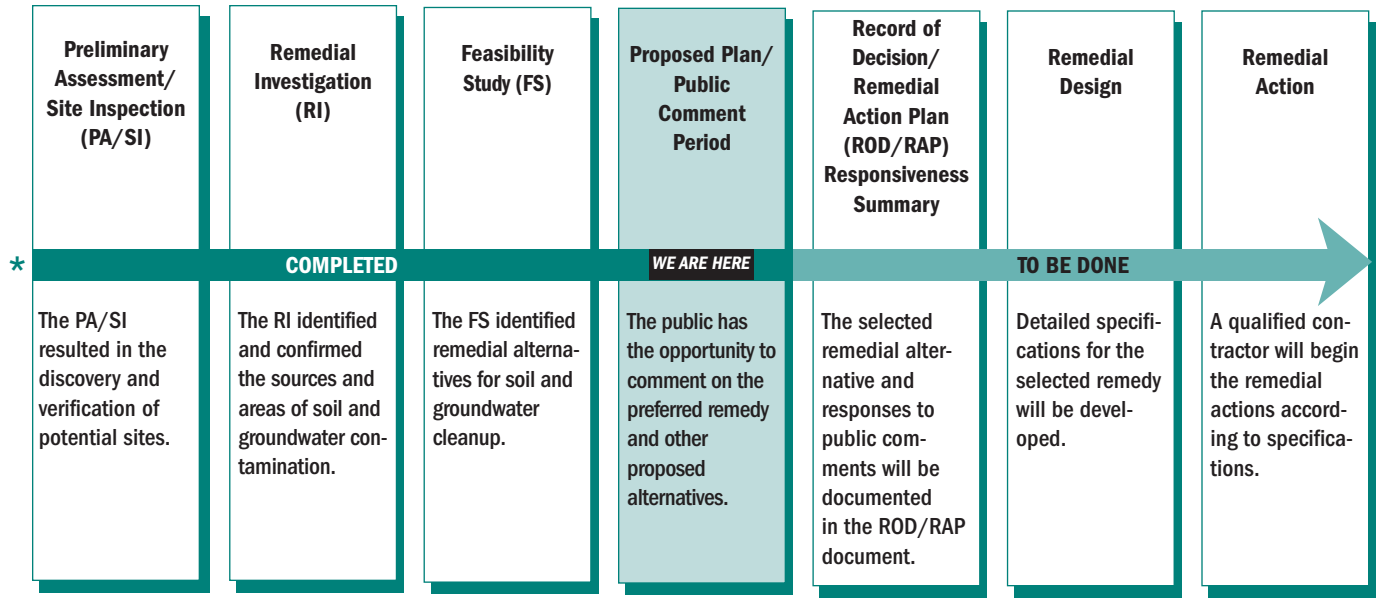
Remediation of contaminated groundwater and soil associated with OU-1B sites IRP-3 and IRP-12 represents a key component of the IRP process at MCAS Tustin. Designed to protect public health and the environment, the IRP provides a detailed process for the Marine Corps to identify, investigate, and implement remedies for contamination that resulted from past operations and waste disposal activities. The IRP effort is being coordinated with the operational closure of the Station that took place in July 1999. The IRP process is shown below. The arrow shows the status of OU-1B.

To effectively manage the overall cleanup effort at MCAS Tustin, IRP sites and AOCs have been organized into five OUs. Each OU represents one component of the comprehensive environmental investigation an cleanup program underway at MCAS Tustin.

