FORA ESCA REMEDIATION PROGRAM

FINAL

Group 2

Remedial Investigation / Feasibility Study

Volume 3: Feasibility Study

California State University Monterey Bay Off-Campus Munitions Response Area

Former Fort Ord
Monterey County, California

February 18, 2013

Prepared for:

FORT ORD REUSE AUTHORITY

920 2nd Avenue, Suite A
Marina, California 93933

Prepared Under:

Environmental Services Cooperative Agreement
No. W9128F-07-2-01621
and
FORA Remediation Services Agreement (3/30/07)

Document Control Number: 09595-09-079-061

Prepared by:

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This effort was sponsored by the Army, Assistant Chief of Staff Installation Management. The content of the information does not necessarily reflect the position or policy of the Government and no official endorsement should be inferred.

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ACRONYMS AND ABBREVIATIONS

ACES	Areas Covered by Environmental Services
AOC	Administrative Order on Consent
ARAR	applicable or relevant and appropriate requirement
Army	United States Department of the Army
BAADT	best available and appropriate detection technology
bgs	below ground surface
BO	biological opinion
BRA	Basewide Range Assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIOP	Community Involvement and Outreach Program
CRP	Community Relations Plan
CRUP	Covenant to Restrict the Use of Property
CSM	conceptual site model
CSUMB	California State University at Monterey Bay
DDESB	Department of Defense Explosives Safety Board
DGM	digital geophysical mapping
DMM	discarded military munitions
DOD	United States Department of Defense
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
EPP	Environmental Protection Provision
ESA	Endangered Species Act
ESCA RP	Environmental Services Cooperative Agreement Remediation Program
FS	Feasibility Study
FFA	Federal Facility Agreement
FORA	Fort Ord Reuse Authority
FOSET	Finding of Suitability for Early Transfer
FWS	United States Fish and Wildlife Service
GIS	geographical information system
HA	historical area
HFA	Human Factors Applications, Inc.
HMP	Habitat Management Plan
HTRW	hazardous, toxic, and radioactive waste

IRP	Installation Restoration Program
LFR	LFR Inc.
LUC	Land Use Control
LUCI	Land Use Control Implementation
LTM	long-term management
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MOUT	Military Operations in Urban Terrain
MR	munitions response
MRA	Munitions Response Area
MRS	Munitions Response Site
NCP	National Contingency Plan
NRMA	natural resource management area
NPL	National Priorities List
NPV	net present value
O&M	operations and maintenance
QA	quality assurance
QC	quality control
RAO	remedial action objective
RD/RA WP	Remedial Design/Remedial Action Work Plan
RDX	cyclotrimethylenetrinitramine
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RQA	Residential Quality Assurance
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SEDR	Summary of Existing Data Report
TIP	Technical Information Paper
TNT	Trinitrotoluene
TRC	Technical Review Committee
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
UXO	unexploded ordnance
Westcliffe	Westcliffe Engineers, Inc.
WESTON	Weston Solutions, Inc.

GLOSSARY

Anomaly
Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.).

Anomaly Avoidance
Techniques employed by unexploded ordnance (UXO) personnel at sites with known or suspected munitions and explosives of concern (MEC) to avoid any potential surface MEC and any subsurface anomalies. This usually occurs at mixed hazard sites when hazardous, toxic, and radioactive waste investigations must occur prior to execution of an MEC removal action. Intrusive anomaly investigation is not authorized during ordnance avoidance operations.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980
CERCLA authorizes federal action to respond to the release or threatened release of hazardous substances into the environment or a release or threatened release of a pollutant or contaminant into the environment that may present an imminent or substantial danger to public health or welfare.

Construction Support
Assistance provided by United States Department of Defense (DOD) explosive ordnance disposal (EOD) or UXO-qualified personnel and/or by personnel trained and qualified for operations involving chemical agents (CA), regardless of configuration, during intrusive construction activities on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, or CA, regardless of configuration, to ensure the safety of personnel or resources from any potential explosive or CA hazards.

Covenant Deferral Request (CDR)
A letter along with a supporting information package known as a Covenant Deferral Request (CDR) is assembled by the Federal landholding to formally request deferral of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) covenant until all remediation has been accomplished prior to transfer. United States Environmental Protection Agency (EPA) requires that the information is: 1) of sufficient quality and quantity to support the request for deferral of the CERCLA covenant; and 2) that it provides a basis for EPA to make its determination. This information is submitted to EPA in the form of a CDR.

Deferral period
The period of time that the CERCLA covenant warranting that all remedial action is complete before transfer, is deferred through the Early Transfer Authority.

Discarded Military Munitions (DMM)
Generally, military munitions that have been abandoned without proper disposal or removed

from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of, consistent with applicable environmental laws and regulations. (10 U.S.C. 2710[e][2])

Early Transfers

The transfer by deed of federal property by United States Department of Defense (DOD) to a nonfederal entity before all remedial actions on the property have been taken. Section 120 (h)(3)(C) of the CERCLA allows Federal agencies to transfer property before all necessary cleanup actions have been taken. This provision, known as early transfer authority, authorizes the deferral of the CERCLA covenant when the findings required by the statute can be made and the response action assurances required by the statute are given. The Governor of the state where the property is located must concur with the deferral request for property not listed on the National Priorities List (NPL). For NPL property, the deferral must be provided by the EPA with the concurrence of the Governor. Upon approval to defer the covenant, DOD may proceed with the early transfer.

Environmental Services Cooperative Agreement Remediation Program (ESCA RP Team)

ARCADIS U.S., Inc., Weston Solutions, Inc., and Westcliffe Engineers, Inc.

Exclusion Zone

A safety zone established around a MEC work area. Only essential project personnel and authorized, escorted visitors are allowed within the exclusion zone. Examples of exclusion zones are safety zones around MEC intrusive activities and safety zones where MEC are intentionally detonated.

Explosive

A substance or a mixture of substances that is capable by chemical reaction of producing gas at such temperature, pressure, and speed as to cause damage to the surroundings. The term “explosive” includes all substances variously known as high explosives and propellants, together with igniters, primers, initiators, and pyrotechnics (e.g., illuminant, smoke, delay, decoy, flare, and incendiary compositions).

Feasibility Study (FS)

The primary objective of the FS is “to ensure appropriate remedial alternatives are being developed and evaluated and an appropriate remedy selected” (NCP 40 CFR 300.430[e]).

Geophysical Reacquisition

Geophysical Reacquisition involves utilizing both a positioning method (i.e., Global Positioning System [GPS], ultrasonic, or tape from corners) and geophysical instruments to reacquire and pinpoint anomaly locations selected by the geophysical processors. The geophysical instruments include the original instrument used for the digital survey of the grid and the analog instrument being utilized by the UXO teams for intrusive activities. The intended result of this method is to pinpoint the location where the intrusive teams will find the subsurface item causing the anomaly.

Intrusive Activity
An activity that involves or results in the penetration of the ground surface at an area known or suspected to contain MEC. Intrusive activities can be of an investigative or removal action nature.

Mag and dig
Utilizing hand held geophysical instruments to detect anomalies and immediately investigating the anomalies (without using collection of digital data and post processing to determine which anomalies to dig) by manual digging or with the assistance of heavy equipment.

Mag and flag
Utilizing handheld geophysical instruments to detect anomalies, marking anomalies with a flag and later investigating the anomalies by manual digging or with the assistance of heavy equipment.

Material Documented as Safe (MDAS)
Material Potentially Presenting an Explosive Hazard (MPPEH) that has been assessed and documented as not presenting an explosive hazard and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

Material Documented as an Explosive Hazard (MDEH)
MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

Material Potentially Presenting an Explosive Hazard (MPPEH)
Material that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within DOD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Memorandum of Agreement (MOA)
"Memorandum of Agreement Among the Fort Ord Reuse Authority, Monterey County and Cities of Seaside, Monterey, Del Rey Oaks and Marina, California State University Monterey Bay, University of California Santa Cruz, Monterey Peninsula College, and the Department of Toxic Substances Control Concerning Monitoring and Reporting of Environmental Restrictions on the Former Fort Ord, Monterey County, California."

Military Munitions
All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DOD, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components of the above. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 101[e][4][A through C]).

Military Munitions Response Program (MMRP)
Department of Defense-established program that manages the environmental, health and safety issues presented by munitions of explosives concern.

Minimum Separation Distance (MSD)
Minimum distance between a potential explosion site (PES) and personnel, assets, or structures, required to provide the appropriate level of protection from a detonation (either intentional or unintentional) at the PES.

Munitions and Explosives of Concern (MEC)
This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) UXO, as defined in 10 U.S.C. 101(e)(5)(A) through (C); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Constituents (MC)
Any materials originating from UXO, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S.C. 2710).

Munitions Debris (MD)
Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Munitions Response Area (MRA)
Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.

Munitions Response Site (MRS)
A discrete location within an MRA that is known to require a munitions response.

Ordnance and Explosives (OE)
See MEC.

Quality Assurance (QA)
An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed to meet project requirements.

Quality Control (QC)
The overall system of operational techniques and activities that measures the attributes and performance of a process, item, or service against defined standards that are used to fulfill requirements for quality.

Record of Decision (ROD)
A ROD is the document used to record the remedial action decision made at a National Priorities List property. The ROD will be maintained in the project Administrative Record and project file.

Remedial Investigation (RI)
The RI is intended to "adequately characterize the site for the purpose of developing and evaluating an effective remedial alternative" (NCP, 40 CFR 300.430[d]). In addition, the RI provides information to assess the risks to human health, safety, and the environment that were identified during risk screening in the site investigation.

Remedial Actions
Those actions consistent with a permanent remedy taken instead of or in addition to removal actions in the event of a release or threatened release of a hazardous substance into the environment, to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health, welfare, or the environment. The term includes but is not limited to such actions at the location of the release as storage; confinement; perimeter protection using dikes, trenches, or ditches; clay cover; neutralization; cleanup of released hazardous substances and associated contaminated materials; recycling or reuse; diversion; destruction; segregation of reactive wastes; dredging or excavations; repair or replacement of leaking containers; collection of leachate and runoff; on-site treatment or incineration; provision of alternative water supplies; and any monitoring reasonably required to assure that such actions protect the public health, welfare, and the environment. The term includes the costs of permanent relocation of residents and businesses and community facilities where the President of the United States determines that, alone or in combination with other measures, such relocation is more cost-effective and environmentally preferable to the transportation, storage, treatment, destruction, or secure disposition off site of hazardous substances, or may otherwise be necessary to protect the public health or welfare. The term includes off-site transport and off-site storage, treatment, destruction, or secure disposition of hazardous substances and associated contaminated materials.

Response Action
Action taken instead of or in addition to a removal action to prevent or minimize the release of MEC so that it does not cause substantial danger to present or future public health or welfare or the environment.

Technology-Aided Surface Removal
A removal of UXO, DMM, or chemical warfare material (CWM) on the surface (i.e., the top of the soil layer) only, in which the detection process is primarily performed visually, but is augmented by technology aids (e.g., handheld magnetometers or metal detectors) because vegetation, the weathering of UXO, DMM, or CWM, or other factors make visual detection difficult.

Unexploded Ordnance (UXO)
Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101[e][5][A through C]).

UXO-Qualified Personnel
Personnel who have performed successfully in military EOD positions, or are qualified to perform in the following Department of Labor, Service Contract Act, Directory of Occupations, contractor positions: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor.

UXO Technicians
Personnel who are qualified for and filling Department of Labor, Service Contract Act, Directory of Occupations, contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III.

1.0 INTRODUCTION

The former Fort Ord is located on Monterey Bay in northwestern Monterey County, California (Figure 1). Since 1917, portions of the former Fort Ord were used by the United States Department of the Army (Army) for maneuvers, target ranges, and other purposes. Military munitions were fired into, fired upon, or used on the facility. As a result, a wide variety of conventional munitions and explosives of concern (MEC), consisting of unexploded ordnance (UXO) and discarded military munitions (DMM) items, have been encountered at the former Fort Ord.

This Group 2 Remedial Investigation/Feasibility Study (RI/FS) Report was prepared by the Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) Team on behalf of the Fort Ord Reuse Authority (FORA) in accordance with an Administrative Order on Consent (AOC), which addresses cleanup of portions of the former Fort Ord in Monterey County, California. The ESCA RP Team consists of ARCADIS U.S., Inc. (formerly LFR Inc.), Weston Solutions, Inc., and Westcliffe Engineers, Inc.

This report has been prepared in accordance with the AOC Task 4 and Task 5. ARCADIS U.S., Inc., has prepared this document on behalf of FORA in accordance with industry standards and consistent with the requirements of the Remediation Services Agreement dated March 30, 2007 by and between ARCADIS U.S., Inc., and FORA including any applicable governing documents and applicable laws and regulations.

The AOC was entered into voluntarily by the United States Environmental Protection Agency (EPA) Region 9, the California Department of Toxic Substances Control (DTSC), FORA, and the United States Department of Justice Environment and Natural Resources Division (EPA Region 9 CERCLA Docket No. R9-2007-03). The AOC was issued under the authority vested in the President of the United States by Sections 104, 106, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 United States Code (U.S.C.) §§ 9604, 9606, and 9622.

As described in the Summary of Existing Data Report (SEDR; ESCA RP Team 2008a), Group 2 included the California State University Monterey Bay (CSUMB) Off-Campus Munitions Response Area (MRA) and the County North MRA, which was formerly referred to as the Development North MRA (Figure 1). In August 2009, the Track 1 Plug-In Approval Memorandum ("the Approval Memorandum") was submitted for the County North MRA by the Army for public review and comment (Army 2009). A notice announcing agency concurrence with the Approval Memorandum was published on March 16, 2010. The Track 1 Plug-In process was described in the Army's "Record of Decision, No Further Action Related to Munitions and Explosives of Concern - Track 1 Sites, No Further Remedial Action with Monitoring for Ecological Risks from Chemical Contamination at Site 3 (MRS-22)," dated March 10, 2005 (Army 2005a). Therefore, this Group 2 RI/FS Report only addresses the CSUMB Off-Campus MRA.

This Group 2 RI/FS Report: 1) describes the nature and extent of MEC; 2) assesses explosives safety risk that may be present; and 3) develops, screens, and evaluates alternatives to reduce the potential explosives safety risk to current and future property owners and the general public. The Group 2 RI/FS Report will be used by the Army in developing the Proposed Plan and making a decision on remedial actions. In accordance with the guidance provided in the Group 2 RI/FS Work Plan (ESCA RP Team 2009), the Group 2 RI/FS Report is based on the evaluation of previous work, including the subsurface removal of MEC, conducted for the CSUMB Off-Campus MRA.

1.1 Purpose of the Feasibility Study

The purpose of this FS is to develop and select remedial alternatives to address any potential MEC risks remaining at the CSUMB Off-Campus MRA reuse areas. Potential human health and ecological risks related to any soil contamination from small arms and military munitions ranges are being addressed under the Basewide Range Assessment (BRA; Shaw 2012). The objectives of this FS are to describe the process used to develop, evaluate, compare, and select preferred alternatives that will meet the remedial action objectives (RAOs) based on the results of the RI and RA for these areas.

