EPA/ROD/R09-94/119
1994

EPA Superfund
Record of Decision:

FORT ORD
EPA ID: CA7210020676
OU 02
MARINA, CA
08/23/1994

Record of Decision
Operable Unit 2, Fort Ord Landfills
Fort Ord, California

July 15, 1994

United States Department of Army
HQ, U.S. Army Garrison (Fort Ord)
Fort Ord, California 93941

Record of Decision
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Fort Ord, California

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CONTENTS

TABLES

PLATES

APPENDIXES

1.0 DECLARATION

1.1 Site Name and Location

Fort Ord is located near Monterey Bay in northwestern Monterey County, California, approximately 80 miles south of San Francisco. The base comprises approximately 28,000 acres adjacent to the cities of Seaside, Sand City, Monterey, and Del Rey Oaks to the south and Marina to the north. The Southern Pacific Railroad and Highway 1 pass through the western portion of Fort Ord, separating the beach front from the rest of the base. Laguna Seca Recreation Area and Toro Regional Park border Fort Ord to the south and southeast, respectively. Land use east of Fort Ord is primarily agricultural.

1.2 Basis and Purpose

This Record of Decision (ROD) addresses the Fort Ord Landfills, also known as Operable Unit 2 (OU 2), north and south of Imjin Road (see Plate 1). A playing field and roads are located on the landfill north of Imjin Road. The north landfill covers approximately 30 acres, and residences are located nearby. The landfill south of Imjin Road (referred to herein as the main landfill) encompasses approximately 120 acres that have not been developed. This area is covered by uneven sand dunes with grass, shrubs, and bushes.

This decision document presents the selected remedial action for OU 2 and underlying aquifers (upper aquifer and 180-foot aquifer). The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for Fort Ord.

The United States Environmental Protection Agency (EPA) and the California Environmental Protection Agency concur with the selected remedy.

1.3 Site Assessment

Actual or threatened releases of hazardous substances at the Fort Ord Landfills, if not addressed by implementing the response action selected in this ROD, may present a current or future threat to public health, welfare, or the environment.

1.4 Description of the Remedy

The selected remedial alternative described in this ROD addresses current or potential significant risks to human health and the environment posed by OU 2 at Fort Ord, California. The selected remedy will involve the following activities.

- Placement of an engineered cover system over the Fort Ord Landfills to restrict rainfall infiltration and prevent leaching to underlying groundwater of any remaining chemical compounds in waste materials or soil. Deed restrictions would be placed on the property to ensure that the integrity of the cover system is maintained and prevent potential direct exposures of VOCs to the environment or people associated with future use of the site.

- Extraction, treatment, and recharge of groundwater that contains volatile organic compounds (VOCs) from the upper aquifer at, and downgradient of, the Fort Ord Landfills. This action would remove VOCs from groundwater that could pose threats to human health and the environment.

- Extraction, treatment, and recharge of groundwater from the 180-foot aquifer downgradient of the Fort Ord Landfills as an interim action to prevent further migration of VOCs. The final cleanup remedy for the 180-foot aquifer will be addressed in the basewide ROD.

1.5 Statutory Determination

The selected remedy is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements for this action, and is cost effective. The remedy is intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable for the Fort Ord Landfills and underlying upper aquifer. Subsequent actions to fully address potential threats posed by the conditions in areas of the 180-foot aquifer will be presented in subsequent decision documents and/or the final basewide ROD. The remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because the remedy will result in hazardous substances remaining onsite above health-based levels, the 5-year review period will apply to this action.

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2.0 DECISION SUMMARY

2.1 Site Description

Ford Ord located near Monterey Bay in northwestern Monterey County, California, approximately 80 miles south of San Francisco. The base comprise approximately 28,000 acres adjacent to the city of Seaside, Sand City, Monterey, and Del Rey Oaks to the south and Marina to the north. The Southern Pacific Railroad and Highway 1 pass through the western portion of Ford Ord, separating the beach front from the rest of the base. Laguna Seca Recreation Area and Toro Regional Park border Ford Ord to the south and southeast, respectively. Land use east of Ford Ord is primarily agricultural.

2.2 Site History

Since its opening in 1917, Ford Ord has primarily served as a training and staging facility for infantry troops. No permanent improvements were made until the late 1930s, when administrative buildings, barracks, mess halls, tent pads and a sewage treatment plant were constructed. From 1947 to 1975, Ford Ord was a basic training center. After 1975, the 7th Infantry Division (Light) was assigned to Fort Ord. Light infantry troops are those that perform their duties without heavy tanks, armor, or artillery. In 1991, Ford Ord was selected for closure in 1993; the majority of the soldiers were reassigned to other Army posts. Although Army personnel still operate the base, no active army division is currently stationed there.

Both landfills at Ford Ord were used for residential and commercial waste disposal. The north landfill was used from 1956 to 1965. The main landfill was operated from 1960 until 1987 and may have received a small amount of chemical waste along with household and commercial refuse. The main landfill facility stopped accepting waste for disposal in May 1987 because of the initiation of interim closure of the facility.

The disposal methods that were used at the north landfill are unknown but are believed to have been similar to practices used in the main landfill. Waste received at the main landfill facility was placed in trenches approximately 30 feet wide, 10 to 15 feet apart, and 10 to 12 feet below ground surface (bgs). Waste was normally placed in the trenches to a height of approximately 10 feet above the trench bottom and covered with about 2 feet of native dune sand deposits excavated during trenching operations; however, thicker refuse, sections exit within the landfill. Detailed records on the amounts or types of waste disposed of at the landfills are not available; however, information collected during field activities and from other sources indicates that household and commercial refuse, dried sewage sludge, construction debris, and small amount of chemical waste (such as paint, oil, pesticides, electrical equipment, ink, and epoxy adhesive) were placed in the landfill. The composition of the waste is similar to that encountered at any municipal landfill.

2.3 Enforcement and Regulatory History

Environmental investigations began at Ford Ord in 1984 at Fritzche Army Airfield (FAAF) under Regional Water Quality Control Board (RWQCB) cleanup or abatement orders 84-92, 86-86, and 86-3l5. Investigations indicated the presence of residual organic compounds from fire drill burning practices at the Fire Drill Burn Pit(Operable Unit 1 or OU 1). The subsequent Remedial Investigation/Feasibility Study (RI/FS) for OU 1 was completed in 1988, and cleanup of soil and groundwater began under RWQCB cleanup or abatement order 86-87, 88-317, and 88-139. In 1986, further investigations began at the Ford Ord landfill (Operable Unit 2 or OU 2), and the preliminary site characterization was completed in 1988. In 1990, Ford Ord was placed on the EPA's National Priorities List (NPL) primarily because of VOCs found in groundwater beneath OU 2. A Federal Facility Agreement(FFA) was signed by the Army, EPA, the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC; formerly the Toxic Substances Control Program of Department of Health Service or DHS), and RWQCB. The FFA established schedules for commencing remedial investigations and feasibility studies and requires that remedial actions be completed as expeditiously as possible. In

1991, the basewide RI/FS began, and Fort Ord was placed on the Base Realignment and Closure (BRAC) list.

2.4 Highlights of Community Participation

On October 12, 1993, the United State Army presented the Proposed Plan for Operable Unit 2 at Ford Ord to the public for review and comment (Dames and Moore, 1993a). The Proposed Plan presented the preferred alternative and summarized information in the OU 2 RI/FS and other document in the Administrative Record. These document are available to the public at the following locations: Fort Ord Post Library, Building 4275, North-South Road, Fort Ord, California, and Seaside Branch Library, 550 Harcourt Avenue, Seaside, California. The administrative record is available at 1143 Echo Avenue, Suite F, Seaside, California.

Comment on the Proposed Plan were accepted during a 30-day public review-and-comment period that began on October 12 and ended on November 11, 1993. A public meet was held on October 19, 1993, at the Doubletree Hotel, Portola Plaza, in Monterey, California. At that time, the public had the opportunity to ask the Army questions and express concerns about the plan. In addition, written comments were accepted during the public comment period. Responses to the comment received during the public comment period are included in the Responsiveness Summary presented in Section 3.0 of this document.

2.6 Site Characteristics

A basewide RI/FS is under way to evaluate environmental contamination. Within Fort Ord, two Operable Units have been identified for separate, expedited investigation and cleanup: the Fritzsche Army Airfield Site (OU 1) and the Fort Ord Landfills (OU 2). The term "operable unit" refers to specific investigations that address a geographic portion of a site or a specific site problem. The result of the RI at the Ford Ord Landfills indicate that landfill materials were buried in relatively uniform sand dune deposits in shallow trenches approximately 30 feet wide that extend from ground surface to 10 to 12 feet bgs (Plate 2). Soil samples collected below the landfills do not contain chemicals associated with the landfills. Chemicals associated with landfills materials, however, have been detected in soil vapor obtained, from soil overlying the landfills and in groundwater collected from beneath the landfills. The chemicals are believed to have migrated away from the landfilled materials as vapors or as solutes in leachate. Chemicals are present in two groundwater aquifers: the upper aquifer and the 180-foot aquifer (Plate 3). The groundwater in the upper aquifer occurs at approximately 50 to 100 feet bgs; groundwater in the 180-foot aquifer occurs at approximately 100 to 300 feet bgs. Results of the RI indicate that the greatest number of chemicals and highest concentrations were detected in the upper aquifer.