- **OU-1A—IRP-13 South**
  A Time-Critical Removal Action and a Petroleum Corrective Action are currently underway to address groundwater contamination in two overlapping plumes at OU-1A and an adjacent underground storage tank site. Both of these actions are interim actions and completion is anticipated to occur in 2003. Development of a final remedial alternative for OU-1A is anticipated to start in 2002.
- **OU-1B—IRP-3 and IRP-12, and four associated AOCs**
  This Proposed Plan focuses on OU-1B.
- **OU-2—IRP Sites 2, 9A/9B, 13E, and nine AOCs**
  Investigation and cleanup of OU-2 is complete. A No Action ROD/RAP was finalized in September 2000.
- **OU-3—IRP-1 (Moffett Trenches and Crash Crew Burn Pits)**
  A Proposed Plan addressing soil and groundwater contamination at OU-3 was issued for public comment in October 1996. However, due to issues with institutional controls, completion of the ROD/RAP has been delayed. The final ROD/RAP was signed by the BCT in December 2001. Major components of the OU-3 remedy include containment, monitoring, and institutional controls.
- **OU-4—IRP Sites 5, 6, 8, 11, 13W, and 16, and six AOCs**
  The Draft OU-4 Focused FS that evaluates five remedial alternatives to address groundwater contamination is currently under review by the BCT. The Final Focused FS is scheduled for submittal in 2003, after completion of additional groundwater monitoring and revision of the human health risk assessment. A Proposed Plan will be developed and issued for public review followed by the ROD/RAP. Both are expected to be finalized in 2003.

Installation Restoration Program Process

The arrow* shows the status of OU-1B sites IRP-3 and IRP-12.



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

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

Chemical-specific—are health- or risk-based numerical values for various environmental media, specified in federal or state statutes or regulations.

Location-specific—address regulations that may require actions to preserve or protect aspects of environmental or cultural resources that may be threatened by remedial actions to be undertaken at the site.

Action-specific—are regulations that apply to specific activities or technologies used to remediate a site, including design criteria and performance requirements.

Potential ARARs that will be met by the preferred remedy (Alternative 7) for cleanup of VOC-contaminated groundwater and soil at OU-1B are listed below.

U.S. ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA)

- The substantive requirements of Title 40 Code of Federal Regulations (CFR) Section 6.301(c); 16 United States Code (USC) Section 469 - 469C-1 [National Archaeological and Historical Preservation Act]; and 16 USC Section 470 aa - 470 mm [Archaeological Resources Protection Act] have been determined to be federal location-specific ARARs. A resources management plan, providing steps for further action and reporting, will be implemented in the event that fossil or archaeological resources are encountered during remedial activities.
- The substantive requirements of Title 36 CFR Part 800; 40 CFR 6.301(b); and 16 USC Section 470 - 470 X-6 [National Historic Preservation Act]; and 16 USC 461 – 467; and 40 CFR 6.301(a) [Historic Sites, Buildings, and Antiquities Act] have been determined to be federal location-specific ARARs. The Department of the Navy will coordinate with the State Historic Preservation Office to minimize impact on historic structures.
- The substantive requirements of Title 40 CFR 6.302(a) [Executive Order 11990, Protection of Wetlands] have been determined to be federal location-specific ARARs. Remedial action will include measures to prevent or mitigate impact to wetlands.
- The substantive requirements of 40 CFR Section 257.3-4 and App. I [Criteria for Classification of Solid Waste Disposal Facilities and Practices] are potential ARARs for use of treated soil as replacement fill on-site.

Substantive requirements of the following provisions of Title 40 CFR pertaining to the protection of inland surface waters and enclosed bays and estuaries have been determined to be federal chemical-specific ARARs for discharge to Peters Canyon Channel:

- National numeric water quality criteria for priority toxic pollutants, "National Toxic Rule" [Section 131.36];
- Numeric water quality criteria for priority toxic pollutants in California, "California Toxics Rule" [Section 131.38].