1.2 Former Fort Ord Military Munitions Response Program

This section summarizes the munitions response program related to MEC cleanup that was previously implemented at the former Fort Ord by the Army and the subsequent program that was implemented to continue MEC remediation in portions of the former Fort Ord by FORA.

1.2.1 Cleanup Program Under the Army

The former Fort Ord was placed on the National Priorities List (NPL) in 1990 primarily because of chemical contamination in soil and groundwater that resulted from past Army use. To oversee the cleanup of the base, the Army, EPA, DTSC, and Central Coast Regional Water Quality Control Board (RWQCB) entered into a Federal Facility Agreement (FFA). One of the purposes of the FFA was to ensure that the environmental impacts associated with past and present activities at the former Fort Ord were thoroughly investigated and appropriate remedial action taken as necessary to protect public health and the environment. In accordance with the FFA, the Army was designated as the lead agency under CERCLA for conducting environmental investigations, making cleanup decisions, and taking cleanup actions at the former Fort Ord. The EPA was designated as the lead regulatory agency for the cleanup, while the DTSC and RWQCB were designated as supporting agencies.

The Army has conducted a number of MEC survey and clearance activities, including geophysical surveys. The Army has conducted its activities pursuant to the President of the United States' authority under CERCLA Section 104, as delegated to the Army in accordance with Executive Order 12580 and in compliance with CERCLA Section 120.

In November 1998, the Army agreed to evaluate MEC at the former Fort Ord and perform a basewide munitions response (MR) RI/FS consistent with CERCLA. The basewide MR RI/FS program addressed MEC hazards at the former Fort Ord and evaluated past removal actions as well as recommended future remedial actions deemed necessary to protect human health and the environment under future uses. In April 2000, an agreement was signed between the Army, EPA, and DTSC to evaluate MEC at the former Fort Ord subject to the provisions of the FFA. The signatories agreed that the FFA provided the appropriate framework and process to address the Army's MEC activities. The FFA established schedules for performing RIs and FSs, and required that remedial actions be completed expeditiously.

The basewide MR RI/FS program is described in the Draft Final Ordnance and Explosives RI/FS Work Plan (USACE 2000). Elements of the MR RI/FS program include a literature review, preparation of a Sampling and Analysis Plan (SAP) for additional MEC characterization activities, evaluation of MEC work by previous contractors, performance of an Ordnance Detection and Discrimination Study, identification of applicable or relevant and appropriate requirements (ARARs), evaluation of risks, and development of long-term risk management measures, a community relations plan, and a health and safety plan. The MR RI/FS program only addresses the physical risk from MEC. The potential for soil contamination from munitions constituents at the former Fort Ord is being addressed under the Army's BRA Program (Shaw 2012).

The Army's approach to categorizing areas within the former Fort Ord includes track groupings consisting of Track 0 through Track 3. Specifically, track definitions are as follows:

- Track 0: Areas that contain no evidence of MEC and have never been suspected of having been used for military munitions-related activities. In June 2002, the Army signed a Track 0 ROD (Army 2002). The Track 0 ROD addresses selected land parcels, and also provides a Plug-In process to address future land parcels that are considered eligible for inclusion in the Track 0 process.
- Track 1: Sites where military munitions were suspected to have been used but, based on results, the sites fall into one of three categories: 1) sites with no evidence to indicate that military munitions were used; 2) sites used for training but military munitions used do not pose an explosive hazard; or 3) sites used for training but military munitions potentially remaining do not pose an unacceptable risk. In April 2005, the Army signed a Track 1 ROD (Army 2005a). The Track 1 ROD addresses selected land parcels, and also provides a Plug-In process to address future land parcels that are considered eligible for inclusion in the Track 1 process.
- Track 2: Sites where MEC were present and MEC removal has been conducted.
- Track 3: Sites where MEC are known or suspected but investigations have not been initiated or completed.

In addition, to remain consistent with the federal Endangered Species Act (ESA), the Army has completed consultations with the United States Fish and Wildlife Service (USFWS) on

the Army's predisposal actions, including cleanup of MEC. These consultations have resulted in biological opinions (BOs) that include endangered species incidental take statements. These BOs allow impacts to and incidental take of listed species during MEC cleanup activities, but require mitigation measures to be implemented during the MEC cleanup activities to reduce and minimize impacts to the protected species and their habitats.

1.2.2 Early Transfer Property and Environmental Services Cooperative Agreement

The transfer of a portion of the former Fort Ord, pursuant to CERCLA Section 120(h)(3)(C), was requested by FORA in a letter dated May 18, 2005. Under CERCLA Section 120(h)(3), the United States is required to provide a covenant in deeds conveying the property warranting that all remedial action necessary to protect human health and the environment has been taken before the date of transfer. For a federal facility listed on the NPL, CERCLA Section 120(h)(3)(C) allows the EPA administrator, with concurrence of the governor of the state, to defer the CERCLA covenant requirement. These types of transfers under CERCLA Section 120(h)(3)(C) are typically called "early transfers," in which the United States provides the warranty after transfer of the property when all of the response actions necessary to protect human health and the environment have been taken. The period between the transfer of title and the making of this final warranty is known as the "deferral period." Early transfers allow productive reuse of the property through access while final remediation work is being conducted. In addition, United States Department of Defense (DOD) and Army policy require that the military department proposing to transfer property prepare a Finding of Suitability for Early Transfer (FOSET).

The Army has completed the "Final Finding of Suitability for Early Transfer, Former Fort Ord, California, Environmental Services Cooperative Agreement (ESCA) Parcels, and Non-ESCA Parcels (Operable Unit Carbon Tetrachloride Plume)" ("FOSET 5"; Army 2007). The Army has requested deferral of the CERCLA covenant and EPA has approved, with the concurrence of the Governor of the State of California, the Covenant Deferral Request associated with the early transfer of the property.

On March 31, 2007, the Army and FORA entered into an ESCA to provide MEC remediation services during the deferral period, thereby allowing the Army to transfer approximately 3,340 acres of property and the responsibility of removing MEC to FORA as an Economic Development Conveyance. The former Fort Ord Property transferred under the ESCA is collectively referred to as the Areas Covered by Environmental Services (ACES). In accordance with the ESCA, FORA is responsible for addressing response actions for the property except for those responsibilities retained by the Army. The ESCA and the AOC identify the Army-retained conditions for which the Army assumes responsibility. If these conditions are encountered, FORA is required to notify the Army of their presence in accordance with the guidelines set forth in the ESCA and the Army assumes responsibility. Included in the Army-retained conditions are:

- Radiological material
- Chemical or biological warfare agents

- Natural resource injuries or damages occurring as a result of contamination releases that have occurred due to Army ownership or activities except to the extent such injuries are a direct result of FORA's activities
- Unknown uninsured conditions, which include the management and cleanup of non-MEC-related hazardous and toxic wastes above insurance parameters
- Perchlorate contamination in soil or groundwater

To accomplish this effort, FORA entered into an agreement with the ESCA RP Team, to assist in the completion of the MEC cleanup activities in accordance with the ESCA and the AOC. During the ESCA RP, FORA is responsible for administrative and management program elements, while the ESCA RP Team conducts the MEC cleanup work under FORA oversight.

1.2.3 FORA ESCA Remediation Program

The purpose of the ESCA RP is to provide the necessary environmental services to FORA, which include characterization, assessment of risk of explosive hazards, FS, remediation alternatives analysis, and performance of remediation (excluding Army-retained conditions described in Section 1.2.2) in accordance with the ESCA and the AOC. The primary objective of the ESCA RP is timely cleanup of the property in accordance with the ESCA and AOC. The potential for soil contamination from munitions constituents at the former Fort Ord is being addressed under the Army's BRA Program (Shaw 2012). As stated in FOSET 5, based on the BRA Program, no further action was recommended for historical areas (HAs) within the CSUMB Off-Campus MRA (Army 2007). In addition, Installation Restoration Program (IRP) Site 39B (Inter-Garrison Site) is located within the CSUMB Off-Campus MRA. As stated in the FOSET, the EPA and the DTSC have concurred that no further action is necessary at IRP Site 39B (Army 2007); however, subsequent soil sampling performed within the MRA resulted in a recommendation for an Interim Action to remove soil contamination from one area with an elevated concentration of lead in shallow soil (Army 2009a). In February 2010, Shaw Environmental, Inc. (on behalf of the Army) excavated approximately 20 cubic yards of soil from HA-161 and disposed of the soil in the Operable Unit 2 landfills. Confirmation samples collected from the excavation indicated that residual soil concentrations for lead were below the target cleanup concentrations. The results of the soil removal activities were presented in the Draft Final Interim Action Confirmation Report (Shaw 2011). As a follow-up to the 3rd Five-Year Review, an additional evaluation is being conducted by the Army to determine the protectiveness of the human health-based cleanup levels for the Interim Action sites with lead in soil, including Site 39B (Army 2012). This evaluation is expected to be completed by December 2013.

The SEDR was completed for the ACES as required under Task 2 of the AOC Scope of Work (ESCA RP Team 2008a). In the SEDR, the ACES were combined into nine MRAs to facilitate the implementation of the AOC. The SEDR provided a site overview, evaluation of existing data, identification of data gaps, a conceptual site model (CSM) including an initial assessment of explosives safety risks, and proposed future use for each MRA. The SEDR

also presented conclusions and recommendations for further actions and formed the basis for the RI planning efforts.

The nine MRAs were consolidated into four groups, according to similar pathway-to-closure characteristics (Figure 2). Group 1 consists of the Parker Flats and Seaside MRAs. Group 2 consists of the CSUMB Off-Campus and County North MRAs. Group 3 consists of the Interim Action Ranges, Laguna Seca Parking, Military Operations in Urban Terrain (MOUT) Site, and Del Rey Oaks/Monterey MRAs. Group 4 consists of the Future East Garrison MRA (ESCA RP Team 2008a). The Interim Action Ranges MRA was subsequently removed from Group 3 for independent evaluation as agreed upon by FORA, the EPA, DTSC, and the Army.

1.3 Report Organization

This FS report is organized into eight sections as follows:

- **Section 1 – Introduction.** This section describes the purpose and objectives of the FS and presents background information on the Group 2 RI/FS process.
- **Section 2 – Remedial Approach.** This section presents the ongoing and future MEC-related activities that are occurring at the former Fort Ord; the long-term management measures that will be applied to implement and manage the remedial alternatives identified for the CSUMB Off-Campus MRA; a summary of the results of the RI and RA and definition of the areas for which remedial alternatives are developed; and the RAOs, potential ARARs, and land use control guidelines that will be considered in the development and analysis of remedial alternatives.
- **Section 3 – Identification of Applicable Response Actions.** This section identifies the range of applicable general response actions for MEC risk management at the CSUMB Off-Campus MRA and a screening of general response actions and process options.
- **Section 4 – Development of Remedial Alternatives.** This section presents long-term management measures specific to implementation and management of the remedial alternatives identified for the CSUMB Off-Campus MRA, and includes development of remedial alternatives and identification of potential ARARs associated with implementation.
- **Section 5 – Evaluation and Comparison of Remedial Alternatives.** This section presents an evaluation and comparison of remedial alternatives for the CSUMB Off-Campus MRA.
- **Section 6 – Identification of Preferred Remedial Alternative.** This section presents and summarizes the preliminary remedial alternative identified for the CSUMB Off-Campus MRA.
- **Section 7 – Approval Process.** This section describes the approval process for documenting the preferred alternative(s) for implementation at Group 2 in the RI/FS Proposed Plan and ROD.

- **Section 8 – References.** This section provides a list of references for pertinent documents cited in the report.

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2.0 REMEDIAL APPROACH

This section describes the general remedial approach applied at the CSUMB Off-Campus MRA, including (1) ongoing and future MEC-related activities that are occurring at the former Fort Ord; (2) long-term management measures that will be applied to implement and manage the remedial alternatives identified for the CSUMB Off-Campus MRA; (3) a summary of the results of the RI and RA and definition of the areas for which remedial alternatives are developed; and (4) the RAOs, potential ARARs, and land use control guidelines that will be considered in the development and analysis of remedial alternatives.

The RI/FS process as outlined in EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA ("EPA's RI/FS Guidance"; EPA 1988) represents the methodology that the Superfund program has established for characterizing the nature and extent of risk posed by contaminated sites and for evaluating potential remedial options. This FS was prepared based on the process outlined in the EPA's RI/FS Guidance; however, it was adapted to fit the unique circumstances of the Group 2 MRAs, as described in applicable sections of this volume of the Group 2 RI/FS Report.

2.1 Ongoing and Future MEC-Related Activities

This section describes ongoing and future MEC-related activities at the former Fort Ord that are components of the ESCA RP and the Army's basewide efforts to promote MEC safety.

2.1.1 Five-Year Review

A review of the former Fort Ord Superfund site will be conducted within five years after implementation of the identified remedy(s). The purpose of the five-year review is to determine whether the selected remedies continue to be protective of human health and the environment within a period of five years from the time the remedy was implemented (or from the time of a previous five-year review). The methods, findings, and conclusions of the five-year review are documented in a five-year review report. In addition, the five-year review report documents newly identified site-related data or issues that are identified during the review, and makes recommendations to address them, as appropriate. The next five-year review will occur in 2017.

2.1.2 Administrative Controls

A number of administrative controls were imposed on the ESCA parcels (including the CSUMB Off-Campus MRA) at the time of early property transfer from the Army to FORA. The administrative controls imposed include land use covenants, city and county ordinances, FORA resolutions, a memorandum of agreement between FORA and the DTSC, habitat-related requirements, and BOs. The applicable administrative controls are described in more detail in Table 2-3. These administrative controls are enforceable and place constraints on

field-related activities and future development activities until such time that remediation has been completed and the regulatory agencies have made a determination as to the closure status of the MRA.

2.1.2.1 Deed Notices

The following clauses are included in the deeds for transferring ESCA parcels:

"The Grantee is hereby notified that, due to the former use of the Property as a military installation, the Property may contain munitions and explosives of concern (MEC). The term MEC means specific categories of military munitions that may pose unique explosives safety risks and includes: (1) Unexploded Ordnance (UXO), as defined in 10 U.S.C. §101(e)(5); (2) Discarded military munitions (DMM), as defined in 10 U.S.C. §2710(e)(2); or (3) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard. For the purposes of the basewide Military Munitions Response Program being conducted for the former Fort Ord and this EPP, MEC does not include small arms ammunition (i.e. ammunition without projectiles containing explosives, other than tracers, that is .50 caliber or smaller, or for shotguns)."

"After response actions are completed, if the Grantee, any subsequent owner, or any other person should find any MEC on the Property, they shall immediately stop any intrusive or ground-disturbing work in the area or in any adjacent areas and shall not attempt to disturb, remove or destroy it, but shall immediately notify the local law enforcement agency having jurisdiction on the Property so that appropriate explosive ordnance disposal (EOD) personnel can be dispatched to address such MEC as required under applicable laws and regulations at no expense to the Grantee."