Water in the upper aquifer flows toward the west and the Pacific Ocean. Due to extensive local and regional pumping of water home from the 180-foot aquifer for agricultural and domestic use, the natural flow toward the west is reversed, and water in the 180-foot aquifer flows inland(eastward). Beneath the landfill, the upper and the 180-foot aquifer are separated by an impermeable layer, or aquiclude, known as the Salinas Valley Aquiclude. Near the Pacific Ocean, however, the two aquifer are connected because the aquiclude pinches out in this area. Thus, chemicals in the upper aquifer can or may(over many years) migrate into the 180-foot aquifer.

Trichloroethene (TCE) was the most important chemical detected, in terms of frequency and concentration, in water samples obtained from the upper and 180-foot aquifer. The maximum concentration of TCE detected in water samples obtained during groundwater sampling of the upper aquifer was 80 parts per billion. The highest TCE concentration detected in the 180-foot aquifer was 50 part per billion. The allowable state and federal drinking water standard, known as the Maximum Contaminant Level (MCL), is 5 parts per billion for TCE. In addition to TCE, other VOCs have been detected in groundwater beneath the site, including: tetrachloroethene, benzene, cis-1,2-dichloroethene, and dichloromethane (Table 1).

2.6 Scope and Role of Operable Unit

OU 2 consists of three components: (1) a shallow soil and waste material unit within the landfill areas, (2) the upper aquifer, and (3) the 180-foot aquifer underlying the upper aquifer.

The first component, shallow soil and buried waste materials in the landfill areas, covers a total area of approximately 150 acres (Plate 1). As described above, waste materials were buried in shallow trenches at the main and north landfills. The primary remedial objectives for shallow soil and buried waste at the Fort Ord Landfills are to prevent human exposure to the buried waste, prevent infiltration of rainwater into the contaminated aquifer, and prevent release of methane offgas generated by decomposition of waste in the landfill (if necessary), through collection and treatment.

The second component, the upper aquifer, is not currently used to supply drinking water. It is identified in the Water Quality Control Plan - Central Coast Basin (November 1989) as a potential drinking water source. The upper aquifer is also in hydraulic communication with the underlying 180-foot aquifer, which is a drinking water source. The primary remedial objectives for the upper aquifer are hydraulic control and containment of contaminated groundwater in the upper aquifer, and extraction and treatment of groundwater exceeding aquifer cleanup levels. Remedial actions for the first two components are intended to be final remedial solutions to risks posed by contaminants present within these units.

The remedy for the third component, the 180-foot aquifer, is an interim measure. The remedial objectives for the 180-foot aquifer are protection of drinking water, containment of northeasterly groundwater flow, and removal of water containing the highest concentrations of VOCs. Initial results of the basewide RI indicate that other source areas may impact the 180-foot aquifer, which is used as a drinking water resource. Additional data will be required before a final remedial alternative for the 180-foot aquifer is selected. Selection of the final remedy will also require additional data to determine how saltwater intrusion is related to remediation of the drinking water resources. The final remedial measure for groundwater in the 180-foot aquifer will be established in the final Fort Ord Basewide Record of Decision.

2.7 Summary of Site Risks

As part of the RI, a Baseline Risk Assessment (BRA) was performed (Dames and Moore, 1993b). A BRA is an evaluation of current or future potential health risks and environmental impacts that would be associated with a site were no remedial action taken. Risk assessment calculates potential health risks using mathematical models to evaluate the ways in which humans, or other receptors, are exposed to chemicals at the site, as well as the known toxic effects of the chemicals of concern.

The BRA assumed the following potentially exposed populations: (1) current onsite resident (child); (2) current onsite resident (adult);(3) future onsite resident (assuming that drinking water was obtained from the upper aquifer); and(4) future onsite resident (assuming that drinking water was obtained from the 180-foot aquifer). The evaluations conducted for the BRA were designed to conservatively estimate potential exposures of these hypothetical residents to the chemicals currently present in soil and groundwater. The potential for carcinogenic and other health impacts was also considered. Among the multiple exposure scenarios evaluated in the BRA were: inhalation of chemicals volatilized from groundwater or soil into the air; ingestion of soil; and ingestion and dermal contact with water. These hypothetical exposures were presumed to take place over many years, up to 70 years for humans. The BRA identified TCE as the primary chemical contaminant of concern based on its frequency of detection, concentration, and effects on human health.

As part of the BRA, risks to the environment were evaluated. Although the chemicals detected are toxic to biological receptors such as plant and animals, the limited exposure pathways, relatively low contaminant concentrations, and small area where exposure might occur (in and

immediately surrounding the landfills) indicate a low potential for hazards to wildlife.

Calculations performed in the BRA identified a reasonable maximum exposure that results in the highest calculated increased non-cancer and cancer-related health risks. The hazard index (a measure of non-cancer-related health risks) for all detected chemicals fell below 1.0 for each of the exposure scenarios in the BRA, indicating little likelihood of non-cancer effects at OU 2. The calculations were based on a scenario where children living on the site would use untreated upper aquifer groundwater for many years. Using mathematical models described in the BRA, the highest predicted risk of cancer, if no action were taken at the site, is approximately 2 in 10,000. In other words, if untreated contaminated water were to be used by children over 30 years for drinking and showering/bathing, approximately two additional people out of 10,000 would be at risk of developing cancer.

Thus, if actual or threatened releases of hazardous substances from this site were not addressed by the selected remedy, they might present a potential threat to public health, welfare, or the environment. Under Superfund, remedial action is required for this site because this level of potential risk is above the acceptable risk range.

2.8 Remedial Action Objectives

The remedial action objectives for the shallow soils and waste materials are to restrict rainfall infiltration and prevent leaching to underlying groundwater of VOCs remaining in waste materials or soil and to prevent potential direct exposure to VOCs of the environment or people who use the site in the future.

To protect human health and comply with federal and state law, groundwater must be returned to a condition that will allow beneficial uses to occur, including potential future use as a drinking water source, without unacceptable risks to the users. Thus, the remedial action objectives for groundwater include cleaning the supper aquifer to MCLs or lower, as shown in Table 1. The provisional goals for the interim action in the 180-foot aquifer also include cleaning groundwater to these same levels. Currently, no on- or off-base residents are exposed to TCE, because no one consumes untreated contaminated groundwater and no residents occupy land overlying the landfill.

2.9 Description of Alternatives

The following five remedial alternatives were evaluated in the FS, and Alternatives 1, 3, and 4 were developed for detailed analysis to assess their performance in accomplishing cleanup of groundwater and securing of the landfill. Alternatives 2 and 5 were eliminated in the initial screening of alternatives in the FS and were not retained for further detailed analysis.

2.9.1 Alternative 1 - No Action

Estimated Construction Cost:	$ 0
Estimated Annual Operation and Maintenance (O&M) Cost:	$ 192,000
Estimated Present Worth Cost:	$2,950,000
Estimated Implementation Timeframe:	0 months
Estimated Time for Cleanup:	No removal of contaminants; therefore, remediation by natural process will be very slow.

Alternative 1 assumes current site conditions will be unchanged except for implementation of a groundwater monitoring program to assess movement of the contaminated groundwater plume. The Superfund program requires evaluation of the No Action alternative to provide a baseline for comparison purposes. The No Action alternative relies on natural degradation (chemical reactions or the gradual breakdown of the VOCs by naturally occurring microorganisms) and dispersion processes (the gradual spreading and continual dilution of the VOCs as they mix

with uncontaminated groundwater) to eventually eliminate the contamination. VOC concentration levels are expected to be reduced over many years under this alternative.

2.9.2 Alternative 2 - Containment

Costs for Alternative 2 were not developed because it was eliminated during initial screening of remedial alternatives. This alternative includes containment of groundwater and waste within the present boundaries. Because of the high permeability of the dune sand deposits that underlie most of Fort Ord, rainfall percolates directly into the soil. When the infiltrated water interacts with chemicals in the landfills, the chemicals may be transported into the aquifers below. Providing a cover system over the landfills eliminates water infiltration and direct exposure to the waste. Soil gas beneath the cover system is extracted by means of wells penetrating the cover system, and treated by granular activated carbon (GAC) to remove VOCs. The details of the cover system design depend in part on future land uses. Installation of the cover system involves stripping the landfill surface of the existing vegetation; regrading the remaining sand; covering the surface of the landfill with several layers of soil and impermeable material; and installing the necessary equipment needed for drainage control and, if necessary, irrigation. A conceptual drawing of the cover system is shown on Plate 3.