Substantive requirements of the following provisions of 40 CFR pertaining to maximum contaminant levels (MCLs) and nonzero MCL goals for VOCs have been determined to be federal chemical-specific ARARs for establishing cleanup standards for the plumes:

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

Substantive requirements of the following provisions of Title 22 of the California Code of Regulations (CCR) have been determined to be federal action- or chemical-specific ARARs:

- Determination of RCRA characteristic hazardous waste [Sections 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100(a)(1)];
- Onsite waste generation [Sections 66262.10(a), 66262.11, and 66264.13(a) and (b)];
- Hazardous waste accumulation [Section 66262.34];
- Groundwater protection and vadose zone standards of MCLs for VOCs as determined under Section 66264.94(a)(1), (a)(3), (c), (d), and (e); [Note: The Santa Ana Regional Water Quality Control Board (RWQCB) identified State Water Resources Control Board (SWRCB) Res. No. 92-49 as a groundwater and vadose zone protection standard. The Marine Corps does not agree with the RWQCB because SWRCB Res. No. 92-49 is no more stringent than Title 22 CCR Section 66264.94. However, because the standards are identical in these two regulations and the proposed remedy complies with the standards in both regulations, the RWQCB concurs with the proposed remedy while reserving its legal position]; (c), 66264.97, 66264.98, 66264.100 (a) and (b)];
- Groundwater monitoring [Sections 66264.91(a) and (c), 66264.97, 66264.98, 66264.100(a) and (b)]; and
- Thermal treatment [Sections 66265.370 - 66265.383 except 66265.382].

THE CALIFORNIA EPA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC)

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

- Non-RCRA hazardous waste determinations [Sections 66261.22(a)(3) and (4), 66261.24(a)(2) to (a)(8), 66261.101(a)(1) and (a)(2) and 66261.3(a)(2)(C) or 66261.3(a)(2)(F); and
- State MCL listings for organic chemicals [Section 64444].

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

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

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

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

- The substantive provisions of SCAQMD regulations 401(b)(1)(A), 403, 404,and 405 pertaining to potential emissions of fugitive dusts constitute potential state action specific ARARs. Dust may be generated during excavation in the vadose zone. Preventative measures include wetting of the soil to assure requirements are met.

Substantive provisions of SCAQMD Rules 212, 1303, and 1401 pertaining to equipment standards to control potential air contaminant emissions during thermal desorption of soil also constitute state action specific ARARs. Potential air contaminants may be present in the emissions from the soil treatment system. Therefore, the soil treatment system will be equipped with GAC filters and other best available control technology design to eliminate these emissions.

THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD—SANTA ANA REGION (RWQCB)

Substantive provisions of the following requirements have been determined to be state chemical- or action-specific ARARs:

- Comprehensive Water Quality Control Plan (CWQCP) for the Santa Ana River Basin, 1995, Chapter 2 through 4;
- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, Sections 1-3 and 1-4;
- The substantive provisions of Water Code Section 13240 as implemented through the beneficial use designations and VOC water quality objectives in the CWQCP for the Santa Ana River Basin, 1995;
- State Water Resources Control Board (SWRCB) Resolution No. 88-63; and
- California Water Code, Division 7, Sections 13241, 13243, 13360, and 13263(a) (Porter-Cologne Water Quality Act).
- The Santa Ana RWQCB identified the substantive provisions of the "Statement of Policy with Respect to Maintaining High Quality Waters in California" (SWRCB Res. No. 68-16) as a state ARAR and interprets it as prohibiting further migration of the VOC contaminant plumes in OU-1B; the U.S. EPA and the Marine Corps do not agree that SWRCB Res. No. 68-16 applies to further migration; however, the Santa Ana RWQCB concurs with the proposed remedy and agrees that the preferred remedy will comply with their interpretation of SWRCB Res. No. 68-16 because the MCL line of the VOC plume is not expected to move. The Marine Corps accepts SWRCB Res. No. 68-16 and California Water Code Section 13263 as ARARs for discharge of treated groundwater to surface water.

MAILING LIST COUPON

If you would like to be on the mailing list to receive information about environmental restoration activities at MCAS Tustin, please complete this coupon and mail to: Base Realignment and Closure, Attn: Jerry Dunaway, BRAC Environmental Coordinator, MCAS Tustin, P.O. Box 1718, Irvine, CA 92619-1718

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

❒ Send me information on Restoration Advisory Board membership.

Name _____

Street _____

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City _____

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Affiliation (optional) _____

Telephone _____

For Additional Information

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

Mr. Jerry Dunaway
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Ms. Viola Cooper
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