2.1.2.2 Local and State Ordinances

The local jurisdictions have established ordinances to monitor or control intrusive activities in specified areas of the former Fort Ord to manage risks of encountering potential MEC. These ordinances require landowners, or landowner representatives, wishing to conduct intrusive activities on the former Fort Ord to apply for a permit prior to conducting activities that disturb 10 cubic yards or more of soil.

The CSUMB Off-Campus MRA is wholly contained within the jurisdiction of Monterey County. Monterey County has adopted Ordinance No. 5012, amending the County Code to include Chapter 16.10, titled "Digging and Excavation on the Former Fort Ord." Prior to any ground-disturbing or intrusive activities, an owner or user of the property within the CSUMB Off-Campus MRA wishing to conduct intrusive activities must first go through a notification and permitting process per the county ordinance. Once an application for a permit is received by the county, the county shall review the permit to verify the location of the proposed excavation and to determine if any sites with known Land Use Controls (LUCs) will be affected.

2.1.3 MEC Incident Reporting

There is a potential for MEC to be present on the former Fort Ord because military munitions were used throughout the former Fort Ord's history. In the event MEC is discovered by a future user of former Fort Ord land, a process has been developed for reporting such finds to an appropriate local law enforcement agency. The local law enforcement agency will arrange a response by UXO-qualified personnel, who will promptly be dispatched to dispose of any discovered MEC. This process is documented and must be acknowledged by the future grantee, its successors, or assigns. A Safety Alert pamphlet and the Ordnance and Explosives Incident Reporting Form are provided to the property users. Such responses will be reviewed during subsequent five-year reviews, which assess the ongoing protectiveness of the remedial action.

2.1.4 MEC Recognition and Safety Training

The Army offers MEC recognition and safety training to anyone conducting ground-disturbing activities (e.g., digging holes, excavating trenches, repairing underground utilities, etc.) at the former Fort Ord. The Army or the Army's representative conducts a 30-minute training session. FORA is currently developing a system to offer this type of training for work conducted on the ESCA parcels. This training includes a lecture on what type of MEC might be found and the procedure to follow if something is found. Trained personnel will contact an appropriate local law enforcement agency if a potential military munitions item is encountered. The local law enforcement agency will then arrange a response by UXO-qualified personnel. The following organizations have received MEC recognition and safety training from the Army: CSUMB, United States Army Corps of Engineers (USACE) contractors, Pacific Gas & Electric, Pacific Bell, and the Bureau of Land Management.

2.1.5 Community Relations

Community relations activities for Group 2 are intended to keep communities informed of MEC-related activities at the former Fort Ord, and to help supporting agencies respond to community concerns. Community relations activities for the ESCA RP are described in the Community Involvement and Outreach Program (CIOP) Plan (ESCA RP Team 2008c) or updated version. The CIOP Plan has been approved by the EPA in consultation with the DTSC and is an addendum to the Army's Community Relations Plan (CRP) Update No. 3 (Army 2006).

The CIOP Plan outlines communication techniques that will be used to keep the affected communities informed throughout the RI/FS process at Group 2. Public participation activities, including fact sheets, public notices, and press releases, will be conducted in accordance with CERCLA.

The following sections summarize the approach outlined for community relations activities in the CIOP Plan that will be used during the RI/FS process.

2.1.5.1 Community Involvement

The CIOP Plan summarizes the community profile surrounding the former Fort Ord as described in the CRP. The community is considered to consist of:

- residents both on the former Fort Ord and in nearby communities
- present business owners, employees, and students on the former Fort Ord property
- elected local representatives and public agencies
- environmental and special interest groups
- students, faculty, and staff at the CSUMB campus
- recreational users including runners, hikers, bikers, and equestrians

Continuing community involvement will be achieved through a combination of communication, participation, and outreach to all affected stakeholders. To achieve this, FORA will use newsletters, community involvement workshops, fact sheets, project announcements, public notices, communications through social media, and website updates to provide information about the RI/FS process. In addition, a dedicated phone line has been established for the FORA ESCA RP. Callers are able to obtain project updates and leave messages regarding questions or comments they may have.

2.1.5.2 Community Relations Strategy

Implementation of community relations for the RI/FS focuses on providing information regarding the timeline, reporting, field activities, and scheduling of RI/FS work. As outlined in the CIOP Plan, several objectives for the CIOP apply to the RI/FS. FORA will do the following:

- Provide timely and accurate FORA ESCA RP information
- Provide opportunities for the public for comment and provide input on technical documents
- Be transparent in decision-making processes, and demonstrate respect for all viewpoints
- Meet all regulatory requirements
- Address community concerns in a collaborative fashion

2.1.6 Programs Conducted by the Army

The following additional activities are conducted by the Army as part of their ongoing and future MEC-related activities at the former Fort Ord that are components of the Army's basewide efforts to promote MEC safety because of Fort Ord's history as a military base. The Army's Ordnance and Explosives Site Security Program (Army 2005b) describes many of these efforts.

2.1.6.1 School Education

The Fort Ord Base Realignment and Closure (BRAC) Community Relations Office announces and coordinates a MEC safety program semi-annually with local schools. The objective is to provide school age children with the ability to utilize the 3Rs of MEC safety: Recognize, Report, and Retreat. Details of the school safety program are in the Fort Ord Munitions Response Site Security Program Annual Report 2011(Army 2011). FORA and the ESCA Remediation Program Team will coordinate with the Army concerning safety and education issues relative to the FORA ESCA Remediation Program. Additional information is available through the Army Community Relations office, (831) 393-1284.

2.1.6.2 Community Involvement

The Army is committed to developing opportunities to assist community members in understanding and participating in the cleanup decision-making process at the former Fort Ord. The Army holds public meetings, Community Involvement Workshops, Technical Review Committee (TRC) meetings, open houses, and tours and conducts public information sessions through booths or tables at local community events. The Army provides public and media tours of former Fort Ord cleanup activities, distributes fact sheets, and makes presentations to special interest and community groups as necessary to address specific community concerns or explain significant cleanup activities. The Army also maintains document repositories available to the public including the administrative record and several information repositories at local libraries. Additionally, the Army administers a public environmental cleanup website and mails monthly cleanup updates. The website provides background information, a description of current activities, documents available for public comment, maps, notices, and agendas for upcoming public meetings. The monthly cleanup update includes information on recent cleanup activities, and recently published documents and fact sheets, and is mailed to those who have requested to be on the community relations mailing list and distributed at community involvement events. Community involvement activities are documented in the CRP.

2.2 Long-Term Management Measures Specific to the CSUMB Off-Campus MRA

This section describes the long-term management measures that are specific to the CSUMB Off-Campus MRA reuse areas. These measures will be applied to implement and manage the remedial alternatives selected for the CSUMB Off-Campus MRA, and as such, are not risk management measures or response actions and are not screened or evaluated for reuse area-specific applicability. These measures will be described in further detail in the Remedial Design/Remedial Action Work Plan (RD/RA WP), or similar document.

2.2.1 Deed Notice

The Army has established a MEC-related deed notice that (1) informs future property owners MEC was found and removed at the reuse area; (2) specifies requirements that must be met prior to performing certain activities at the area; (3) specifies that any modifications to these

requirements must be approved by the Army and EPA, and be coordinated with DTSC prior to implementation; and (4) outlines appropriate procedures to be followed in the event that MEC is encountered during development or reuse. The following clauses are included in the deeds for transferring ESCA parcels:

"The Grantee is hereby notified that, due to the former use of the Property as a military installation, the Property may contain munitions and explosives of concern (MEC). The term MEC means specific categories of military munitions that may pose unique explosives safety risks and includes: (1) Unexploded Ordnance (UXO), as defined in 10 U.S.C. §101(e)(5); (2) Discarded military munitions (DMM), as defined in 10 U.S.C. §2710(e)(2); or (3) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard. For the purposes of the basewide Military Munitions Response Program being conducted for the former Fort Ord and this EPP, MEC does not include small arms ammunition (i.e. ammunition without projectiles containing explosives, other than tracers, that is .50 caliber or smaller, or for shotguns)."

"After response actions are completed, if the Grantee, any subsequent owner, or any other person should find any MEC on the Property, they shall immediately stop any intrusive or ground-disturbing work in the area or in any adjacent areas and shall not attempt to disturb, remove or destroy it, but shall immediately notify the local law enforcement agency having jurisdiction on the Property so that appropriate explosive ordnance disposal (EOD) personnel can be dispatched to address such MEC as required under applicable laws and regulations at no expense to the Grantee."

2.2.2 Annual Monitoring and Five-Year Review Reporting

FORA or FORA's representative will monitor the CSUMB Off-Campus MRA reuse areas on an annual basis, and collect and report any MEC-related data that may be discovered after transfer of the property. FORA or FORA's successor will report results of the annual monitoring on an annual basis. If MEC is encountered in the area during reuse, (1) MEC incident reporting will be performed; (2) the project team (the Army, EPA, and DTSC) will be notified; and (3) the need for reevaluation of the protectiveness of the area under the current remedy will be assessed by the project team.

CERCLA five-year reviews are conducted as a basewide effort at the former Fort Ord. All remedies at the former Fort Ord are reviewed together, including the remedy selected for the CSUMB Off-Campus MRA reuse areas. The purpose of the five-year review is to determine whether the remedy at a reuse area continues to be protective of human health and the environment (1) within a period of five years from the time the remedy was implemented, or (2) five years from the time of a previous five-year review. The results of annual monitoring and the methods, findings, and conclusions of the five-year review will be documented in a five-year review report, which will identify any recommendations to address them, as appropriate. The next five-year review will occur in 2017.

2.3 Results of Remedial Investigation and Risk Assessment and Definition of Areas for FS Analysis

The following sections present a summary of the results of the remedial investigation and risk assessment and provide the definition of the reuse areas for the FS analysis.

2.3.1 Summary of Remedial Investigation Results

The general premise of the RI process is that MEC contamination exists at a site for which an initial investigation is required to define the nature and extent of the contamination. For the CSUMB Off-Campus MRA being evaluated in this RI/FS, MEC was known or suspected to be present in these areas and MEC removal actions were completed by the Army's contractors according to contractual and/or work plan requirements in place at the time the work was conducted, as described in the RI (Volume 1of this Group 2 RI/FS Report). Therefore, the purpose of the RI in this case was to evaluate the completeness of the previous MEC removal actions conducted by the Army and verify adequate MEC-related data was available to perform the subsequent RA and FS. The RI determined adequate MEC-related data was available to perform the subsequent RA and FS for the CSUMB Off-Campus MRA.

2.3.2 Summary of Risk Assessment Results

The general premise of the RA process is that contamination exists at a site at concentrations that can be compared to risk-based levels considered protective of human health and the environment. In order to quantify potentially remaining risks, protective risk-based levels are typically translated into site-wide cleanup levels. A range of remedial alternatives are then developed and compared in the FS based on their ability to achieve the site-wide cleanup levels and other RAOs. For the CSUMB Off-Campus MRA being evaluated in this RI/FS, site-wide cleanup levels cannot be developed to quantify potentially remaining MEC risks. In this case, a unique Fort Ord MEC Risk Assessment Protocol ("the Protocol"; Malcolm Pirnie 2002) was developed to estimate potentially remaining MEC risks (Overall MEC Risk Scores) for each receptor expected to be present during development and reuse of an area.

Tables 2-1 and 2-2 provide a summary of the reuse receptors and the Overall MEC Risk results for the after-action analysis of the CSUMB Off-Campus MRA conducted in the RA presented as Volume 2 of this Group 2 RI/FS Report. The overall risk for each receptor for each MEC Hazard Type in both reuse areas has been calculated as "A - Lowest Risk".

Although the results of the RA calculated the Overall MEC Risk as "A - Lowest Risk" for the identified potential reusers within the CSUMB Off-Campus MRA, it is recognized that detection efficiencies of the Schonstedt instruments used during the previous removal actions conducted at the CSUMB Off-Campus MRA are not 100%. Although the detected anomalies may have been removed, the potential exists that some MEC may remain in the subsurface at the CSUMB Off-Campus MRA. Therefore, the risks associated with intrusive receptors (maintenance workers, construction workers, and residents) are assumed to remain at the CSUMB Off-Campus MRA at a level that requires mitigation.

2.3.3 Assessment and Definition of Areas for FS Analysis

The CSUMB Off-Campus MRA is located in the north-central portion of the former Fort Ord, bordered by Inter-Garrison Road to the north, the County North MRA to the east and southeast, the Parker Flats MRA to the south, and 8th Avenue and CSUMB campus property to the west and southwest (Figure 3). The MRA boundaries generally correspond to the boundaries of land transfer Parcel S1.3.2 (Figure 3). The CSUMB Off-Campus MRA is wholly contained within the jurisdictional boundaries of Monterey County. The CSUMB Off-Campus MRA is approximately 333 acres in size and composed of several munitions response sites (MRSs) that were described in greater detail in Volume 1of this Group 2 RI/FS Report.

The Installation-Wide Habitat Management Plan (HMP) for the former Fort Ord (USACE 1997) identified the CSUMB Off-Campus MRA as a development parcel with borderland development areas along a natural resource management area (NRMA) interface. The HMP does not designate specific reuses for the CSUMB Off-Campus MRA. The general development land use category described in the HMP encompasses numerous different potential reuses including infrastructure activities such as roadway and utility construction, as well as commercial/retail, parks, possible residential use, and borderland activities.

The CSUMB Off-Campus MRA will ultimately be transferred to CSUMB.

The Base Reuse Plan (FORA 1997) indicated this area is proposed for school/university reuse with residential infill opportunities. The following reuse areas have been identified:

- Residential (CSUMB campus housing; Sector 1) — The western one-sixth (approximate) of the MRA is proposed for use as off-campus housing for CSUMB (CSUMB 2007). This area is approximately 49 acres. Construction of buildings and roads, installation of utilities, as well as the activities of future residents are expected within the MRA.
- Non-residential (CSUMB open space park; Sector 2) — The eastern five-sixths (approximate) of the MRA is proposed for an oak woodland and maritime chaparral open space park with a 100-ft buffer along the NRMA interface (ESCA RP Team 2008a). The area is approximately 284 acres. Vegetated areas and hiking trails may require maintenance such as planting and weeding. Recreational hiking and bicycling/horseback riding on dirt paths are expected to occur.