Construction of the proposed landfill cover system impacts local flora and fauna. Restoration of the original habitat and revegetation, particularly of threatened or endangered species, will be conducted to mitigate the impacts of the cover system construction and is consistent with the Habitat Management Plan (HMP) (Jones and Stokes, 1994). In addition, to minimize impacts to housing north of Imjin Road, the cover system construction includes excavation on the perimeter of the northern portion of the landfill, thereby reducing the area of the cover system. Exact design details regarding the cover system design will be determined in the Remedial Design. Excavated soil and debris (if any) are disposed of in the main landfill area south of Imjin Road prior to covering. The landfill areas are revegetated with native plants or returned to former uses after cover system construction.

Groundwater containment is achieved by installing an extraction well field down gradient of the landfills. A limited number of wells screened in the upper and 180-foot aquifers are used 10 hydraulically contain flow in the aquifers, preventing water in the upper aquifer from leaving the site and reducing flow toward supply wells in the 180-foot aquifer. Based on information generated in the RI, it its believed that several pumping wells in the upper aquifer, and at least one well in the 180-foot aquifer, are required to achieve containment. Proposed extraction well locations are within the boundaries of Fort Ord. If extracted groundwater requires treatment, it would be passed through granular activated carbon (GAC), then recharged to the subsurface or reused. Unlike Alternative 4, described below, Alternative 2 provides only containment without aggressive removal of contaminated groundwater. Alternative 2 was not considered for a detailed analysis because this alternative would most likely neither obtain regulatory approval nor achieve remedial action objectives because it does not comply with ARARs.

2.9.3 Alternative 3 - Upper Aquifer Cleanup and Landfill Covering

Estimated Construction Cost:	$12,750,000
Estimated Annual Operation and Maintenance (O&M) Cost:	$485,000
Estimated Present Worth Cost:	$20,200,000
Estimated Implementation Timeframe:	30 months
Estimated Time for Cleanup:	20 to 40 years

Under this alternative, groundwater extraction wells are screened only in the upper aquifer, and the system is designed to achieve groundwater and chemical removal as well as containment in the upper aquifer. Wells are placed such that the groundwater plume is captured and treated. Up to 10 pumping wells operating at a total of 170 gallons per minute are proposed to achieve containment and removal of chemicals in upper aquifer groundwater. The proposed upper aquifer well field is shown on Plate 4. Under this alternative, no action is taken for the 180-foot aquifer. A cover system on the landfills is installed as described under

Alternative 2.

Under Alternative 3, extracted water is treated to remove VOCs by passing it through GAC, then recharged to the subsurface or reused.

2.9.4 Alternative 4 - Upper Aquifer Cleanup and Landfill Covering-Interim Groundwater Extraction on 180-Foot Aquifer

Estimated Construction Cost:	$12,800,000
Estimated Annual Operation and Maintenance (O&M) Cost:	$485,000
Estimated Present Worth Cost:	$20,250,000
Estimated Implementation Timeframe:	30 months
Estimated Time for Cleanup:	20 to 40 years

This alternative supplements Alternative 3 by including containment of water and chemicals in the 180-foot aquifer by implementing an Interim Action.

In addition to the actions identified in Alternative 3, this alternative includes removal and treatment of groundwater and chemicals from the 180-foot aquifer. The Interim Action generates additional performance data regarding the aquifer's response to pumping and subsequent changes in water quality which would include additional information regarding the impact of other source areas to the 180-foot aquifer and the effect of salt water intrusion on drinking water sources during groundwater remediation. Collection of these data enables final decisions to be made regarding remediation of the 180-foot aquifer. Currently, one well located near the main landfill and pumping at 15 to 25 gallons per minute will be used to extract water from the 180-foot aquifer, in addition to the wells described in Alternative 3 for the upper aquifer. Additional wells may be required in the 180-foot aquifer to provide hydraulic containment. Water from both aquifers is treated using GAC, then recharged to the subsurface, or reused.

2.9.5 Alternative 5 - Upper Aquifer Cleanup and Removal, Treatment, and Disposal of Landfill Waste - Interim Groundwater Extraction on 180-Foot Aquifer

Costs for this alternative were not developed because it was eliminated during initial screening. Groundwater is removed and treated as described in Alternative 4. In addition, the waste from the landfill area is excavated using conventional earth-moving equipment. The excavated waste is then segregated and disposed of appropriately.

Alternative 5 was not considered for a detailed analysis because this alternative is expensive relative to the other alternatives, requires implementation of difficult and unreliable technologies to sort and segregate buried waste materials, and most likely would not obtain community and regulatory acceptance. community and regulatory acceptance.

2.10 Summary of Alternative Comparison

Nine criteria established by CERCLA were used to evaluate the alternatives in the detailed analysis step. The nine criteria encompass statutory requirements and include other technical, economic, and practical factors that assist in comparing the overall feasibility and acceptability of the cleanup alternatives. The nine criteria are summarized as follows:

Overall Protection of Human Health and the Environment. Addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure route are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Addresses whether or not a remedy will meet all of the ARARs or provide grounds for invoking a waiver of the requirements.

Long-Term Effectiveness and Permanence. Refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment after cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume Through Treatment. Evaluates the anticipated performance of the treatment technologies that may be employed in a remedy.

Short-Term Effectiveness. Refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

Implementability. Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the selected solution.

Cost. Evaluates capital and operating and maintenance costs for each alternative by performing present-worth cost analyses.

State Acceptance. Indicates whether, based on its review of the RI/FS reports and Proposed Plan, the state concurs with, opposes, or has no comment on each alternative.

Community Acceptance. Assesses general public response to the Proposed Plan following a review of the public comments received on the RI/FS reports and the Proposed Plan during the public comment period and open community meeting(s).

The selected remedy must meet the first two of the nine CERCLA screening criteria described in Section 2.8 above: protection of human health and the environment as well as compliance with ARARs. The next five criteria are primarily balancing criteria used for comparison with other remedial action alternatives. The final two criteria, state and community acceptance, are used to address the concerns of state agencies and surrounding communities. Remedial action alternatives 1, 3 and 4 discussed above were evaluated on the basis of these criteria in the FS (Dames and Moore, 1993c); Table 2 presents a summary of this evaluation.

2.11 The Selected Remedy

Alternative 4 is the selected alternative based on the assessment in the FS and as summarized in Table 2. Alternative 4 met the first two screening criteria and was judged to be superior in the following three balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume of chemicals
- Short-term effectiveness
- Cost effectiveness

The State of California (Cal/EPA, DTSC and RWQCB) concurs with the selection of Alternative 4. Community acceptance is discussed in the responsiveness summary (Section 3.0). Details regarding soil and groundwater remedial actions under the selected alternative are presented below.

2.11.1 Selected Remedy: Soil Action

The goal of the cover system is to prevent rainwater percolation through the landfills area and into the underlying drinking water aquifers, to collect and remove methane offgas (if necessary), and to prevent exposure of sanitary waste in the landfills to the surrounding environment. The cover system for the OU 2 landfill surface soil and buried waste is driven by ARARs for landfill closure. Institutional control(i.e., deed restrictions) will be placed

on the property to ensure that the integrity of the cover system is maintained and prevent potential direct exposures of VOCs to the environment or people associated with future use of the site.

2.11.2 Selected Remedy: Groundwater Actions

The goal of this remedial action is to restore groundwater to its beneficial use, which is, at this site, as a drinking water source. Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, the Army, EPA, and the State believe that the selected remedy will achieve this goal. The remedy includes institutional controls (i.e., deed restrictions) that prevent the use of groundwater within the contaminant plume for domestic or agricultural purposes. It may become apparent, during implementation or operation of the groundwater extraction system and its modification, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal over some portion of the contaminated plume. In such a case, the system performance standards and/or the remedy may be reevaluated.

The selected remedy will include groundwater extraction for an estimated period of 30 years, during which the system's performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. Modifications may include any or all of the following:

- Discontinuing pumping at individual wells where cleanup goals have been attained
- Alternating pumping wells to eliminate stagnation points
- Pulse pumping to allow aquifer equilibration and to allow adsorbed contaminants to partition into groundwater; and
- Adding additional extraction wells to facilitate or accelerate cleanup of the contaminant plume.

The points of compliance for the remediation goals are any monitoring wells screened in the upper and 180-foot aquifers within the plume area. Remedial Design/Remedial Action documentation will define at what point the remediation goals will be considered to have been attained. To ensure that remediation goals continue to be maintained, the aquifer will be monitored in the vicinity of wells where pumping has ceased until the Army, EPA, and the State agree that cleanup is complete.

Remediation goals for chemicals present in contaminated groundwater are either based on ARARs or on values determined by the BRA and are presented in Table 1.

The estimated total aggregate excess cancer risk for all chemicals at their respective remediation goals is 6 x 10-5. This cumulative risk is within acceptable range, and is health protective.

2.12 Statutory Determinations

The selected remedy meets the requirements of Section 121 of CERCLA to:

- Be protective of human health and the environment
- Comply with ARARs
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable

- Satisfy the preference for treatment that reduces toxicity, mobility, and/or volume as a principal element

- Be cost effective.