Current land use restrictions specified in the deed for the property transfer parcel are prohibition of:

- any uses other than investigation and/or remediation of MEC and installation of utilities and/or roadways until Certification of Completion of remedial action has occurred
- the use of the property for residence, hospital, school (for persons under the age of 21, except for post-secondary schools), and a day care center for children

- activities (including soil disturbance) in violation of the Excavation Ordinance, as modified

Additionally, the current land use restrictions stated in the State Covenant to Restrict the Use of Property (Army/DTSC 2009) require:

- the buyer, lessee, or sub-lessee be given written notice that there is the potential for the presence of MEC in the soil of the property

- DTSC, the United States working through the Army, and their contractors and/or agents to have reasonable right-of-entry and access to the Property for inspection, monitoring, testing, sampling and other activities consistent with the CERCLA covenant as deemed necessary by the DTSC in order to protect the public health and safety or the environment and oversee any required activities

2.4 Definition of Remedial Action Objectives

The primary RAOs for the CSUMB Off-Campus MRA are based upon the risk assessment results presented in Volume 2 of this Group 2 RI/FS Report and on EPA's RI/FS Guidance (EPA 1988) to achieve the EPA's threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)."

For the purpose of this RI/FS, the contaminant of concern within the CSUMB Off-Campus MRA is MEC. The potential for soil contamination from munitions constituents at the former Fort Ord is being addressed under the Army's BRA Program (IT 2001; Shaw 2012). As stated in the FOSET, based on the BRA Program, no further action was recommended for HAs within the CSUMB Off-Campus MRA (Army 2007). In addition, IRP Site 39B (Inter-Garrison Site) is located within the CSUMB Off-Campus MRA. As stated in the FOSET, the EPA and the DTSC have concurred that no further action is necessary at Site 39B (Army 2007); however, subsequent soil sampling performed within the MRA resulted in a recommendation for an Interim Action to remove soil contamination from one area with an elevated concentration of lead in shallow soil (Army 2009a). In February 2010, Shaw Environmental, Inc. (on behalf of the Army) excavated approximately 20 cubic yards of soil from HA-161 and disposed of the soil in the Operable Unit 2 landfills. Confirmation samples collected from the excavation indicated that residual soil concentrations for lead were below the target cleanup concentrations. The results of the soil removal activities were presented in the Draft Final Interim Action Confirmation Report (Shaw 2011).

The exposure pathway for potential receptors and MEC is direct contact. As described in Volume 2 of this Group 2 RI/FS Report, a risk assessment was performed to describe the qualitative and quantitative factors leading to an encounter between a potential reuse receptor and a MEC item. The RA results are based on the following three key factors that are assigned reuse-specific values and are weighted in importance: (1) MEC Hazard Type, (2) Accessibility, and (3) Exposure. These factors were used according to the RA protocol to develop an Overall MEC Risk Score for each potential receptor at a given reuse area

within the CSUMB Off-Campus MRA. The results were presented in Volume II of this Group 2 RI/FS Report.

Based upon the risk assessment and the EPA's RI/FS Guidance, the following RAO was developed for the protection of human health and the environment for the CSUMB Off-Campus MRA:

- Prevent or reduce the potential for the CSUMB Off-Campus MRA reuse receptors to come in direct contact with MEC items potentially remaining in subsurface soil and minimize potential impacts from such exposures

In order to achieve this RAO, the development of alternatives for the CSUMB Off-Campus MRA reuse areas will (1) mitigate potentially remaining MEC risks, and (2) comply with ARARs and other guidelines. A discussion of these components and their consideration in the development of remedial alternatives for the CSUMB Off-Campus MRA reuse areas is presented below.

2.4.1 Potential Applicable or Relevant and Appropriate Requirements

This section presents a general description and analysis of ARARs. Potential federal and state ARARs that may be pertinent to implementation of the remedial alternatives were developed for the CSUMB Off-Campus MRA. For each of the remedial alternatives developed in Section 4.0, their compliance with ARARs are evaluated and compared in Section 5.0.

Section 121 of CERCLA requires that site cleanups comply with federal and state laws that are ARARs. Under CERCLA Section 121(d)(2), the federal ARARs for a remedial action could include requirements under any of the federal environmental laws. State ARARs include promulgated requirements under state environmental or facility siting laws that are more stringent than federal ARARs, and that have been identified in a timely manner, pursuant to 40 Code of Federal Regulations (CFR) Part 300.400(g)(4). A requirement may be either "applicable" or "relevant and appropriate."

The terms "applicable", "relevant and appropriate", and "to be considered" are defined in the next section.

2.4.1.1 Definition of ARARs

"Applicable" requirements are defined as those cleanup or control standards, or other substantive environmental protection requirements, criteria, or limitations, promulgated under federal or state laws. Applicable requirements are identified on a site-specific basis by determination of whether the jurisdictional prerequisite of a requirement fully addresses the circumstances at the site or the proposed remedial activity. All pertinent jurisdictional prerequisites must be met for the requirement to be applicable. These jurisdictional prerequisites are as follows:

- The party must be subject to the law;
- The substances or activities must fall under the authority of the law;
- The law must be in effect at the time the activities occur;
- The statute or regulation requires, limits, or protects the types of activities; and
- A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the statute or regulation directly addresses the circumstances at the site.

"Relevant and appropriate" requirements refer to those cleanup standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that while not necessarily applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site, and whose use is well suited to the particular site (EPA 1993). The relevance and appropriateness of a requirement can be judged by comparing a number of factors including the characteristics of the remedial action, the items in question, or the physical circumstances of the site, with those addressed in the requirement. If there is sufficient similarity between the requirements and the circumstances at the site, determination of the requirement as relevant and appropriate may be made.

Determining whether a requirement is both relevant and appropriate is a two-step process. First, to determine relevance, a comparison is made between the response action, location, or chemicals covered by the requirement and related conditions at the site, release, or potential remedy. A requirement is relevant if it generally pertains to these conditions. Second, to determine whether the requirement is appropriate, the comparison is further refined by focusing on the nature of the items, the characteristics of the site, the circumstances of the release, and the proposed response action. The requirement is appropriate if, based on such comparison, its use is well suited to the particular site. The facility must comply with the substantive elements of requirements that are determined to be both relevant and appropriate.

To Be Considered requirements, the final class of requirements considered by EPA during the development of ARARs, are non-promulgated advisories or guidance documents issued by federal or state governments. They do not have the status of ARARs, and are not legally binding, but may be considered in determining the necessary cleanup levels or actions to protect human health and the environment.

2.4.1.2 Types of ARARs

In general, ARARs that govern actions at CERCLA sites fall into three broad categories based upon the chemical contamination present, site characteristics, and alternatives proposed for cleanup (EPA 1993). These three categories (chemical-specific, location-specific, and action-specific) are described below.

Chemical-Specific ARARs

Chemical-specific ARARs include those environmental laws and regulations that regulate the release to the environment of materials with certain chemical or physical characteristics or that contain specified chemical compounds. These requirements generally set health or risk-based concentration limits or discharge limits for specific hazardous substances by media. Chemical-specific ARARs are triggered by the specific chemical contaminants found at a particular site. Examples of potential chemical-specific ARARs are effluent limitations, emission limitations, drinking water standards, and hazardous waste characteristics identified for specific chemicals and compounds. A more stringent standard, requirement, criterion, or limitation promulgated pursuant to a state environmental statute and identified in a timely manner is also a potential ARAR.

Location-Specific ARARs

Location-specific ARARs govern activities in certain environmentally sensitive areas. These requirements are triggered by the particular location and the proposed activity at the site. An example of a location-specific ARAR is compliance with the Endangered Species Act of 1973, as amended, to avoid sensitive ecosystems or habitats. Location-specific ARARs also focus on wetland or floodplain protection areas, or archaeologically significant areas.

Action-Specific ARARs

Action-specific ARARs are restrictions that define acceptable treatment and disposal procedures for hazardous substances. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities. An example might be a state Air Quality Management Authority that sets limitations on fugitive dust generated during grading and excavation activities during clearance action.

2.4.1.3 Application of ARARs at Former Fort Ord

CERCLA Section 121(d) allows the selection of alternatives that will not attain ARAR status if any of six conditions for a waiver of ARARs exists. However, the selected alternative must be protective even if an ARAR is waived. Only five of the conditions for a waiver may apply to a DOD site. The conditions for a waiver are as follows:

- The action selected is only part of a total response action that will attain the required level or standard of control when completed;
- Compliance with the designated requirement at that site will result in greater risk to human health and the environment (e.g., worker safety) than alternative options;
- Compliance with the designated requirement is technically impracticable from an engineering perspective;
- The action selected will result in a standard of performance that is equivalent to an applicable requirement through the use of another method or approach;

- A state requirement has not been equitably applied in similar circumstances on other clearance actions within the state; and
- A fund-financed clearance action does not provide a balance between available monies and the need for protection of human health and the environment at sites where the need is more immediate (not applicable to DOD sites).

In determining whether a requirement is pertinent to MEC at the former Fort Ord, potential ARARs are initially screened for applicability. If determined not to be applicable, the requirement is then reviewed for both relevance and appropriateness. Requirements that are considered to be relevant and appropriate command the same importance as applicable requirements.

2.4.2 Land Use Control Guidelines

The following guidelines set forth by the EPA, DOD, and DTSC that are relevant to potential land use controls that may be identified for the CSUMB Off-Campus MRA reuse areas will be considered in the development and implementation of remedial alternatives.

As described in the Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred Ranges (DOD/EPA 2000):

- LUCs must be clearly defined, established in conjunction with affected parties, and enforceable.
- LUCs will be considered as part of the development and evaluation of alternatives for a given closed, transferring, or transferred range.
- DOD (the Army) will conduct periodic reviews to ensure the long-term effectiveness of response actions, including LUCs.

In addition, DOD/EPA guidelines specifically address the requirement for institutional controls (LUCs) when MEC contamination has been or may still be on the site (DOD/EPA 2000) as follows:

> "When complete UXO clearance is not possible at military closed, transferring, and transferred ranges, DOD will notify the current land owners and appropriate local authority of the potential presence of an explosives safety hazard. DOD will work with the appropriate authority to implement additional land use controls where necessary."

The EPA policy "Institutional Controls and Transfer of Real Property under CERCLA Section 120 (h)(3)(A), (B), or (C)" (EPA 2000a) requires the responsible agency to perform the following activities:

- Monitor the institutional controls' effectiveness and integrity
- Report the results of such monitoring, including notice of violation or failure of control to the appropriate EPA and/or state regulator, local or tribal government, and designated party or entity responsible for enforcement

- Enforce the institutional controls should a violation or failure of controls occur

In addition, the policy states that "in order to ensure long-term protection of human health and safety in the presence of potential explosive hazards, institutional controls must be enforceable against whomever may gain ownership or control of the property in the future."

In 1987, DTSC developed policy recommending the use of land use covenants based on statutory authority in the California Health and Safety Code (Chapters 6.5, 6.8, 6.85) and the California Civil Code, Section 1471, which allows an owner of property to enter into environmental restrictions due to the presence of hazardous materials, hazardous wastes or constituents, or hazardous substances that will remain at the property at levels that are not suitable for unrestricted use of the land. In April 2003, DTSC adopted regulations to add Section 67391.1—Requirements for Land Use Covenants—to Title 22, Division 4.5, Chapter 39, of the California Code of Regulations.

These regulations are imposed by the DTSC and specify that a land use covenant imposing appropriate limitations on land use shall be executed and recorded at a county recorder's office so that they will be found during a title search of county records. The land use covenant regulations require DTSC to clearly set forth and define land use limitations or covenants in a remedy selection or response action decision document (for CSUMB Off-Campus MRA reuse areas under CERCLA, the Record of Decision) prior to approving or concurring with a response action. The decision document must also include an implementation and enforcement plan.

Land use covenants are proprietary controls, agreed to by property owners, to allow ongoing use of the property as long as the cleanup remedy is not compromised by current or future development. Land use covenants include written instruments and agreements restricting land uses, easements, servitudes, covenants, and land use restrictions, i.e., they are non-engineering mechanisms to restrict activities and site access to limit exposure pathways of human and environmental receptors to prevent exposure to contaminants. Land use covenants "run with the land", i.e., they are binding on current and subsequent property owners, and remain in effect until they are formally removed or modified, pursuant to the California Health and Safety Code, sections 25233, 25234, and 25398.7. These regulations certify that DTSC may later modify or terminate land use covenants if it is determined such modification or termination is protective of public health and safety and the environment.

For sites requiring land use covenants, DTSC policy requires that the property owner enter into a land use covenant agreement to ensure that the state will have authority to implement, monitor, and enforce protective restrictions. Restrictions agreed to in land use covenants are typically intended to do the following:

- Prevent inappropriate land use on property containing residual contamination or the surrounding property;

- Guarantee that information about property containing residual contamination is available to local governments and the public;
- Disclose to real estate transaction participants (buyers, sellers, lending institutions, brokers, title companies) that the property in question contains residual contamination;
- Ensure that long-term mitigation measures or monitoring requirements are carried out and maintained;
- Ensure that the integrity and stability of the remedy is maintained;
- Ensure that subsequent property owners or lessees have a duty to assume responsibility for any requirements or restrictions pertaining to residual contamination when they take over the property;
- Ensure that DTSC will be contacted prior to change in land use or the cleanup remedy; and
- Ensure that only DTSC can terminate or modify the remedy (land use covenant per DTSC policy).

The current DTSC CRUP (Army/DTSC 2009) for the CSUMB Off-Campus MRA includes the following restrictions:

- Residential Use Restriction: Prohibits the CSUMB Off-Campus MRA from being used for the following purposes: a residence, including any condominium, mobile home or factory built house, constructed or installed for residential habitation; a hospital (other than a veterinary hospital); a public or private school for persons under the age of 21, except for post-secondary schools; and a day care center for children.;
- Prohibited Activities/Soil Management Requirements: Prohibits activities in violation of the county excavation ordinance (including soil disturbance). The ordinance requires the following: 1) construction personnel involved in intrusive operations to attend the MEC recognition and safety training; and construction support performed by UXO-qualified personnel during any intrusive or ground-disturbing construction activities at Group 2 MRA reuse areas to address potential MEC risks to construction personnel

After the CSUMB Off-Campus MRA ROD is signed, the existing covenant, including the residential use restriction, will be modified, if appropriate, to document and be consistent with the final land use restrictions included in the selected remedy.

Although the Army determined that there were no potential Federal or State ARARs that relate to LUCs at the CSUMB Off-Campus MRA, LUCs will be implemented in a manner consistent with applicable Federal and State guidance. While the Army does not consider California laws and regulations concerning Land Use Covenants to be potential ARARs, the Army entered into a State Covenant to Restrict the Use of Property (CRUP) at the time the property was transferred. After the CSUMB Off-Campus MRA ROD is signed the existing covenant will be modified, if appropriate, to document the land use restrictions included in the selected remedy. Although DTSC and EPA Region IX disagree with the Army's determination that California laws and regulations concerning Land Use Covenants are not potential ARARs, they will agree-to-disagree on this issue since the Army executed the State

CRUP and agrees that it will be modified, if appropriate, to be consistent with the selected remedy, in a manner acceptable to DTSC.