2.12.1 Protection of Human Health and the Environment

The selected remedy provides the greatest degree of protection for both human health and the environment. Implementation of the selected remedy includes groundwater containment and aggressive-removal of contaminants from the upper aquifer, and containment of contaminants from the 180-foot aquifer as the Interim Action. Extracted groundwater from both affected aquifers will be treated by GAC. Treated groundwater will be discharged to the upper and/or 180-foot aquifers by means of recharge systems or reused at the surface. The landfill will be closed in place and covered to eliminate water infiltration and direct exposure to the waste. In addition, a vapor control system will be included, if necessary, in the final cover system design (Plate 3).

Implementation of the selected remedy may make short-term impacts on the surrounding environment. An ecological survey of the OU-2 landfills area was presented in the Flora and Fauna Baseline Study of Fort Ord (Jones and Stokes, 1992). Excavation activities for the landfill may disturb local flora and fauna. Other potential short-term environmental impacts from this alternative include noise and dust from construction activities. Mitigation measures will be established in the Remedial Design phase of this project to minimize potential short term impacts to the surrounding environment, and will comply, at a minimum, with mitigation measures described in the HMP.

2.12.2 Compliance with ARARs

The selected remedy complies with ARARs.

ARARs are "applicable" or "relevant and appropriate" requirements that the Army is required to comply with. The categories of ARARs are: action-specific, chemical-specific, and location-specific. Action-, chemical-, and location-specific ARARs for the selected alternative are presented in Appendix A. In addition to complying with ARARs, the Army has the discretion to consider guidance and health advisories as "to-be-considered" (TBC) requirements. Those TBCs that the Army selects become performance standards that must be complied with.

2.12.3 Cost Effectiveness

The selected remedy is a cost-effective solution for reducing risks to human health and the environment. The estimated net present value for the No Action alternative (Alternative 1) is approximately $2.95 million. The estimated cost of the selected remedy is approximately $20.2 million, which is commensurate with the higher level of protection of human health and the environment. The cost is approximately equal to the estimated cost for Alternative 3, although the selected alternative yields a greater level of protection of human health and the environment than Alternative 3.

2.12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies

The selected remedy uses permanent solutions, alternative treatment technologies, and resource recovery technologies to the maximum extent practicable. Landfill covering in place is similar in permanence to removing the waste to another landfill that would subsequently be covered. RI data do not indicate that methane generated by the landfill waste is of sufficient quantity to warrant resource recovery.

Removal of VOCs from groundwater is permanent and recharge of treated groundwater to affected aquifers or surface reuse represents resource recovery. Groundwater extraction and treatment of the 180-foot aquifer, however, is not considered the final remedy for this aquifer. This

groundwater extraction will generate additional performance data regarding the 180-foot aquifer's response to pumping and subsequent changes in water quality. Collection of these data will enable decisions to be made regarding the selection and implementation of a final remedy for the 180-foot aquifer. Because a final remedy regarding the 180-foot aquifer is not the subject of this ROD, its remedy will be specifically addressed in a subsequent decision document or the basewide ROD. The decisive factors in selection of this remedy are compliance with ARARs and protection of human health and the environment.

2.12.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element in addressing the human health and environmental threats posed by the Fort Ord Landfills. The principal environmental threat identified during the RI is posed by VOCs in groundwater. The selected alternative treats extracted groundwater, thereby removing the VOCs and reducing potential risks to human health and the environment. VOCs will also be removed from the vapor phase via the vapor control system.

Treatment would not be practical for buried landfill materials because the waste contents are of large volume, very heterogeneous and difficult to separate. The buried waste is similar to waste found at a sanitary landfill. Many wastes in the landfill have no suitable treatment technologies other than disposal at another landfill.

2.13 Documentation of Significant Changes

As described in the Responsiveness Summary(Section 3.0), the Proposed Plan for OU 2 was released for public comment on October 12, 1993, and a public meeting was held on October 19, 1993. This Proposed Plan identified upper aquifer cleanup and landfill covering with interim groundwater extraction on the 180-foot aquifer as the selected remedial response action.

Comments collected over the 30-day public review period between October 12 and November 11, 1993, did not necessitate any significant changes to the conclusions or procedures outline the OU 2 Feasibility Study and Proposed Plan.

3.0 RESPONSIVENESS SUMMARY

3.1 Overview

At the time of the public review period for the Army's Remedial Investigation/Feasibility Study and Proposed Plan for the Fort Ord Landfills, the Army identified a preferred remedial alternative. The preferred remedial alternative consisted of upper aquifer cleanup and landfill covering with interim action on the 180-foot aquifer. This remedial alternative was selected on the basis of an evaluation of five remedial alternatives.

On the basis of the written and verbal comments received, the Army's Proposed Plan was generally accepted by the public. However, several citizens expressed concern over the identification of the preferred remedial alternative. In particular, these individuals stated that they felt the Army had not fully characterized the landfill contents. These individuals also stated that the landfill should be excavated and moved to another location given that Fort Ord is a closing installation. In addition, a number of parties commented on the conceptual design of the landfill cover system.

3.2 Background on Community Involvement

Community involvement in decisions regarding the Fort Ord Landfills was minimal until Fort Ord was added to the National Priorities List (NPL) in 1990. Environmental investigations at the Fort Ord Landfills had been ongoing since 1986 with regulatory agency coordination conducted at quarterly meetings held at Fort Ord. Potential contamination of nearby City of Marina water supply wells was a major contributing factor to listing the entire Fort Ord base on the NPL.

In 1991, Fort Ord was added to the Department of Defense Base Realignment and Closure (BRAC) List. The economic impact of Fort Ord's imminent closure has created much community interest relative to the potential economic reuse of portions of Fort Ord. Specifically, the Fort Ord Landfills are under consideration for reuse by the Ford Ord Reuse Group (FORG) and other interested parties. Focused community involvement in the Fort Ord Landfills has most recently involved the public review of the Army's Remedial Investigation/Feasibility Study and Proposed Plan for the Fort Ord Landfills. The public comment period began October 12, 1993, and closed November 11, 1993. A public meeting was held on October 19, 1993, to present the Army's Proposed Plan to the public. This responsiveness summary responds to written comments received during the public comment period as wel1 as verbal comments expressed during the public meeting.

3.3 Summary of Comments Received During the Public Comment Period and Department of the Army Responses

Comments raised during the Fort Ord OU 2 Proposed Plan public comment period are summarized below. The comments received from the comment period are categorized by relevant topics.

3.3.1 Remedial Alternative Preference.

- Several interested parties were concerned that Alternative 4 was not the best choice of alternatives.

Department of the Army Response: All alternatives were evaluated against the National Contingency Plan's (NCP) nine criteria for the evaluation of remedial alternatives. Of all the remedial alternatives, Alternative 4 was selected as being the best alternative. The EPA, DTSC, and RWQCB concurred with the selection of Alternative 4 as the best alternative.

The nine criteria used for the evaluation of remedial alternatives are as follows:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance.

These criteria are discussed in Section 2.10, and a summary of the evaluation of alternatives is presented in Table 2.

- Several interested parties expressed the concern that Alternative 5, (excavation of landfill contents) or a combination thereof with Alternative 4, would be a better remedial alternative.

Department of the Army Response: The excavation and segregation of the landfill waste as described in Alternative 5 is extremely difficult because of the nature and volume of the waste. The health and safety hazards would be particularly significant, especially potential biohazards associated with exposing landfill waste. Segregation of waste, dust and leachate controls, and impacts to native plant and animal life make this alternative difficult to implement. The volume of waste generated would be enormous, and would require removing significant amounts of native soil because the waste would be difficult to segregate. Excavated soil would require analytical testing, and then transfer to a landfill in some other location. Additionally, this alternative would also be prohibitively expensive. This alternative does not correspond with agency and regulatory preferences for "onsite" solutions rather than "offsite" solutions which transfer environmental problems or risks to another area.

3.3.2 Technical Questions/Concerns Questions/Concerns Regarding Remedial Alternatives

- Several interested parties were concerned about the design of the landfill.

Department of the Army Response: The Proposed Plan presented a conceptual design for the landfill cover system that was not intended to be a final design. The final design will be prepared under the direction of registered engineers and reviewed by appropriate regulatory agencies and the Restoration Advisory Board (RAB). The final design will meet all applicable requirements and address the following concerns expressed by interested parties:

- Ability of the landfill to support deep rooted native vegetation
- Ability of the landfill to withstand natural disasters such as earthquakes on the basis of strength, stability, and sealing potential of the landfill cover system
- Ability of the landfill design to accommodate stormwater runoff
- Ability of the landfill cover system to support reuse (restrictions) without further risk of endangerment to human health and the environment
- Ability of the remedial action to reasonably eliminate the risk of human/environment and contaminant exposure paths, especially in areas adjacent to housing areas and Imjin Road.
- Ability of the landfill design to control and reuse any generated methane
- Ability of the landfill design to prevent existing vadose zone water from percolating to groundwater

- Interested parties expressed concern about the characterization of the landfill contents and the soil beneath the landfill; specific concerns were as follows:

- The Monterey County Department of Health expressed concern that the characterization of unsaturated soil below the landfill was based solely on soil gas testing and not on soil chemical analyses

Department of the Army Response. The characterization of unsaturated soil below the landfill was based on both soil gas testing and soil chemical analyses. Approximately 330 soil gas samples and 220 soil samples were collected for characterization. In addition, six test pits were completed within the landfill area as part of the site characterization activities.