3.0 IDENTIFICATION OF APPLICABLE RESPONSE ACTIONS

Potentially applicable response actions and process options for achieving the RAO are identified and screened in this chapter according to EPA guidance (EPA 1988). Technologies that pass this screening are used to develop comprehensive remedial alternatives for the CSUMB Off-Campus MRA. Due to the limited number of technologies available for MEC remediation, the general response actions and process options have been combined, rather than presented separately as recommended in the EPA guidance. A preliminary screening of the response actions and process options is conducted in this section based upon effectiveness, implementability, and general costs.

3.1 Description of General Response Actions and Process Options

The following general response actions have been identified to potentially address remaining MEC risks at the CSUMB Off-Campus MRA:

- No Further Action
- Land Use Controls
- Containment
- Additional MEC Remediation

In addition, process options have been identified for the general response actions. The general response actions and the process options have undergone a preliminary screening based upon effectiveness, implementability, and estimated costs. The results of this screening are presented in Section 3.2. The goal of the preliminary screening process is to eliminate general response actions and process options that clearly do not provide an additional reduction in risk for reuse receptors to contact MEC and/or are not technically implementable based on site conditions or intended future reuse of the MRA. The general response actions and process options that are retained for further analysis in the preliminary screening are used to develop the remedial alternatives presented in Section 4.0.

3.1.1 No Further Action

This alternative assumes no further action would be taken related to MEC at the reuse areas. The No Further Action Alternative is provided, as required under CERCLA and the National Contingency Plan (NCP), as a baseline for comparison to the other proposed remedial alternatives and has been retained for further analysis.

3.1.2 Land Use Controls

LUCs (also referred to as Institutional Controls) are legal and/or physical means of limiting or eliminating potential human exposures from a site. LUCs may be an appropriate alternative if placing controls on, or limits to, property use could prevent or limit exposure

to potentially remaining MEC risks, such as in areas where MEC removal actions have already been conducted and the remaining MEC risks are expected to be low for the majority of receptors. Specific examples potentially applicable for the Group 2 MRAs include:

- Access Management Measures
- Deed and/or Zoning Restrictions
- MEC Safety, such as awareness training and construction support

3.1.2.1 Access Management Measures

Access management measures could include (1) maintenance of existing measures at the reuse area, or (2) implementation of additional measures. The Ordnance and Explosives Site Security Program Summary (Army 2005b) provides information about different types of site security measures that may be implemented at the former Fort Ord. For the Group 2 MRA reuse areas, the following access management measures may be applicable:

- **Informational Displays** such as signs, kiosks, or display boards would provide safety information regarding potentially remaining MEC risks in nearby areas. The informational displays would be multi-lingual and posted in areas such that they are within a legible distance.
- **Fencing** would be identified based on land use and potential for residual MEC risks.
- **Security Patrols** may be required and employed by either private or governmental entities to monitor and discourage trespassing into areas potentially containing MEC risks.

3.1.2.2 Deed and/or Zoning Restrictions

Deed and/or zoning restrictions regarding potential MEC risks at a Group 2 MRA reuse area would establish the appropriate restriction that indicates the following:

- Specified reuses evaluated in the RA, that were designated and approved at the time the Army transferred the property to FORA, must be maintained by all property owners.
- Potential MEC risks may significantly increase if changes in the designated and approved reuse are implemented without further evaluation and approval by the regulatory agencies.
- Any modifications to these restrictions must be approved by the Army and EPA, and be coordinated with DTSC prior to implementation.

Specific types of restrictions would vary depending on the reuse area conditions, potential MEC risks, and anticipated future land use. Examples could include restrictions that require the property owner to apply for and obtain a permit from the local jurisdiction prior to excavation of soil or restrictions that prevent residential use of the property. This control

would identify who would be responsible for implementation, monitoring, reporting, and enforcement.

3.1.2.3 Residential Use Restriction

The Army agreed to enter into a Land Use CRUP with the DTSC at the time of property transfer to FORA prohibiting the CSUMB Off-Campus MRA from residential reuse. For the purposes of this document, residential reuse includes, but is not limited to, single family or multi-family residences, child care facilities, nursing home or assisted living facilities, and any type of educational purpose for children/young adults in grades kindergarten through 12. The residential use restriction is required to remain in place for the CSUMB Off-Campus MRA until the regulatory agencies agree that the CSUMB Off-Campus MRA (or any portion thereof) is approved for residential reuse.

Based upon the results of the RI and RA, including the RQA Process Pilot Study, a residential use restriction may be applied only to the portion of the CSUMB Off-Campus MRA where it is determined necessary, such as the area proposed for non-residential reuse as an open-space park (i.e., Sector 2, the eastern portion).

3.1.2.4 MEC Recognition and Safety Training

For the Group 2 MRA reuse areas, digging or underground "intrusive" activities are planned for the proposed reuses and development. People involved in intrusive operations at these reuse areas would be required to attend the MEC recognition and safety training to increase their awareness of and ability to identify MEC items. Prior to planned intrusive activities, the landowner would be required to notify FORA or FORA's representatives and provide MEC recognition and safety training for all workers performing intrusive activities.

3.1.2.5 Construction Support

Construction support would be performed by UXO-qualified personnel during any intrusive or ground-disturbing activities at Group 2 MRA reuse areas to address potential MEC risks to those involved in such activities. Construction support would be arranged during the planning stages of the project prior to the start of any intrusive activities. The level of construction support will be determined on a case-by-case basis. Two levels of construction support have been identified: on-call construction support and active construction support. For on-call construction support, UXO-qualified personnel must be contacted prior to the start of intrusive activities to ensure their availability, advised about the project, and placed "on call" to assist if suspected MEC are encountered during intrusive activities. For active construction support, UXO-qualified personnel must be contacted prior to the start of intrusive activities, advised about the project, and must remain on-site during any such intrusive activities to monitor for MEC items. If evidence of MEC is found during construction support activities, the intrusive and ground-disturbing work will immediately cease; no attempt will be made to disturb, remove, or destroy the MEC, and the local police department will be immediately notified so that appropriate explosive ordnance disposal

personnel can be dispatched to address the MEC, as required under applicable laws and regulations. Construction support may be applicable in the short term during development of the reuse area, and/or in the long term during established reuse.

3.1.3 Containment

Containment technologies involve placing a physical barrier over the areas of concern to limit or prevent the direct exposure to MEC items in soil without further removal or treatment, for example, by placing an asphalt cap over the area of concern or importing clean soil and placing a specified thickness of soil across the area of concern. Containment technologies do not offer a reduction in the quantity of MEC items, but instead reduce the remaining MEC risks by eliminating the exposure pathway (direct contact) to certain receptors. Containment technologies require regular inspection and maintenance to ensure that the integrity of the barrier is not compromised over time.

3.1.4 Additional MEC Remediation

Additional MEC Remediation involves locating remaining MEC items within an area, either visually or using MEC detection instruments, and physically removing or destroying the MEC item(s) thereby reducing the remaining MEC risk. Additional MEC Remediation includes the following components:

1) Vegetation clearance involves conducting site preparation procedures to clear vegetation to bare ground or approximately 6 inches above ground surface, if necessary, to allow for proper operation of MEC detection equipment, and to provide the required ground visibility for the safety of MEC workers.
2) MEC remedial action involves using the best available and appropriate MEC detection technology (BAADT) and removal (remedial) technology procedures and Department of Defense Explosives Safety Board (DDESB)-approved MEC detonation procedures in areas where explosive MEC items are identified during remedial activities and require disposal. A MEC remedial action includes a range of potential components, including technology-aided surface removal and subsurface clearance to depth. Additional remediation may be performed across an entire area or focused on specific areas of concern based upon previous investigation results and/or the results of the risk assessment. The type of removal action (e.g., surface removal versus subsurface removal) may determine the extent and type of vegetation removal that is necessary.

Descriptions and applicable methods for implementation of the components of additional MEC remediation are described below. If identified for implementation at the CSUMB Off-Campus MRA, the RD/RA WP would describe the planned vegetation clearance methods and additional MEC removal methodologies in greater detail. The RD/RA WP would be available for regulatory agency and public review prior to implementation of the fieldwork.

3.1.4.1 Vegetation Clearance

A range of vegetation clearance methods that are potentially applicable at the former Fort Ord were described and evaluated in the Evaluation of Vegetation Clearance Methods Technical Memorandum (Harding ESE 2002). Table 12 of the Vegetation Clearance Methods Technical Memorandum presents a matrix of vegetation clearance methods that should be retained for further consideration for the range of different plant communities (types of vegetation) found at the former Fort Ord.

The selection of vegetation clearance methods depends on (1) the type of vegetation present, and (2) the planned reuse(s) of the MRA. The vegetation in the CSUMB Off-Campus MRA consists primarily of coastal live oak woodland with smaller areas of maritime chaparral and grassland (ESCA RP Team 2008a). The HMP identified the CSUMB Off-Campus MRA primarily as a development parcel, with borderland development areas along the natural resource management area interface (the habitat reserve area located on the neighboring County North MRA). For the three types of vegetation present at the CSUMB Off-Campus MRA and the development reuse category, the following subset of vegetation clearance methods may apply depending on the site-specific characteristics and the components of the remedial action:

- No action – no vegetation clearance would be required prior to MEC remediation because vegetation that was cleared during the previous removal action has not re-grown to the extent that would prohibit the proper operation of MEC detection equipment, and vegetation at the site would provide the required ground surface visibility for the safety of MEC workers.
- Manual methods – the use of manual equipment by an operator to cut vegetation by hand. Typically conducted by an operator who is on foot and in the work area being cleared (e.g., using motorized chainsaws, power chippers, mowers, weed eaters, and non-motorized hand tools such as clippers, loppers, pruning shears, and trimmers).
- Mechanical methods – the use of mechanical equipment conducted by an operator to cut vegetation using self-propelled equipment in the work area being cleared (e.g., operation of tractor-pulled track carriers with booms or skid-steer equipment fitted with vegetation clearance tools).

Depending on the type and height of vegetation present in area(s) requiring additional MEC remediation, one or more of the vegetation clearance methods described above would be implemented in accordance with the guidelines provided in the Vegetation Clearance Technical Memorandum (Harding ESE 2002) and the HMP (USASCE 1997). The planned vegetation clearance methods would be described in greater detail in the RD/RA WP. The RD/RA WP would be available for regulatory agency and public review prior to the beginning of fieldwork.

3.1.4.2 Technology-Aided Surface Removal

Technology-aided surface removal utilizes MEC detection instruments to detect and remove MEC present in part or whole on the ground surface. If the MEC detection instruments indicate a response, but the item is not present at or near the ground surface, the investigation does not extend to depth. During a surface removal, qualified personnel mark, identify, and record the approximate locations of all MEC found on the surface for removal or subsequent destruction. Any explosive items identified would be detonated using DDESB-approved MEC detonation procedures. In addition, all munitions debris and other materials interfering with the investigation present at the surface would be collected and stored for later disposal. After MEC removal is conducted, quality control and quality assurance activities are implemented.

3.1.4.3 Subsurface MEC Remediation

Subsurface MEC Remediation would consist of identifying MEC (conduct a visual search and operate MEC detection equipment to locate subsurface items) and investigating and removing detected MEC items. Munitions debris and other debris items that are found or detected during the process are also removed, to the extent feasible. The subsurface removal action can be conducted to a specified depth which would be predetermined prior to beginning the remedial activities. Alternatively, the excavations can be conducted to the depth of detection. Subsurface MEC removal depths would be determined based upon (1) the type of MEC, (2) the typical depth at which the type of MEC is found, and (3) the capabilities of the geophysical detection equipment selected as best suited for site conditions.

To the extent possible, digital geophysical surveys would be conducted after conducting MEC removals on the surface. Digital mapping would be performed using the BAADT. The BAADT would digitally record and locate anomalies identified during the survey. A map of the anomalies would be generated and anomalies identified during the survey would be digitally reacquired and excavated to depth (the anomalies would be investigated, and MEC removals would be conducted if MEC was found). Any explosive items identified would be detonated using DDESB-approved MEC detonation procedures.

Digital mapping in some areas may not be feasible based on site conditions, such as difficult terrain that prevents equipment access or operation. In these areas other methods of subsurface detection and removal, such as “mag and flag” may be utilized.

3.2 Preliminary Screening of General Response Actions and Process Options

In this section, general response actions and process options for the CSUMB Off-Campus MRA identified above are screened following EPA guidance (EPA 1988). Options which pass the screening are combined into comprehensive alternatives for remediation of the CSUMB Off-Campus MRA and are presented in Section 4.0. The CSUMB Off-Campus MRA remedial alternatives are the subject of the detailed analysis presented in Section 5.0.

3.2.1 Methodology for Preliminary Screening

Technologies which passed the initial screening in Section 3.0 are combined into remedial options by reuse area, and these options are further screened on the basis of effectiveness, implementability, and estimated cost. Task 5 of the AOC indicates the FS evaluation should consider, at a minimum, the following:

- A no-action alternative
- An alternative that reduces or eliminates the hazard, toxicity, mobility, or volume of contaminants that includes treatment
- An alternative that considers land use controls
- An alternative that considers unrestricted use
- Innovative technologies

No innovative technologies that exist as process options were identified during the identification of applicable response actions. Some innovative detection technologies may be applicable as BAADT and would be discussed in further detail in the RD/RA Land Use Control Implementation and Operation and Maintenance (LUCI O&M) Plan, or similar document.

3.2.1.1 Effectiveness

Effectiveness is evaluated by the ability to achieve the remedial action objective:

- Prevent or reduce the potential for the CSUMB Off-Campus MRA reuse receptors to come in direct contact with MEC items potentially remaining in surface and subsurface soil and minimize potential impacts from such exposures

Short-term and long-term effectiveness are evaluated. The short-term time period is during construction and implementation of remedial activity, while the long-term time period is after the remedial action is complete.

3.2.1.2 Implementability

Implementability considers both technical and administrative feasibility. Technical feasibility considerations may include:

- the availability of necessary services, equipment, and skilled workers to implement a remedial option, and
- required permits.

Remedial options are first screened based on technical feasibility to eliminate those that are clearly ineffective or unworkable in the Group 2 MRA.

Administrative feasibility considerations may include the:

- ability to obtain permits and approvals from regulatory agencies and other offices;
- ability to obtain access from property owners or agreement from future landowners; and
- interference of a remedial option with planned future reuse of the MRA.

Administrative feasibility is an important element of implementability, because a technically feasible remedial option may be difficult to permit.

3.2.1.3 Estimated Cost

The estimated cost of an option is evaluated with respect to both capital and O&M requirements. At this stage of analysis, costs are estimated on the basis of engineering judgment. Each option is evaluated as to whether its costs are high, low, or moderate relative to other options. If two options are determined to provide equal benefits, the higher cost option is eliminated from further analysis.

3.2.2 Screening of General Response Actions and Process Options

Each of the remedial technology components identified in Section 3.1 are screened in the following sections based upon the factors identified in Section 3.2.1: effectiveness, implementability, and cost.

3.2.2.1 No Further Action

Effectiveness. No additional risk reduction measures would be implemented under this option and therefore, the overall MEC risks calculated in the RA would remain the same for each reuse area and receptor. This measure would not be effective at reducing potentially remaining risks at the CSUMB Off-Campus MRA.

Implementability. Since no further action would be conducted, this option would be technically implementable. However, this alternative would require approval from the regulatory agencies which may be difficult to obtain. Therefore, this alternative may not be administratively feasible to implement.

Cost. The cost of no action would be minimal and therefore considered low in comparison with other remedial options.

Overall Evaluation. The no further action option is retained for comparison with other remedial alternatives as required by the NCP.

3.2.2.2 Access Management Measures

Effectiveness. Access management measures, such as fencing and security patrols, may be effective at reducing trespasser access during development to the CSUMB Off-Campus MRA; however, access management measures would not reduce the risks to subsurface receptors such as construction workers or residents.

Implementability. The proposed reuses for the CSUMB Off-Campus MRA are residential and non-residential (an open-space park). As part of the CSUMB campus, the area is patrolled by campus police and will continue to be for as long as the property is owned by CSUMB. Restricting access to the property with use of a fence would be technically feasible, but not administratively feasible as this would prohibit access by all of the future users to the open-space park and residential area and interfere with the proposed future reuse of the MRA.

Cost. The cost of access management measures would be considered low in comparison with other remedial options.

Overall Evaluation. Because this option may interfere with the proposed reuses of the CSUMB Off-Campus MRA, it has not been retained for further analysis.

3.2.2.3 Deed and/or Zoning Restrictions

Effectiveness. These measures are effective at helping to ensure that the current and future land use is compatible with the agreed-upon land use that was the basis for the risk assessment and selection of the remedial alternative.

Implementability. These measures are already in place for the CSUMB Off-Campus MRA as described in Section 2.1.3 and therefore are considered technically and administratively feasible. The long-term management measures, which were identified in Section 2.2, ensure that these measures will continue by requiring that all property transferred from the former Fort Ord must include deed notices informing property owners of the history and potential for presence of MEC at properties that were once part of the former Fort Ord. In addition, the local jurisdiction in which the CSUMB Off-Campus MRA is located has adopted a local ordinance which requires a special permit that requires construction support for any activities conducted at properties within the former Fort Ord that disturb 10 cubic yards or more of soil.

Cost. The cost of deed and/or zoning restrictions would be considered low in comparison with other remedial options.

Overall Evaluation. These types of restrictions are already in place at the CSUMB Off-Campus MRA. The long-term management measures described in Section 2.2 will be a component of any remedial alternative identified for the CSUMB Off-Campus MRA and would ensure that these types of restrictions continue.

3.2.2.4 Residential Use Restriction

Effectiveness. This measure would effectively eliminate the risk posed to the resident/child user at the CSUMB Off-Campus MRA; however, a residential reuse restriction alone would not reduce the risks to other subsurface receptors, such as construction workers. A residential use restriction would also interfere with the proposed reuse of a portion of the CSUMB Off-Campus MRA. The RI presented the results of the RQA Process Pilot Study completed on the proposed future residential reuse portion of the CSUMB Off-Campus MRA. The entire future residential reuse area within the CSUMB Off-Campus MRA was recommended as acceptable for residential reuse with appropriate institutional controls, such as the county excavation ordinance, construction support, and disclosures.

Implementability. The Army agreed to enter into a Land Use Covenant to Restrict the Use of Property with the DTSC at the time of property transfer to FORA prohibiting the CSUMB Off-Campus MRA from residential reuse. Since this restriction is already in place, it is both technically and administratively feasible. However, since the proposed reuse for a portion of the CSUMB Off-Campus MRA is for residential, this alternative would interfere with the proposed property reuse. With modification of necessary documents, the residential use restriction may be applied only to the portion of the CSUMB Off-Campus MRA where it is determined necessary, such as the area proposed for non-residential reuse as an open-space park.

Cost. The cost of a residential use restriction would be considered low in comparison with other remedial options.

Overall Evaluation. This alternative is retained for further analysis as a potentially applicable component of a remedial alternative in Sector 2, which was not evaluated under the RQA Process Pilot Study and, therefore, has not been recommended as acceptable for residential reuse.

3.2.2.5 MEC Recognition and Safety Training

Effectiveness. This measure is aimed at educating people who may conduct intrusive activities within the former Fort Ord about the potential presence of MEC and thereby increasing their awareness of these items and educating them on the proper procedures to follow should suspected MEC items be encountered during their work. This measure would only be effective for those people that took part in the training.

Implementability. The Army already offers the MEC recognition and safety training as part of their public education program. FORA is currently in the process of setting up a system to offer this type of training. Therefore, this measure is technically and administratively feasible.

Cost. The cost of MEC Recognition and Safety Training would be considered low in comparison with other remedial options.

Overall Evaluation. This alternative is retained for further analysis as a potentially applicable component of a remedial alternative.

3.2.2.6 Construction Support

Effectiveness. This measure is effective at reducing the risk posed by MEC to people involved in intrusive, soil-disturbing activities by requiring UXO-qualified personnel to monitor for MEC during such activities that occur within the CSUMB Off-Campus MRA. On-call construction support would be provided during any intrusive or ground-disturbing activities at the MRA.

Implementability. The local jurisdictions have adopted local ordinances that require construction support for soil-disturbing activities that occur within the boundaries of the former Fort Ord. This alternative is both technically and administratively feasible.

Cost. The cost to implement construction support would be considered low in comparison with other remedial options.

Overall Evaluation. This alternative is retained for further analysis as a potentially applicable component of a remedial alternative.

3.2.2.7 Containment

Effectiveness. This alternative would be effective at reducing risks to the potential reusers by providing a barrier between the receptor and MEC; however no reduction in the volume of MEC potentially remaining at the MRA would be achieved. Because this type of response action involves placing a physical barrier over the existing soil surface to eliminate the exposure pathway, the nature of the response would virtually eliminate, or at least greatly disturb, the existing vegetation within the CSUMB Off-Campus MRA.

Implementability. This option would be technically feasible to implement. However, it may be difficult to obtain public acceptance of this option because of the level of disturbance to the existing site conditions required by the implementation. Therefore, this alternative may not be administratively feasible to implement.

Cost. The cost of containment would be high in comparison with other remedial options because of the costs associated with testing and importing the volume of clean fill material that may be required to implement this option.

Overall Evaluation. Because this type of response action involves placing a physical barrier over the existing soil surface to eliminate the exposure pathway, the nature of the response would virtually eliminate, or at least greatly disturb, the existing vegetation within the CSUMB Off-Campus MRA. In addition, because the quantity of MEC would remain within the MRA, the remaining MEC risks for intrusive receptors (such as construction or maintenance workers) would not be reduced. Therefore, containment technologies have not been retained for further analysis.

3.2.2.8 Technology-Aided Surface Removal

Effectiveness. This measure is effective at reducing the risks by reducing the amount of MEC that may remain on the surface. Because a 3- to 4-foot removal action has been conducted at the CSUMB Off-Campus MRA and the RI determined that the removal action was conducted in accordance with the proper procedures, the remaining risks at the CSUMB Off-Campus MRA have already been reduced. Therefore, the added protection gained by performing a technology-aided surface removal would be considered minimal for the amount of effort involved. This measure would not be effective for reducing risks to subsurface receptors since only the potentially remaining surface MEC items would be removed.

Implementability. This type of removal is technically and administratively feasible to implement. Vegetation cutting and/or removal may be required to conduct the surface removal. Because the removal is conducted on the surface, no intrusive work is required.

Cost. The cost of technology-aided surface removal is expected to be moderate compared to other options evaluated since no intrusive work would be conducted.

Overall Evaluation. Although this measure is technically and administratively feasible and would reduce the potentially remaining risks posed by MEC to surface receptors, this measure would not reduce the potentially remaining risks posed by MEC to subsurface receptors. Therefore, this measure is not retained for further analysis.

3.2.2.9 Subsurface MEC Remediation

Effectiveness. This measure is effective at reducing the surface and subsurface risks for reuse receptors encountering MEC on the surface and subsurface by reducing the amount of MEC that may remain at the MRA. Because a removal action has already been conducted at the CSUMB Off-Campus MRA to a depth of 3 to 4 feet and the RI determined that the removal action was conducted in accordance with the proper procedures, the remaining risks at the CSUMB Off-Campus MRA have already been reduced. Therefore, the added protection gained by performing an additional subsurface MEC detection and removal is considered minimal for the amount of effort involved. Additional measures such as LUCs would likely be required following the completion of the removal activities.

Implementability. This type of removal is technically feasible to implement.

Cost. The cost of subsurface MEC Remediation is expected to be high compared to other options evaluated.

Overall Evaluation. Although the results of the RA calculated the Overall MEC Risk as “A - Lowest Risk” for potential reusers within the CSUMB Off-Campus MRA, the potential exists that MEC may remain in the subsurface at the CSUMB Off-Campus MRA. This measure is retained for further analysis as an alternative that reduces MEC risks through reduction of volume of potentially remaining MEC at the site in accordance with the AOC.

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

Using the options retained from Section 3.0, three remedial alternatives were developed for detailed analysis. The alternatives are summarized below. In accordance with the AOC, a no further action alternative for the entire site is being evaluated, as required by the NCP.

4.1 Alternative 1 – No Further Action

This alternative assumes no further action would be taken to address potential MEC risks for those receptors identified in the RA. This alternative is provided as a baseline for comparison to the other remedial alternatives, as required under CERCLA and the NCP.

4.2 Alternative 2 – Land Use Controls

This alternative assumes that LUCs without additional MEC remediation on any portion of the site would be implemented to address potential MEC risks for intrusive reuse. The LUCs alternative consists of MEC recognition and safety training, construction support, and continuation of the residential use restriction in Sector 2, the proposed future non-residential reuse area (open space park). The residential use restriction would be removed from Sector 1, the proposed future residential reuse area.

4.3 Alternative 3 – Additional Subsurface MEC Remediation

This alternative assumes that subsurface MEC remediation would be conducted throughout the entire CSUMB Off-Campus MRA. This alternative includes vegetation clearance, if necessary, and the implementation of additional MEC remediation. The details of the vegetation clearance methods and the MEC detection equipment used would be presented in further detail in the RD/RA WP, or similar document.

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5.0 EVALUATION AND COMPARISON OF REMEDIAL ALTERNATIVES

This section presents the evaluation and comparison of remedial alternatives that would provide mitigation of potentially remaining MEC risks for potential receptors assumed to reuse the area, including workers and future residents conducting intrusive activities at the CSUMB Off-Campus MRA. The evaluation is conducted based on the nine CERCLA evaluation criteria specified in the EPA's RI/FS Guidance (EPA 1988) and is summarized in Table 5-1. Of the different types of likely receptors identified in the MRA reuse areas, the evaluation and comparison of remedial alternatives is performed with regards to construction and maintenance workers and for future residents who, it is assumed, will require additional risk management measures.

The three remedial alternatives developed for the CSUMB Off-Campus MRA include:

Alternative 1 - No Further Action

Alternative 2 - Land Use Controls

Alternative 3 - Additional MEC Remediation

The nine CERCLA evaluation criteria specified in the EPA's RI/FS Guidance are described in further detail as follows:

Threshold Criteria

1) *Overall Protection of Human Health and the Environment* – An alternative must eliminate, reduce, or control threats to public health and the environment through treatment or institutional controls.

2) *Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)* – The alternative must meet Federal and State environmental statutes, regulations, and other requirements that pertain to the site or area unless a waiver is justified.

Balancing Criteria

1) *Long-Term Effectiveness and Permanence* – Considers the ability of an alternative to maintain protection of human health and the environment over time.

2) *Reduction of Toxicity, Mobility, or Volume Through Treatment* – Evaluates the alternative's use of treatment (for which there is a statutory preference) to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

3) *Short-Term Effectiveness* – Considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

4) *Implementability* – Considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of

goods and services. Technical feasibility considerations include the availability of services, necessary equipment, and skilled workers to implement a particular alternative. Administrative feasibility includes obtaining necessary permits and regulatory approvals for implementation of the alternative.

5) *Cost* – Capital and long-term management (LTM) costs are estimated for each alternative based on quotes for labor, materials, and equipment necessary to implement the alternative. For annual LTM costs, the net present value (NPV) is calculated over the expected period of years it will take to implement the alternative based on real discount rates (similar to interest rates) that vary according to the period of performance for federal projects. For those alternatives whose life-cycle is indeterminate or exceeds 30 years, for the purposes of evaluating and comparing alternatives as specified in EPA's RI/FS Guidance (EPA 1988), a period of 30 years is used for estimating LTM costs. USACE/EPA provide guidelines for estimating remedial alternative costs in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-75 (EPA 2000b). The guidelines are applied to cost estimates based upon experience at the former Fort Ord and engineering judgment. These cost estimates are intended to have an accuracy of +50%/-30%.

Modifying Criteria

1) *State Acceptance* – Evaluates technical and administrative issues and concerns that the state may have regarding each alternative. State acceptance will be addressed in the Group 2 MRA ROD once comments on the RI/FS Report and Proposed Plan have been received (EPA 1988).

2) *Community Acceptance* – Evaluates issues and concerns that the public may have regarding each alternative. Community acceptance will be addressed in the Group 2 MRA ROD once comments on the RI/FS Report and Proposed Plan have been received (EPA 1988).

5.1 Evaluation of Remedial Alternatives

This section presents the evaluation of remedial alternatives developed for the CSUMB Off-Campus MRA based on each of the nine CERCLA evaluation criteria described above.

5.1.1 Overall Protection of Human Health and the Environment

MEC removal actions were conducted to depths of approximately 3 and 4 feet below ground surface (bgs) across the CSUMB Off-Campus MRA. In addition, after-action reports indicate that if anomalies were detected at depths greater than approximately 4 feet bgs, the anomalies were investigated and MEC removals were conducted if MEC was found. MEC is not expected to remain in the majority of the CSUMB Off-Campus MRA. The RQA Pilot Study was conducted in an approximately 17-acre portion of the proposed future residential reuse area and the ESCA RQA Process Implementation Study was performed for the entire proposed future residential reuse area of the MRA. Based on the results of the RQA Process evaluation, the approximately 49 acres proposed for future residential reuse within the

CSUMB Off-Campus MRA was recommended as acceptable for future residential reuse with appropriate institutional controls, such as the county excavation ordinance, construction support, and disclosures. Long-term management measures (deed notice, annual monitoring, and five-year review reporting) would be implemented to (1) warn property owners of potential MEC risks associated with intrusive activities, (2) monitor and report any MEC-related data during development or reuse, and (3) assess and manage information regarding the continued protectiveness of these alternatives over time.

Each remedial alternative provides protection of the environment at the CSUMB Off-Campus MRA because the CSUMB Off-Campus MRA has been identified as a development parcel in the HMP.