- A concerned citizen stated that "it is imperative that our community knows exactly what waste materials are present within the landfill." This citizen also expressed concern about 90,000 unaccounted-for chemical weapon vials buried at Fort Ord.

Department of the Army Response: The characterization of landfill waste materials was performed in accordance with work plans reviewed and approved by the United States Environmental Protection Agency and the California Environmental Protection Agency. The characterization of the landfill waste materials utilized a number of investigation methods as listed below:

- Soil gas sampling

- Soil chemical sampling

- Test pits to characterize waste materials

- Geophysical surveys to define the extent of waste materials.

Soil gas and soil samples were analyzed for a comprehensive list of organic and inorganic chemicals.

The Army has conducted a comprehensive archival search of the possible use of chemical weapons at all Army installations within 33 states, including California. This archival search is documented in a report prepared by the U.S. Army Chemical Material Destruction Agency (USACMDA) entitled "Non-Stockpile Chemical Material Program, Survey and Analysis Material Program, Survey and Analysis Report," dated November 1993. This report indicates that the only known chemical agent-related activity conducted at Fort Ord was the use of Chemical Agent Identification Sets (CAISs) The CAISs were reportedly used at Fort Ord prior to 1974 for "field training of troops at a site just off 10th Street Gate Road past the landfill area off Imjin Road." In 1974, four CAISs in the Fort Ord inventory were removed from the installation and transported to Edgewood Arsenal, Aberdeen Proving Ground and were later sent to Rocky Mountain Arsenal for destruction. To date, however, environmental site characterizations at 43 environmental restoration sites, including the Fort Ord Landfills, have not indicated the presence of CAISs. The report indicates that there is no known need for chemical agent remediation at Fort Ord and that Fort Ord is not believed to present any immediate threat to human health or safety due to chemical agents.

• Several interested parties expressed concerns about cleanup of the various aquifers underlying the landfill; according to expressed concerns, the cleanup should:

  - Include injection/recharge into the 180-foot aquifer of some of, if not all of, the extracted and treated groundwater

  - Identify the number of wells required for containment in the 180-foot aquifer

  - Address short-term reduction of groundwater pumping due to base the closure, pumping from the 400-foot aquifer, or other influences that may alter groundwater gradients and flow.

Department of the Army Response: The Department of the Army has undertaken additional pre-design analyses to obtain more information required to design the groundwater extraction, treatment, and reinjection system. The Proposed Plan presented a conceptual design that was not intended to be a final design. The final design will be prepared under the direction of registered engineers and geologists and reviewed by the regulatory agencies and the RAB. The final design will meet all applicable requirements and address the concerns expressed by interested parties.

In addition to the pre-design analyses, the Department of the Army is conducting basewide remedial investigations. The final remedy for the 180-foot aquifer will be identified as part of the basewide Feasibility Study, Proposed Plan, and Record of Decision. The final basewide Proposed Plan will describe the remediation schedule and final remedy for cleanup of the 180-foot aquifer.

3.3.3 Costs/Funding Issues

- Interested parties inquired about the cost for the implementation of Alternative 5 - Upper Aquifer Cleanup and Removal, Treatment, and Disposal of Landfill Waste - Interim Groundwater Treatment on 180-Foot Aquifer.

Department of Army Response: Costs for the implementation of Alternative 5 were not estimated because this remedial alternative was screened from further detailed analysis in the Feasibility Study due to uncertain regulatory and community acceptance, engineering problems, and high costs. A qualitative evaluation of the cost for Alternative 5 indicated extremely high costs for its implementation relative to other remedial action alternatives.

A local Monterey area newspaper estimated cost for Alternative 5 to be approximately $700 million based on extrapolation from figures provided in an interview with Harvey Don Jones, U.S. Army Corps of Engineers. In an interview following the public meeting on October 19, 1993, Mr. Jones stated that the estimated cost for the excavation of a 15-acre landfill in northern California was $70 million in 1985. The newspaper reporter apparently assumed that the cost for the Fort Ord Landfills (150 acres) would be approximately 10 times that of the 15-acre landfill because it covers approximately 10 times the area. The Army believes that this extrapolation is not realistic and the costs for excavation of the landfills area would be significantly higher and prohibitively expensive.

3.3.4 Enforcement

- One individual recommended that a civilian committee be established to monitor ongoing environmental restoration activities at Fort Ord.

Department of the Army Response: Since first being placed on the National Priorities List (Superfund) in February 1990, Fort Ord has had an active Technical Review Committee (TRC) as required by 10 USC Section 2705(c). The responsibility of this committee is to oversee environmental restoration activities at Fort Ord. This committee is comprised of representatives from the Army; representatives of federal, state, local regulatory agencies; and a designated civilian representative selected by the Association of Monterey Bay Area Governments.

As of July 1993 and the announcement of the President's five-point plan to speed economic recovery of communities at closing bases, the Restoration Advisory Board (RAB) is required Restoration Advisory Board (RAB) is required for base realignment and closure activities. The RAB will comprise representatives from the Department of Defense (DOD) component, EPA, State representatives, and members of the local community. The RAB will be jointly chaired by an Army representative and a member of the local community and will also meet the requirement of 10 USC Section 2705(c). The function of the RAB will be to (1) act as a forum for discussion and exchange of cleanup information between government agencies and the public, (2) conduct regular meetings open to the public at convenient times, (3) keep meeting minutes and have them available to the public, (4) develop and maintain a mailing list of addresses and names of those who wish to receive information on the environmental restoration program, (5) review

and evaluate environmental restoration documents, (6) identify environmental restoration requirements, (7) recommend priorities among sites or projects, and (8) identify applicable standards and proposed cleanup levels that are consistent with Section 121 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as well as with planned land use.

The initial RAB establishment meeting for Fort Ord was held February 7, 1994.

3.4 Remaining Concerns

A number of concerns raised by the public remain to be addressed as part of remedial design. These concerns include:

- The design of the landfill cover system as discussed in Section 3.3.2.
- The ability of the groundwater extraction and treatment system to effectively contain and remediate contaminated groundwater without exacerbating saltwater intrusion problems.

These remaining concerns are considerations that will be incorporated into the Army's remedial design. The associated remedial design documents will be reviewed by the regulatory agencies, the RAB, and will be available for public review prior to implementation of remedial actions.

4.0 REFERENCES

Dames and Moore, 1993a. Final Remedial Investigation Report. D&M Job No. 13846-007-043. Prepared for the U.S. Army Corps of Engineers, Omaha District under Contract No. DACA45-89-C-0529. June.

_____, 1993b. Baseline Risk Assessment. D&M Job No. 13846-007-043. Prepared for the U.S. Army Corps of Engineers, Omaha District under Contract No. DACA45-89-C-0529. June.

_____, 1993c. Final Feasibility Study Report. Remedial Investigation and Feasibility Study, Fort Ord Landfills, Fort Ord, California. Prepared for Omaha COE. October 1.

_____, 1993d. Proposed Plan for the Final Feasibility Study Report, Remedial Investigation and Feasibility Study, Fort Ord Landfills, Fort Ord, California. "U.S. Army Proposes Cleanup Plan for the Landfills Site at Fort Ord, California." Prepared for Omaha COE. October 12.

Jones and Stokes, 1992. Draft Flora and Fauna Baseline Study of Fort Ord, California, Prepared for Omaha COE, July 1992.

Jones and Stokes, 1994. Installation-Wide Multispecies Habitat Management Plan for Fort Ord, California, Prepared for Sacramento COE, February, 1994.

U.S. Army Chemical Material Destruction Agency, 1993. Non-Stockpile Chemical Material Program, Survey, and Analysis Report. November.

TABLES

Table 1. Chemicals of Concern, Remediation Goals, and Discharge Limits
Record of Decision
Operable Unit 2, Fort Ord Landfills
Fort Ord, California

Chemical of Concern	Federal MCL (ppb)	State MCL (ppb)	Maximum Chemical Concentration Detected (ppb)	Aquifer Cleanup Levels (ppb)	Discharge Limited for Treated Water (ppb)
Benzene	5.0	1.0	2.6	1.0	0.5
Carbon Tetrachloride	5.0	0.5	0.7	0.5	0.5
Chloroform	100	_	16.0	2.0a	0.5
1,1-Dichloroethane	-	5.0	12.0	5.0	0.5
1,2-Dichloroethane	5.0	0.5	6.9	0.5	0.5
cis-1,2-Dichloroethene	70.0	6.0	54.0	6.0	0.5
1,2-Dichloropropane	5.0	_	8.6	1.0a	0.5
Dichloromethane	5.0b	-	130.0	5.0	0.5
Tetrachloroethene	5.0	5.0	8.2	3.0a	0.5
Trichloroethene	5.0	5.0	80.0	5.0	0.5
Vinyl chloride	2.0	0.5	8.0	0.1a	0.1

a Aquifer cleanup goals lower than federal or state MCL selected based on risk calculations in Baseline Risk Assessment (Dames and Moore, 1993b). The estimated combined excess cancer risk from exposure to all chemicals at the levels listed in Table 1 is 6 x 10-5. This cumulative risk is within the acceptable risk range, and is health protective.

b The federal MCL for dichloromethane became effective January 17, 1994 (57FR31838).

Table 2. Evaluation of the Preferred Alternative
Operable Unit 2, Ford Ord Landfills
Ford Ord, California

Remedial Alternatives Retained for Detailed Analysis in the FS	EPA Evaluation Criteria							
	Protection of human health and the environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, and volume or mass through treatment	Short-term effectiveness	Implementability (technical and administrative)	Present worth cost	State and community acceptance
Alternative 1: No Action	This alternative will not effectively protect human health and the environment.	State law and policies for restoration of degraded water not met. Eventual compliance, over very long timeframe, with chemical-specific ARARs.	Risk will remain until natural degradation occurs.	No active reduction of toxicity, mobility volume or mass of contaminants.	No short-term effects on humans of the environment. Remedial action objects (RAOs) will not be achieved for a long time.	Easily implementable	Total present worth $2,950,000	Not likely to be acceptable to agencies or the public - does not remediate contamination nor protect human health or the environment.
Alternative 3: Upper Aquifer Cleanup and Capping - Construction of cover system over the landfill - Estimated 6 extraction installed in Upper Aquifer - GAC treatment and disposal by uppermost aquifers.	Human health protected by cover system and extraction wells. Some worker exposure during cover system construction. Impacts to environment during construction, requiring mitigation. Lack of action on the 180-foot aquifer represents a residual risk to users.	For the upper aquifer, will achieve compliance with chemical and action-specific ARARs, including waste manage-ment and effluent disposal. For the 180-foot aquifer, eventually compliance over a very long timeframe, with chemical-specific ARARs.	Cover system reduces risk from landfill waste. Reduces risks associated with upper aquifer groundwater only. 180-foot aquifer risk will remain until natural degradation occurs.	Cover system reduces mobility of landfill waste but not toxicity or volume. Upper aquifer contamination aggressively reduced. 180-foot aquifer contamination not actively reduced.	Impacts to environment during construction requiring mitigation. Workers will require protective measures.	Implementable.	Total present worth $20,200,00	Generally acceptable; see responsiveness summary.

Table 2. Evaluation of the Preferred Alternative
Operable Unit 2, Ford Ord Landfills
Ford Ord, California

	EPA Evaluation Criteria							
Remedial Alternative Retained for Detailed Analysis in the FS	Protection of human health and the environment	Compliance with ARARs	Long term effectiveness and permanence	Reduction of toxicity, mobility and volume or mass through treatment	Short-term effectiveness	Implementability (technical and administrative)	Present worth cost	State and community acceptance
Alternative 4: Cleanup and Capping - Cover system - Estimated 6 extraction wells screened in upper aquifer - Estimated 1 extraction well screened in 180-foot aquifer - GAC treatment and disposal by recharge to uppermost aquifers	Most effective in protecting human health and environment through remediation of upper and 180-foot aquifers and capping of waste. Some workers exposure during cap construction and impacts to environment, requiring mitigation. 180-foot aquifer interim action remedy will meet interim goals. Final goals for environmental protection will be established in subsequent decision documents.	Will achieve compliance with chemical and action-specific ARARs, including waste manage-ment and effluent disposal.	Reduces risk associated with both Upper and 180-foot aquifers. Cover system reduces risk from landfilled waste. Provides most effective long-term control.	Cover system reduces mobility of landfill waste but not toxicity or volume. Most effective reduction for both upper and 180-foot aquifers.	Same general short-term risks as Alternative 3. Time to achieve RAOs may be reduced by active 180-foot aquifer remediation.	Implementable. Slightly more complex technically due to greater number of wells and addition of deeper wells.	Total present worth $20,250,000	Generally acceptable; see responsiveness summary.

PLATES

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APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE SELECTED ALTERNATIVE

APPENDIX A

CONTENTS

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE SELECTED ALTERNATIVE

The promulgated standards described below are chemical-, location-, and action-specific ARARS for the selected alternative, Upper Aquifer Cleanup and Landfill Covering with Interim Groundwater Extraction on the 180-foot aquifer. The standards described below are "applicable," or "relevant and appropriate," or "To Be Considered (TBCs)" for groundwater and landfill remediation. These standards are designed to be protective of human health and the environment and to be technically achievable with existing analytical and treatment technologies.

A1.0 GROUNDWATER CHEMICAL-SPECIFIC ARARS

Federal Chemical Specific ARARs

- National Primary Drinking Water Standards (40 CFR Part 141)
  (Source: Safe Drinking Water Act, 40 U.S.C. §300)

Chemical-specific drinking water standards which contain Maximum Contaminant Levels (MCLs) have been promulgated under the Safe Drinking Water Act (SDWA). Drinking-water goals (MCLGs) also have been promulgated under the SDWA. MCLGs above zero are considered chemical-specific ARARs under the NCP (40 CFR 300.430[e][2][i][B]). When MCLGs are equal to zero (which is generally the case for any chemical considered to be a carcinogen), the MCL is considered to be a chemical-specific ARAR, instead of the MCLG (40 CFR 300.430[e][2][i][C]). These requirements are considered relevant and appropriate. Table 1 lists national primary drinking water standards (federal MCLs) for chemicals detected in groundwater during the Operable unit 2 Remedial Investigation.

State Chemical-Specific ARARs

- State Primary Drinking Water Standards (California Code of Regulations [CCR] Title 22, Section 64435)
  (Source: California Safe Drinking Water Act, H&S Code, Div. 5, Part 1, Chapter 7, Sec. 4010)

California primary drinking water standards establish enforceable limits for chemicals that may affect public health or the aesthetic qualities of drinking water. However, only those State requirements that are more, stringent than federal standards are ARARs, and in this case, relevant and appropriate. These requirements (state MCLs) are summarized in Table 1.

A2.0 SOIL CHEMICAL-SPECIFIC ARARs

No ARARs for soil cleanup levels have been promulgated by EPA or the State of California for chemicals of concern at this site. If necessary, soil cleanup levels may be derived from the results of the Risk Assessment.

A3.0 LOCATION SPECIFIC ARARS

No special resources such as wetlands or other environmentally or historically sensitive locations have been identified near the landfills by investigations performed during the RI and Risk Assessment. Certain endangered plant species, such as the sand gilia and the monterey spineflower, have been identified as occurring at Fort Ord by Jones & Stokes (Jones & Stokes, 1992).

Federal Location Specific ARARs

- Endangered Species Act, 50 CFR Part 402
  (Source: 16 U.S.C. 1531)

The Act requires action to conserve endangered species and critical habitats upon which endangered species depend. Consultations with the U.S. Fish and Wildlife Service will be

necessary to achieve compliance. This requirement is applicable.

State Location-Specific ARARs

- Fish and Game Code, Chapter 15, Article 15, Section 2090

The Code contains a requirement to obtain written findings from the state Department of Fish and Game regarding the impact of disturbances on the viability of an endangered population. This requirement is relevant and appropriate.

A4.0 ACTION-SPECIFIC ARARS

Action-specific ARARs and determinations of whether requirements are "applicable" or "relevant and appropriate" are noted in the following paragraphs. In addition, the action with which each ARAR is concerned is noted in the following text.

Federal Action-Specific ARARs

- Underground Injection Control (UIC) (40 CFR 144.12; 144.26-27)
  (Source: Safe Drinking Water Act, 42 U.S.C. 300)

The UIC regulations require inventories and monitoring of recharged water and require that recharged fluids not contain concentrations of chemicals that exceed MCLs. These requirements are applicable to any alternative involving recharge of treated groundwater. Additionally, if reinjection standards under the State's Antidegradation Policy, Resolution No. 68-16, provide more stringent requirements, these requirements would be applicable.

- National Pollutant Discharge Elimination System (NPDES) Permit (40 CFR 122)
  (Source: Clean Water Act, 33 U.S.C. 1251)

NPDES permit requirements and standards must be met for effluent discharges to surface water. The effluent limitations and monitoring requirements of an NPDES permit legally apply to point source discharges such as those from a treatment system with an outfall to surface waters. If the selected alternative results in a discharge to surface waters, compliance with NPDES requirements must be achieved. To maximize opportunity for effective management of treated water and minimize chemical concentrations in discharges, the Army proposed that concentrations of volatile organic chemicals in treated water discharged to the surface will be "not detectable" as measured by EPA Method 502.2, as shown in Table 1.

- Criteria for Municipal Solid Waste Landfills 40 CFR Part 258, Subpart D
  (Source: Resource Conservation and Recovery Act [RCRA], 42 U.S.C. 6901)

These regulations became effective October 9, 1993, and are therefore not applicable to the Fort Ord Landfills. While these regulations may be relevant and appropriate, state requirements provided in Title 14 and Title 23 (described in more detail below) for closure of landfills are more stringent than Subpart D closure requirements and are also included as ARARs in this section.

- National Primary and Secondary Ambient Air Quality Standards (NAAQS), 40 CFR 50
  (Source: Clean Air Act, 42 U.S.C. 7409, 7601.)