Alternative 1 (No Further Action): This alternative would not be protective of human health for the receptors who are conducting intrusive activities in the MRA. Although MEC removal was conducted in this area, current MEC-detection technologies do not have a 100% detection efficiency and detection efficiencies decrease with depth. There is a possibility that MEC remains in the subsurface and would potentially pose unacceptable risks to those workers performing intrusive activities during development or reuse of the area and potential future residents.

Alternative 2 (Land Use Controls): This alternative would be protective of human health for those who are to conduct intrusive activities. These receptors performing intrusive activities during or after development would be protected under this alternative because the landowner will be required to (1) provide notice of planned intrusive activities, and arrange for and provide MEC recognition and safety training to those involved in intrusive activities prior to the start of intrusive work, and (2) coordinate and arrange for construction support by UXO-qualified personnel during any intrusive activities. This alternative is also protective of future residential reusers because residential reuse would be restricted to those areas evaluated under the RQA Process Pilot Study and recommended as acceptable for future residential reuse (Sector 1). The residential use restriction would remain in place for those areas not evaluated under the RQA process for residential reuse (Sector 2).

Alternative 3 (Additional MEC Remediation): This alternative may offer some additional protection of human health for the receptors who are to conduct intrusive activities during development or reuse of the area. This alternative assumes there is MEC remaining in the subsurface that could pose a risk to receptors. This alternative is not expected to provide a significant increase in the protection of human health because subsurface MEC removals have already been completed, removing all detected MEC from the site. In addition, because even current MEC-detection technologies do not have a 100% detection efficiency, a potential for residual MEC to remain cannot completely be eliminated, therefore, these areas may require additional risk mitigation measures (e.g., LUCs) following the completion of the additional MEC remediation to protect those receptors that would perform intrusive activities during development and reuse.

5.1.2 Compliance with ARARs

Alternative 1 (No Further Action): There are no ARARs that apply to implementation of this alternative.

Alternative 2 (Land Use Controls): The residential use restriction would be removed from Sector 1 and continue to be implemented in Sector 2 in accordance with the guidelines set forth by the EPA, DOD, and DTSC. No ARARs were identified that apply to implementation of this alternative.

Alternative 3 (Additional MEC Remediation): This alternative would be implemented in compliance with the potential ARARs listed in Appendix A of this report.

5.1.3 Short-Term Effectiveness (During Development)

This criterion considers the impact of an alternative in the short term. For the CSUMB Off-Campus MRA, the short term is considered the period during implementation of additional MEC remediation and/or the period of initial site development during which construction activities and mass soil grading activities are expected to occur. It is not anticipated that residents would be present at the CSUMB Off-Campus MRA in the short term.

Alternative 1 (No Further Action): This alternative would not be effective in the short term because no further action would be taken to mitigate potentially remaining MEC risks to workers who are to conduct intrusive activities during development.

Alternative 2 (Land Use Controls): This alternative would be effective in the short term because LUCs (MEC recognition and safety training and construction support) would be implemented to mitigate potentially remaining MEC risks to those who are to conduct intrusive activities. This alternative would prohibit the reuse of Sector 2 for residential reuse in the short and long term.

Alternative 3 (Additional MEC Remediation): This alternative would be implemented prior to development. Following the completion of the remedial action, the need for additional risk mitigation measures (e.g., LUCs) to protect receptors that may conduct intrusive activities during development would need to be reassessed.

5.1.4 Long-Term Effectiveness and Permanence

This criterion examines the impact of an alternative in the long term. For the CSUMB Off-Campus MRA, the long term is considered the period following the implementation of additional MEC remediation and/or the period following initial site development during which construction activities and mass soil grading activities are expected to be completed. It is anticipated that residents would be present in the CSUMB Off-Campus MRA in the long term (in the portion of the MRA proposed for residential reuse) and that construction and maintenance workers would be present to conduct occasional inspection and maintenance of roads, utilities, trails, and any other infrastructure located in the MRA.

Alternative 1 (No Further Action): This alternative would not provide long-term effectiveness or permanence because no further action would be taken to mitigate potentially remaining MEC risks to receptors who are to conduct intrusive activities during long-term reuse.

Alternative 2 (Land Use Controls): This alternative would provide long-term effectiveness and permanence for receptors because LUCs (MEC recognition and safety training and construction support) would be implemented to mitigate potentially remaining MEC risks to those who are to conduct intrusive activities during long-term reuse and would be maintained until further evaluation determined the LUCs were no longer necessary. This alternative would prohibit the reuse of Sector 2 for residential reuse in the long term.

Alternative 3 (Additional MEC Remediation): It is unknown whether this alternative would provide long-term effectiveness or permanence because after additional MEC remediation is completed, these areas may require additional risk mitigation measures (e.g., LUCs) to protect receptors conducting intrusive activities during long-term reuse.

5.1.5 Reduction of Toxicity, Mobility, or Volume Through Treatment

This Group 2 RI/FS Report addresses only the physical hazards to humans from MEC. The chemical hazards have been addressed under the BRA program (Shaw 2012). MEC-related field sampling and removal activities were completed at the CSUMB Off-Campus MRA by the Army's Munitions Response contractors according to contractual and/or work plan requirements in place at the time the work was conducted. Therefore, it is expected that the volume of MEC remaining in the subsurface has been reduced by completion of these past sampling and removal actions.

Alternative 1 (No Further Action): This alternative would not reduce the volume of MEC remaining in the subsurface because no further action would be taken to mitigate potentially remaining MEC risks.

Alternative 2 (Land Use Controls): This alternative would not reduce the volume of MEC remaining in the subsurface because if MEC remains at the MRA, the MEC would not be removed.

Alternative 3 (Additional MEC Remediation): This alternative may result in some reduction of the volume of MEC remaining in the subsurface if MEC is discovered and removed during additional MEC remediation.

5.1.6 Implementability

Alternative 1 (No Further Action): It is anticipated that this alternative would not be administratively feasible to implement because the necessary approvals from the regulatory agencies to take no further action are not expected to be obtainable. This

alternative would be technically feasible to implement, since it requires taking no further action.

Alternative 2 (Land Use Controls): This alternative would be administratively feasible to implement because the necessary approvals to implement and manage the LUCs are expected to be obtained. Removing the residential use restriction from Sector 1, the portion of the CSUMB Off-Campus MRA proposed for future residential reuse, would be administratively feasible. This alternative would require a moderate level of effort to implement from a technical perspective during development and reuse. LUCs require coordination prior to the start of intrusive work to (1) provide MEC recognition and safety training to all people performing intrusive activities and refresher training on an ongoing basis as appropriate, and (2) mobilize UXO-qualified personnel to provide monitoring during all intrusive activities.

Alternative 3 (Additional MEC Remediation): This alternative would be administratively feasible to implement, because the necessary approvals to implement additional MEC remediation could be obtained. The necessary services, equipment, and skilled workers to implement this alternative are readily available. This alternative would require a high level of effort to implement from a technical perspective, because (1) it may require additional vegetation clearance, and (2) involves UXO-qualified personnel teams conducting MEC removals, managing, and reporting MEC-related data. After additional MEC remediation is completed, these areas are likely to require additional risk mitigation measures (e.g., LUCs) to protect human health and comply with ARARs during development and long-term reuse.

5.1.7 Cost

Capital and LTM costs are estimated for each alternative based on quotes for labor, materials, and equipment necessary to implement the alternative. For LTM costs, the NPV is calculated over the expected period of years it will take to implement the alternative based on real discount rates (similar to interest rates) that vary according to the period of performance for federal projects. USACE/EPA provide guidelines for estimating remedial alternative costs in OSWER Directive 9355.0-75 (EPA 2000b). These cost estimates are intended to have an accuracy of +50% or -30%. A period of 30 years is used for estimating LTM costs for alternatives with indeterminate or 30+ year periods of performance, for the purposes of evaluating and comparing alternatives as specified in EPA's RI/FS Guidance (EPA 1988).

Cost estimating assumptions, unit costs, and real discount rates (that vary according to the period of performance) that are associated with implementation of the remedial alternatives are provided in Tables 5-2 through 5-5.

Long-term management measures (deed notice, annual monitoring, and five-year review reporting) will be implemented for the CSUMB Off-Campus MRA as implementation and management aspects of the identified remedial alternatives. The costs associated with

implementing these measures for the CSUMB Off-Campus MRA over a period of 30 years is approximately $210,000 as summarized in Table 5-2.

Alternative 1 (No Further Action): There are minimal costs associated with implementation of this alternative. No cost tables have been prepared.

Alternative 2 (Land Use Controls): The costs associated with implementing this alternative are summarized in Table 5-3 for the Group 2 MRA. The total cost is estimated to be $1.2 million.

Alternative 3 (Additional MEC Remediation): The costs associated with implementing this alternative for the CSUMB Off-Campus MRA are summarized in Table 5-4. The cost is estimated to be approximately $6.9 million. Costs for this alternative may be higher than can be estimated at this time because these areas may require additional risk mitigation measures (e.g., LUCs) to protect human health during development and long-term reuse.

5.1.8 State Acceptance

The anticipated acceptability by the state of each alternative is presented below; however, state acceptance of the preferred remedial alternative will be addressed in the Group 2 ROD once comments on the Group 2 RI/FS Report and Proposed Plan have been received.

Alternative 1 (No Further Action): This alternative is not likely to be acceptable to the regulatory agencies because it does not take action to mitigate potentially remaining MEC risks to workers who are to conduct intrusive activities during the planned development and reuse of these areas.

Alternative 2 (Land Use Controls): This alternative would likely be acceptable to the regulatory agencies because it takes action both in the short and long term to mitigate potentially remaining MEC risks to all receptors during the planned development and reuse of these areas.Alternative 3 (Additional MEC Remediation): This alternative would likely be acceptable to the regulatory agencies. This alternative takes action to attempt to mitigate potentially remaining MEC risks to receptors who are to conduct intrusive activities during the planned development and reuse of these areas. After additional MEC remediation is completed, these areas are likely to continue to require additional risk mitigation measures (e.g., LUCs) to protect human health during development and long-term reuse.

5.1.9 Community Acceptance

The anticipated acceptability by the community of each alternative is presented below; however, community acceptance will be addressed in the Group 2 ROD once comments on the Group 2 RI/FS Report and Proposed Plan have been received.

Alternative 1 (No Further Action): This alternative is not likely to be acceptable to the community because it does not take action to mitigate potentially remaining MEC risks during the planned development and reuse of these areas.

Alternative 2 (Land Use Controls): This alternative may be acceptable to the community because it takes action both in the short and long term to mitigate potentially remaining MEC risks to all receptors during the planned development and reuse of these areas.

Alternative 3 (Additional MEC Remediation): It is unknown at this time whether the vegetation disturbance and removal required to implement this alternative would be acceptable to the community.

5.1.10 Overall Evaluation

Alternative 1 (No Further Action): Although this alternative is technically implementable and there are minimal costs associated with this alterative, this alternative does not take action to mitigate potentially remaining MEC risks during the planned development and reuse of the CSUMB Off-Campus MRA. As a result, this alternative is not protective of human health and the environment in the short or long term, and does not meet the RAO identified for the CSUMB Off-Campus MRA.

Alternative 2 (Land Use Controls): This alternative is technically feasible to implement and has an estimated implementation cost of $1.2 million. This alternative is protective of human health and the environment in the short and long term and meets the RAO by reducing the potential for reuse receptors to come in contact with MEC.

Alternative 3 (Additional MEC Remediation): This alternative is technically and administratively feasible to implement. The costs associated to implement this alternative are estimated to be $6.9 million. This alternative may be protective of human health and the environment in the short and long term; may reduce the volume of MEC remaining in the subsurface if additional MEC is encountered; and does meet the RAO by potentially reducing the volume of MEC in the subsurface, thereby reducing the potential for a reuser to encounter MEC; however, this alternative may require additional risk reduction measures (e.g., LUCs) following completion of the additional MEC remediation.

5.2 Comparison of Remedial Alternatives

The remedial alternatives for the CSUMB Off-Campus MRA reuse areas are compared relative to each other below based on their ability to achieve the nine evaluation criteria specified in the EPA's RI/FS Guidance (EPA 1988). A summary of this comparison is provided in Table 5-5.

5.2.1 Overall Protection of Human Health and the Environment

Alternative 2 (Land Use Controls) would provide the most protection for future receptors conducting intrusive activities.

Alternative 3 (Additional MEC Remediation) may provide some additional protection of human health. However, this alternative is not expected to provide a significant decrease in potentially remaining MEC risks because a minimal amount of MEC is expected to remain in the CSUMB Off-Campus MRA. After additional MEC remediation is completed, these areas may continue to require additional risk mitigation measures (e.g., LUCs) to protect human health for those receptors that would perform intrusive activities during development and reuse.

Alternative 1 (No Further Action) would be the least protective of future workers or residents conducting intrusive activities at the CSUMB Off-Campus MRA.

5.2.2 Compliance with ARARs

No potential federal and state ARARs were determined to apply to implementation of Alternative 1. Alternative 2 (Land Use Controls) would continue to be implemented in accordance with guidelines set forth by the EPA, DOD, and DTSC. Alternative 3 (Additional MEC Remediation) would be implemented to comply with the potential ARARs shown in Appendix A to this report.

5.2.3 Short-Term Effectiveness

Alternative 2 (Land Use Controls) is most effective in the short term during development of the reuse areas. This alternative provides measures to protect workers conducting intrusive activities and also prohibits use of Sector 2, the non-residential portions of CSUMB Off-Campus MRA, for residential purposes in the short term.

Alternative 3 (Additional MEC Remediation) may provide some additional effectiveness in the short term to mitigate potentially remaining MEC risks. However, after additional MEC remediation is completed, these areas may continue to require additional risk mitigation measures (e.g., LUCs) to protect receptors that may conduct intrusive activities during development.

Alternative 1 (No Further Action) provides the least short-term effectiveness.

5.2.4 Long-Term Effectiveness and Permanence

Alternatives 2 (Land Use Controls) would provide additional effectiveness in the long term at mitigating potentially remaining MEC risks. Under Alternative 3, the CSUMB Off-Campus MRA may continue to require additional risk mitigation measures (e.g., LUCs) to protect receptors that may conduct intrusive activities during long-term reuse.

Alternative 1 (No Further Action) provides the least long-term effectiveness at the CSUMB Off-Campus MRA.

5.2.5 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 3 (Additional MEC Remediation) would provide the most reduction of remaining MEC volume, if MEC is discovered and removed during the additional MEC remediation.

Alternatives 1 (No Further Action) and 2 (Land Use Controls) would provide the least reduction of remaining MEC risks through treatment. However, under Alternative 2 (Land Use Controls), potential exposures would be reduced through controls that would mitigate potentially remaining MEC risks to workers conducting intrusive activities.

5.2.6 Implementability

Alternative 2 (Land Use Controls) and Alternative 3 (Additional MEC Remediation) would be the most administratively feasible to implement because the necessary approvals to implement the alternatives could be obtained.