Section 109 of the Clean Air Act, defines National Primary and Secondary Ambient Air Quality Standards (NAAQS), which are listed in 40 CFR 50. Under certain circumstances, such as particulate matter generated during construction, these standards may be applicable.

- RCRA Regulations

Because California is authorized to administer the RCRA program, State RCRA regulations cited in CCR Title 22, listed below, are considered federal requirements.

- Health and Safety Standards for Management of Hazardous Waste, CCR Title 22, Divisions 4.5, Chapter 14, Article 9, Sections 66264.170-178

These standards apply to owners and operators who store hazardous waste for longer than 90 days in containers. They cover use and management of containers, containment, inspection, and closure. These standards may be applicable to spent carbon drums that are stored awaiting offsite regeneration if they contain hazardous levels of VOCs. These standards are relevant and appropriate.

- CCR Title 22, Division 4.5, Article 16, Sections 66264.600-603

Applies to owners and operators of facilities that treat, store, or dispose of RCRA hazardous waste in miscellaneous units. Carbon canisters used for groundwater treatment are considered miscellaneous units. Covers environmental performance standards, monitoring, inspections, and post-closure care. These standards are relevant and appropriate.

- Hazardous Waste Landfill Closure Requirements CCR Title 22; Chapter 14, Article 6; Chapter 15, Articles 6, 7, 11, and 14

Title 22 provides for comprehensive regulation of hazardous waste management, including generation, transportation, storage, and disposal of hazardous wastes and applies to landfills that accepted hazardous waste after November 19, 1980.

Title 22 requirements pertaining to landfill closure and post-closure care are not applicable because there is not documented evidence that hazardous waste was ever disposed of in the landfills. In addition, physical evidence collected during the remedial investigation supports the view that the landfills were used for disposal of inert construction materials and household-type wastes only. If hazardous waste had been disposed of at the landfills, then usually higher concentrations of pollutants would be observed in groundwater, soil, and soil gas at the site. The levels detected are consistent with levels detected near municipal landfills throughout California. Because no throughout California. Because no documentation or physical evidence of past hazardous waste disposal exists, Title 22 requirements dealing with hazardous waste landfills (closure and post closure care, groundwater monitoring, and corrective action programs) are not applicable to closure of the Fort Ord Landfills.

Title 22 provides for comprehensive regulation of hazardous waste management, regulation of hazardous waste management, including generation, transportation, storage, and disposal of hazardous wastes and applies to landfills that accepted hazardous waste after November 19, 1980

Furthermore, Title 22 closure requirements are not relevant and appropriate to landfill closure based on site-specific conditions because the waste is generally of low toxicity because the waste is generally of low toxicity and the contamination is dispersed over a large area that bears little resemblance to the discrete units regulated under RCRA, and such regulations would not be appropriate.

However, other sections of Title 22 dealing with the management of hazardous waste are applicable. Adsorbents and other solid materials used for treatment of water containing VOCs, such as activated carbon, will contain the chemicals after use, and may be hazardous waste. Title 22 regulations pertaining to the treatment, storage, or disposal of such hazardous wastes will be applicable to the extent that wastes are managed on site.

- National Pretreatment Standards, 40 CFR Part 403-S
  (Source: Federal Water Pollution Control Act, as amended by the Clean Water Act)

Allows municipalities to determine pretreatment standards for publicly owned treatment works (POTWs) within its jurisdiction. These standards are ARARs only if treated or untreated groundwater is discharged to a POTW. Conceptual groundwater treatment system designs, however, anticipate reusing treated groundwater, or returning it to the aquifer using surface infiltration.

- Monterey Regional Water Pollution Control Regulations
  (Source: Clean Water Act 40 CFR 403.5)

The requirements of the Clean Federal Water Act pretreatment standards are ARARs for discharge of groundwater to the local sanitary sewer system. The Act allows municipalities to determine pretreatment standards for discharge to Publicly Owned Treatment Works (POTWs) within its jurisdiction. The Monterey Regional Water Pollution Control Agency sets forth standards for monitoring and reporting, along with effluent quantity and discharge concentration limits.

State Action-Specific ARARs

- Water Quality Control Plan, Central Coast Basin
  (Source: Porter-Cologne Water Quality Control Act, California Water Code, Sections 13164, 13170, 13240, 13241)

The Basin Plan establishes numerical and narrative water quality standards. The Plan also contains requirements for implementation plans or action plans for attaining compliance with these standards. The requirements of the Basin Plan are applicable to groundwater remediation activities. Each Regional Board promulgates and administers a Water Quality Control Plan for ground and surface water basin(s) within its region. The State Board also promulgates statewide water quality control plans that the regional boards administer. The Plans establish water quality standards (including beneficial use designations, water quality objectives to protect these uses, and implementation programs to meet the objectives) that apply statewide or to specific water basins.

- State Water Resources Control Board Antidegradation Policy, Resolution No. 68-16
  (Source: Porter-Cologne Water Quality Control Act, California Water Code, Sections 13164, 13170, 13240, 13241)

The State Water Resources Control Board's (SWRCB) "Statement of Policy with Respect (SWRCB) "Statement of Policy with Respect to Maintaining High Quality of Waters in California," Resolution 68-16, requires maintenance of existing water quality unless it is demonstrated that a change will benefit the people of the State, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed by other State policies. Further, the resolution requires that discharges of waste to high-quality waters must meet waste discharge requirements. These requirements must result in treatment or control of the discharge to ensure that pollution or nuisance will not occur, and that the highest water quality consistent with maximum benefit to the people of the State is benefit to the people of the State is maintained. Specifically, where any activities result in discharges to high quality waters, dischargers shall use the best practicable treatment or control of the discharge necessary to avoid pollution or nuisance and to maintain water quality consistent with maximum benefit to the people of the State. This requirement is applicable to recharge of the treated water. See Section 3.3.2, which states that concentrations of volatile organic chemicals in discharged treated water will be nondetectable as measured by EPA Method 502.2.

These discharge levels were chosen for OU 2 considering site-specific conditions, including the contaminants to be discharged and the designated beneficial uses of the receiving water, available treatment technologies, and cost.

- Discharges of Waste to Land, Title 23 CCR, Division 3, Chapter 15
  (Source: Porter-Cologne Water Quality Control Act, California Water Code, Section 13172)

This Chapter regulates discharges of waste to land. Article 5, (Water Quality Monitoring and Response Programs for Waste Management Units) and Articles 8 and 9 (Closure and Post-Closure Maintenance) are applicable to this action at the Fort Ord Landfills. These regulations provide detailed requirements for: monitoring of water quality and, if a release occurs, for evaluation of the impact of discharges, selection of response programs, and setting of remedial objective (Article 5); performance requirements for landfill covering (Article 8);

and landfill closure in an irrigated area (Article 9). Specific requirements of Title 23, Chapter 15, which are applicable, are discussed below.

- Chapter 15 - Landfill Closure, Articles 1, 8, and 9

  Section 2510(d). This section defines/designates existing waste management units (WMU) as "waste management units which are operating, or have received all permits necessary for construction and operation on or before the effective date." Because the Fort Ord Landfills were operating and received all permits necessary for operation on or before the effective date of Chapter 15 (November 27, 1984), the landfill is considered to be an existing site.

  Section 2580(c) requires that Class III landfills be closed pursuant to Section 2581. Section 2581 provides specific closure construction details that must be implemented.

  Section 2580(d) and (e) specify closure and post-closure specifications regarding survey monuments and vegetation selection.

  Section 2581. Landfill Closure Requirements provides specific requirements for the final cover. Subsections (a)(1), (a)(2), (a)(3), and (a)(4) detail the multi-layer cover design, including acceptable soil types, thickness, and permeability requirements. Section 2581(b) provides grading requirements.

  Section 2597. Landfill Closure Requirements provides specific requirements for landfill closure in irrigated areas. Subsections (b)(1) and (2) require quantification of water entering, leaving, and remaining onsite and design of monitoring systems that will detect penetrations of final cover by precipitation or applied irrigation water.

- Chapter 15 - Groundwater Monitoring and Cleanup (Article 5)

Article 5 includes applicable requirements for groundwater monitoring and cleanup. Article 5 was updated in 1991 to be in compliance with federal regulations regarding land waste disposal. Sections of Article 5 that are appropriate to the selected alternative include:

Section 2550(a) requires owners and operators of existing landfills to monitor ground and surface water and perform unsaturated zone monitoring as feasible.

Section (d) specifies that monitoring requirements are applicable during the active life, closure, and post-closure periods, unless all waste residues, contaminated containment systems components, and contaminated geologic materials have been removed or decontaminated at closure.

Section 2550.1. Required Monitoring and Response Program. This section specifies actions including monitoring and corrective actions required if WMU operations have impacted ground or surface water.

Section 2550.2 Water Quality Protection Standard. This section requires that the discharger must propose standards to satisfy the substantive portions of Waste Discharge Requirements. The standards consist of five parts:

Section 2550.3. List of Chemicals of Concern (see Table 1);

Section 2550.4. Concentration Limit for each Chemical of Concern in each monitored medium (see Table 1);

Section 2550.5. List of Monitoring Points and Background Monitoring Points at which the Standard is applied

Section 2550.5. Description of the Point of Compliance

Section 2550.6. The length of the Compliance Period.

- Sources of Drinking Water Policy, Resolution No. 88-63
  (Source: Porter-Cologne Water Quality Control Act, California Water Code, Section 13140)

This resolution specifies that all ground and surface water is existing or potential sources of drinking water unless TDS is greater than 3,000 ppm, the well yield is less than 200 gallons per day from a single well, or the groundwater is unreasonable to treat using best management practices or best economically achievable treatment practices. The resolution is applicable to the site.

- California Integrated Waste Management Board Regulations for Solid Waste Landfills, Title 14 CCR, Chapter 3, Article 7.8
  (Source: California Public Resources Code, Division 30)

The only requirement Title 14 provides with regard to closure at solid waste landfills that is more stringent than Title 23, Chapter 15, is a requirement to control trace gases "to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds." This requirement is applicable to landfill closure.

- Monterey Bay Unified Air Pollution Control District (MBUAPCD) Regulation II (New Sources) and Regulation X (Toxic Air Contaminants)
  (Source: Rule 207; Rule 1000)

The MBUAPCD regulates New Sources under requirements described in Regulation II, Rule 207, and restricts specific discharges of organic compounds to the atmosphere through remedial actions (such as fugitive odors from consolidation of waste and removal of organic compounds from groundwater) in accordance with Rule 1000 of the above-mentioned regulation. The MBUAPCD requirements may limit emissions of total and individual organic compounds (benzene, vinyl chloride, PCE, TCE, or methylene chloride) on a site-specific basis and/or may require emission controls.

Under Rule 207, emissions of most individual organic compounds are generally restricted to 25 lbs/day using Best Available Control Technology (BACT). Emissions may be as high as 137 lbs/day under certain circumstances such as using offsets to balance the emissions. The limit for vinyl chloride under Rule 207 is 5.48 lbs/day. Under Rule 1000, the emission limits are health-based and are expressed in terms of allowable increased risks of no more than 1 in 100,000 (or 1 x 10-5). Whichever rule is the more stringent rule of the two would apply.

In addition, the MBUAPCD regulates releases of certain identified or potential air toxics at levels determined to be "appropriate for review." In some cases, a Risk Assessment may be required. The MBUAPCD requirements are ARARs for removal of landfilled waste from the subsurface and for control and treatment of landfill gases.

A5.0 SUMMARY OF ARARS FOR MANAGEMENT OF TREATED GROUNDWATER

- Discharge to Surface Water

National Pollutant Discharge Elimination System (NPDES) substantive permit requirements and/or substantive portions of RWQCB Waste Discharge Requirements (WDRs) are ARARs for effluent discharge. The effluent limitations and monitoring requirements of an NPDES permit/WDRs are applicable to point source discharges such as those from a treatment system with an outfall to surface waters or storm drains. The storm drain system at Fort Ord discharges both to the Pacific Ocean and to inland basins. The RWQCB establishes effluent discharge limitations and permit requirements based on Water Quality Standards set forth in the Water Quality Control Plan, Central Coast Basin.

- Effluent Infiltration to Subsurface

Regulations governing underground recharge of treated water are applicable, and are therefore ARARs, if treated groundwater is recharged. The Federal Safe Drinking Water Act requires an Underground Injection Control (UIC) permit which, in California, is administered by the EPA for wells not related to oil and gas activities. The UIC regulations (40 CFR 1441.13(c)) allow infiltration of groundwater that has been treated and is being recharged into the same formation from which it was drawn. The UIC permit is not required as long as the substantive requirements of the permit are met. This recharge is allowed if approved by the EPA pursuant to provisions for remediation of releases under CERCLA.

The California Toxic Injection Well Act (California Health and Safety Code Section 25159.24[a]) provides an exemption for recharge wells provided that the recharge is conducted for the purpose of improving the quality of the groundwater in the formation.

- Discharge to Sewer

Substantive requirements of the Federal Clean Water Act Pretreatment Standards (40 CFR 403.5) are ARARs for discharges of groundwater to the local sanitary sewer system. The Clean Water Act allows municipalities to determine pretreatment standards for discharges to Publicly Owned Treatment Works (POTWs) within its jurisdiction. The Monterey Regional Water Pollution Control Agency sets forth standards for monitoring and reporting, along with effuent quantity and discharge concentration limits. These ARARs regarding quality of treated groundwater discharges will be met.

- Reuse

Water may be reused onsite to the extent possible. For example, treated groundwater may be used to irrigate landscaped areas and playing fields. Onsite reuse would not require a water reclamation requirement permit from the RWQCB. Water may also be used offsite for irrigation, subject to approval from the Monterey County Water Resources Agency.

- Discharge Limits for Treated Water

To maximize opportunity for effective management of treated water and minimize chemical concentrations in discharges, the Army proposes that concentrations of volatile organic chemicals in discharged treated water will be "not detectable" as measured by EPA Method 502.2. These discharge limits were chosen for OU 2 after considering site-specific conditions, including the contaminants to be discharged and the designated beneficial uses of the receiving waters, available treatment technologies and cost, and are provided in Table 1.

APPENDIX B

COMMUNITY RELATIONS ACTIVITIES CONDUCTED FOR FORT LANDFILLS, OPERABLE UNIT 2

The following activities have been conducted as part of the Army's public relations and information transfer efforts regarding environmental restoration activities at Fort Ord. Presentations, briefings, and/or tours were given to the following groups or organizations, or the following meetings.

Activity

- Presentation to Pebble Beach Property Land Owners. 12/07/93.
- Public meeting and public comment period for the Interim Action Feasibility Study (IAFS). 11/30/93.
- California Central Coast Regional Water Quality Control Board meeting regarding the Proposed Plan for OU 2. 11/12/93.
- Marina California, City Council meeting regarding the Fort Ord Landfills-Operable Unit 2 (OU 2). 11/09/93.
- Technical Review Committee meeting 10/27/93.
- Public meeting and public comment period for the Fort Ord OU 2 Landfills Remedial Investigation/Feasibility Study (RI/FS). 10/19/93.
- Fort Ord Superfund public relations public meeting. 09/21/93.
- Superfund presentation to the American Society of Military Engineers in Mountain View, California. 07/09/93.
- Fort Ord Natural Resources Trustee Day. 06/30/93.
- EPA Federal Facilities Conference. 06/22 - 06/24/93.
- Superfund presentation to the San Jose Senior Citizens Group. 06/22/93.
- Monterey County meeting. 06/21/93.
- Meeting regarding the acquisition of Fort Ord property by the University of California. 06/12/93.
- Meeting regarding the parcelization process for Ford Ord base closure in accordance with the Community Environmental Response and Facilitation Action (CERFA). Participants included the USEPA, Fort Ord Reuse Group, DTSC, RWQCB, and the Army Enviromnental Center. 06/03/93.
- Association of 7ID Veterans. 06/01/93.
- Fort Ord Reuse Group meeting regarding the status of Superfund sites throughout the installation. 05/20/93.
- Superfund presentation for Aptos Junior High, Aptos, California. 04/23/93.
- Technical Review Committee meeting. 04/21/93.
- Superfund presentation for the Watsonville Junior High School career day in Watsonville, California. 04/16/93.
- Update with the District Attorney regarding the progress of Fort Ord's cleanup activities. 04/16/93.
- Biological and technical assistance team meeting regarding the Fort Ord beach front firing ranges. 04/06/93.
- Superfund presentation for the Pacific Grove Rotary Club in Pebble Beach, California. 03/23/93.

- CERFA meeting. 03/04/93.
- Installation walking tour and Superfund presentation to Sierra Club senior citizens' group. 02/23/93.
- Fort Ord Environmental Impact Statement Public Meeting discussion concerning Fort Ord disposal and reuse. 02/11/93.
- Presentation to RAND. 01/19/93.
- Technical Review Committee meeting. 01/13/93.
- Discussion with the National Oceanographic and Atmospheric Administration (NOAA) regarding the proposed sand falls study on the Fort Ord beach ranges. 01/13/93.
- Meeting with Walter Wong. 12/09/92.
- Environmental restoration presentation and site tour for Hartnell College students. 10/14/92.
- Technical Review Committee meeting. 10/09/92.
- Walking tour and Superfund presentation for Cypress High School students from Seaside, California. 09/20/92.
- Meeting with Fort Ord majority counsel for the Senate Arms Service Committee and Majority Counsel for the House Energy and Commerce Committee regarding the impact of proposal parcelization legislation. 08/20/92.
- Community relations meeting with high school students from the Upward Bound program. 07/15/92.
- Technical Review Committee meeting. 07/08/92.
- Seminar regarding the Environmental Restoration of Closing Military Bases in Sacramento, California. 06/23 - 06/25/92.
- Base Realignment and Closure Environmental Impact Statement status meeting with Army, COE, U.S. Fish and Wildlife Services, California Fish and Wildlife, and Jones & Stokes. 08/25 - 01/26/92.