The necessary services, equipment, and skilled workers to implement Alternative 3 (Additional MEC Remediation) are readily available. However, Alternative 3 (Additional MEC Remediation) would require the highest level of effort to implement from a technical perspective, and after additional MEC remediation is completed, the area may continue to require additional risk mitigation measures (e.g., LUCs) to protect human health during development and long-term reuse.

Alternative 1 (No Further Action) would be the least administratively feasible to implement because the necessary approvals to take no further action to mitigate potentially remaining MEC risks are not expected.

5.2.7 Cost

The costs to implement Alternative 1 (No Further Action) are expected to be the least of the alternatives evaluated. The cost to implement Alternative 2 (Land Use Controls) is considered moderate relative to Alternative 3 (Additional MEC Remediation). As summarized in Table 5-3, these costs are estimated to be $1.2 million. Alternative 3 (Additional MEC Remediation) has the highest costs associated with implementation. As summarized in Table 5-4, these costs are estimated to be $6.9 million. Actual costs to implement this alternative may be higher than can be estimated at this time because, after additional MEC remediation is completed, these areas may require additional risk mitigation measures (e.g., LUCs) to protect human health and comply with ARARs during development and long-term reuse.

5.2.8 State Acceptance

State acceptance will be addressed in the Group 2 ROD once comments on the Group 2 RI/FS Report and Proposed Plan have been received.

5.2.9 Community Acceptance

Community acceptance will be addressed in the Group 2 ROD once comments on the Group 2 RI/FS Report and Proposed Plan have been received.

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6.0 IDENTIFICATION OF PREFERRED REMEDIAL ALTERNATIVE

This section presents a preliminary identification of a preferred remedial alternative in accordance with the Group 2 RI/FS Work Plan (ESCA RP Team 2009). Alternative 2 (Land Use Controls) is presented here as the preliminary remedial alternative identified for implementation at the CSUMB Off-Campus MRA. This alternative would:

- be protective of human health and the environment for all intrusive receptors;
- be effective in the short and long term at mitigating potentially remaining MEC risks to reusers conducting intrusive activities during development and reuse of the area;
- be administratively and technically feasible to implement; and
- have a moderate cost associated with its implementation relative to the other alternatives evaluated.

Implementation of this alternative would be described in further detail in the RD/RA LUCI O&M Plan, or similar document.

Although this section of the report presents a preliminary preferred remedial alternative, the preferred remedial alternative may be modified based upon comments received from the agencies and the public during the review period of the Draft and Draft Final RI/FS Report. Based upon the input received from the agencies and the public, any modifications to the preferred alternative would be prepared and submitted as part of the Proposed Plan. Section 7.0 discusses in further detail the approval process that will be followed for the preferred remedial alternative.

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7.0 APPROVAL PROCESS

The approval process for the Group 2 RI/FS includes the following components:

- Prepare the Final RI/FS report with regulatory agency and public review of the Draft and Draft Final reports.
- Prepare a Group 2 Proposed Plan that presents the preferred alternative for the reuse areas and summarizes the results of the RI, RA, and FS.
- Solicit public comments on the Proposed Plan during a 30-day public comment period.
- Provide an opportunity for a public meeting on the Proposed Plan where written and verbal comments can be submitted.
- Prepare the ROD that (1) summarizes the results of the RI, RA, and FS, (2) includes a responsiveness summary that summarizes any public comments received on the Proposed Plan, and responses to comments, and (3) specifies the details of the selected remedy(s), including plans for development and submittal of a RD/RA WP, and a LUCI O&M Plan. The RD/RA WP and LUCI O&M Plan may be combined.
- Receive EPA approval of the ROD, and review by DTSC.
- Announce the decision regarding the remedy selection in a major local newspaper and place copies of the RI/FS, Proposed Plan, and ROD in the Administrative Record and local information repositories.

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Table 2-1
MEC Risk Assessment Summary for CSUMB Off-Campus MRA, Sector 1, Residential Land Use

Receptor	MEC Hazard Type [1]	Overall MEC Risk [2]
Trespasser (Surface)	1	A
	2	A
	3	A
Recreational User (down to 6 inches bgs)	1	A
	2	A
	3	A
Maintenance Worker (down to 24 inches bgs)	1	A
	2	A
	3	A
Resident (down to 48 inches bgs)	1	A
	2	A
	3	A
Construction Worker (down to 60 inches bgs)	1	A
	2	A
	3	A

Notes:

MEC = munitions and explosives of concern
bgs = below ground surface

[1] **MEC Hazard Type**:
1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.
2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.
3 = Will kill an individual if detonated by an individual's activities.

[2] **Overall MEC Risk**: qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:
A = Lowest Risk

Table 2-2
MEC Risk Assessment Summary for CSUMB Off-Campus MRA, Sector 2, Non-Residential Land Use

Receptor	MEC Hazard Type [1]	Overall MEC Risk [2]
Trespasser (down to 12 inches bgs)	1	A
	2	A
	3	A
Recreational User (down to 6 inches bgs)	1	A
	2	A
	3	A
Maintenance Worker (down to 24 inches bgs)	1	A
	2	A
	3	A
Construction Worker (down to 60 inches bgs)	1	A
	2	A
	3	A

Notes:

MEC = munitions and explosives of concern
bgs = below ground surface

[1] **MEC Hazard Type**:
1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.
2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.
3 = Will kill an individual if detonated by an individual's activities.

[2] **Overall MEC Risk**: qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:
A = Lowest Risk

Table 2-3
CSUMB Off-Campus MRA – Administrative Controls

Type	Description
Land Use Covenants	· To further ensure protection of human health and the environment, the Army has agreed to enter into CRUPs with the State of California. The CRUPs place additional use restrictions on all of the transferring property, as appropriate. · Due to Fort Ord's former use as a military installation, the property may contain MEC and there remains a risk of encountering subsurface MEC. Any person conducting ground-disturbing or intrusive activities (e.g., digging or drilling) must comply with the applicable municipal code. Any alterations, additions, or improvements to the property in any way that may violate excavation restrictions are prohibited. No actual or potential hazard exists on the surface of the property from MEC that may be in the subsurface of the property provided the CRUPs are adhered to (Army 2007) · The CRUPs are defined in the "Memorandum of Agreement Among the Fort Ord Reuse Authority, Monterey County and Cities of Seaside, Monterey, Del Rey Oaks and Marina, California State University Monterey Bay, University of California Santa Cruz, Monterey Peninsula College, and the Department of Toxics Substances Control Concerning the Monitoring and Reporting of Environmental Restrictions on the Former Fort Ord, Monterey County, California." · These restrictions involve the enforcement of site review and reporting requirements and agency cost recovery/reimbursement requirements as imposed by the DTSC.
Restrictions to Digging / Excavation	· Monterey County Ordinance 16.10 prohibits excavation, digging, development, or ground disturbance of any type on the former Fort Ord that involves the displacement of 10 or more cubic yards of soil without approval.
FORA Resolution 98-1	· An approved FORA resolution that contains proposed and suggested measures to avoid or minimize hazardous material impact.
ESCA MOA	· MOA between FORA and the jurisdictions for the purpose of defining terms of an agreement for holding and managing (ownership and responsibilities) property while remedial work is accomplished under an ESCA. · MOA establishes FORA's ownership during the MEC remediation period; identifies that jurisdictions need to provide public safety response from police, fire, and other emergency personnel as needed; establishes control of access to ESCA properties during the MEC remediation period; and agreement that access to properties will be governed by the restrictions included in the Land Use Covenant accompanying the transfer of the property.
Habitat Management Plan	· The HMP incorporated conservation measures pursuant to USFWS BOs dated prior to issuance of the HMP in April 1997. Specific MEC activities were addressed in Chapter 3 of the HMP (USACE 1997b).
Biological Opinions	· Since the release of the HMP, three additional BOs have been issued that are relevant to the MEC remediation period (USFWS 1999, 2002, and 2005). Accordingly, some information has been updated and additions have been made to the sections that address MEC activities. · Future MEC work is required to be consistent with the applicable conservation measures.

Table 5-1
Summary of Evaluation of Remedial Alternatives

Remedial Alternative	EPA's 9 CERCLA EVALUATION CRITERIA								
	Threshold Criteria		Balancing Criteria					Modifying Criteria	
	Overall Protectiveness of Human Health and the Environment	Compliance with ARARs	Short-Term Effectiveness	Long-Term Effectiveness & Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Implementability	Cost	State Acceptance	Community Acceptance
Alternative 1 - No Further Action	Not protective; does not mitigate potentially remaining MEC risks to intrusive workers	No ARARs identified for this alternative	Not effective in the short-term; no MEC risk mitigation	Not effective in the long-term; no MEC risk mitigation	No reduction in volume because no further MEC removals would be conducted	Not administratively feasible	Minimal	Unlikely	Unlikely
Alternative 2 - Land Use Controls	Protective to construction and maintenance workers; mitigates risks to future residents	No ARARs identified for this alternative	Required training and construction support would mitigate risks to construction and maintenance workers	Required training and construction support would mitigate risks to construction and maintenance workers; effective in long-term for potential MEC risks posed to future residents until evaluation determines LUCs no longer necessary	No reduction in volume because no further MEC removals would be conducted	Technically and administratively feasible to implement	$1,204,000	Likely to be acceptable	May be acceptable
Alternative 3 - Additional MEC Remediation	May be protective of human health and the environment	Implementation would require compliance with potential ARARs identified in Appendix A	May be effective in the short-term, although additional mitigation measures (such as land use controls) may be required	May be effective in the long-term, although additional mitigation measures (such as land use controls) may be required	May result in MEC reduction if additional MEC is discovered and removed during remediation	Technically and administratively feasible to implement	$6,920,000	Likely to be acceptable because of additional remediation and short and long term mitigation actions	Acceptability unknown due to vegetation disturbance and removal involved.

Notes:
ARARs = applicable or relevant and appropriate requirements
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
MEC = munitions and explosives of concern

Table 5-2

Long-Term Management Costs

	Quantity	Unit	Unit Price	Total
LONG-TERM MANAGEMENT MEASURES UNIT COSTS				
File Initial Deed Notice [1]	2	reuse area	$5,000	**$10,000**
Modify or Remove Deed Notice [1]	2	reuse area	$5,000	**$10,000**
Subtotal Capital Costs				**$20,000**
Capital Cost Contingency	10%	of Capital Costs		**$2,000**
TOTAL CAPITAL COSTS				**$22,000**
Annual LTM Costs				
Annual Monitoring [2]	1	Entire MRA	$5,000	**$5,000**
5-Year Review Reporting [3]	1	Entire MRA	$3,000	**$3,000**
Subtotal Annual Costs				**$8,000**
Annual Cost Contingency	10%	of Annual Costs		**$800**
TOTAL ANNUAL COSTS				**$8,800**
30-Year Annual LTM Costs				
NPV LTM (2.7% Real Interest Rate, OMB Circular A-94, Appendix C, December 2008)				**$179,369**
TOTAL LONG-TERM MANAGEMENT COSTS (rounded to nearest thousand)				$210,000

Definitions:
LTM = Long-Term Management
NPV = Net Present Value
OMB = President's Office of Management and Budget

Assumptions:
These costs are for comparison purposes only and have an accuracy of +50/-30%. Many design variables and necessary pre-field activities have not been established.
Cost estimates would be refined after the field preparation/design is completed.

[1] Costs for initial deed notice and modification of deed notice assumed by FORA.
[2] Costs of annual monitoring assumed by FORA until land is transferred to recipient.
[3] Costs of first two five-year review reports (for 2012 and 2017) assumed by FORA, then covered by Army.

Table 5-3

Alternative 2 - Land Use Controls Costs

	Quantity	Unit	Unit Price	Total
LAND USE CONTROLS UNIT COSTS				
ANNUAL LTM COSTS (Years 1-7 During Development)				
Construction Monitoring [1]				
MEC Personnel & Equipment	20	day	$1,867	$37,340
MEC Recognition Training [2]				
On-Site Training	12	each	$300	$3,600
Subtotal				$40,940
Annual Cost Contingency	10%	of Annual Costs		$4,094
TOTAL ANNUAL COSTS (Years 1-7)				$45,034
ANNUAL LTM COSTS (Years 8-30 During Reuse)				
Construction Monitoring [3]				
MEC Personnel & Equipment	5	day	$1,867	$9,335
MEC Recognition Training [4]				
On-Site Training	4	each	$300	$1,200
Subtotal				$10,535
Annual Cost Contingency	10%	of Annual Costs		$1,054
TOTAL ANNUAL COSTS (Years 1-7)				$11,589
30-YEAR ANNUAL LTM COSTS				
NPV YEARS 1-7 LTM (2.7% Real Interest Rate, OMB Circular A-94, Appendix C, December 2008)				$917,922
NPV YEARS 8-30 LTM (2.7% Real Interest Rate, OMB Circular A-94, Appendix C, December 2008)				$236,207
ALTERNATIVE 2 TOTAL COST (rounded to nearest thousand)				$1,211,000

Definitions:
LTM = Long Term Management
MEC = munitions and explosives of concern
NPV = Net Present Value
OMB = President's Office of Management and Budget

Assumptions:
These costs are for comparison purposes only and have an accuracy of +50/-30%. Many design variables and necessary pre-field activities have not been established. Cost estimates would be refined after the field preparation/design is completed.

[1] = Assumes two-person qualified MEC personnel team visually observing mass soil grading and utility installation activities during development (estimate of 4 weeks for comparison purposes, actual length may vary)
[2] = Assumes monthly training and/or refresher training of construction crews during development
[3] = Assumes two-person qualified MEC personnel team visually observing occasional utility installation and/or repairs during reuse
[4] = Assumes quarterly training and/or refresher training of construction crews during reuse

Table 5-4

Alternative 3 - Additional MEC Remediation Costs

	Quantity	Unit	Unit Price	Total
ADDITIONAL MEC REMEDIATION UNIT COSTS [1]				
Survey (Boundary & Grid)	333	acre	$380	$126,540
Vegetation Clearance	333	acre	$4,500	$1,498,500
Digital Survey of Anomalies	333	acre	$2,592	$863,136
Excavation & Removal of MEC	333	acre	$6,389	$2,127,537
Detonation & Engineering Controls	333	acre	$450	$149,850
GIS/Database	333	acre	$1,000	$333,000
Quality Control DGM	333	acre	$2,592	$863,136
QC Excavation & Removal of MEC	333	acre	$1,405	$467,865
Site Restoration	333	acre	$862	$287,046
Total Field Costs				$6,716,610
Reporting [2]	1	lump sum	$200,000	$200,000
ALTERNATIVE 3 TOTAL COST (rounded to nearest thousand)				$6,920,000

Definitions:
LTM = Long-Term Management
MEC = munitions and explosives of concern
GIS = Geographical Information System
DGM = digital geophysical mapping
QC = quality control

Assumptions:
These costs are for comparison purposes only and have an accuracy of +50/-30%. Many design variables and necessary pre-field activities have not been established.
Cost estimates would be refined after the field preparation/design is completed.

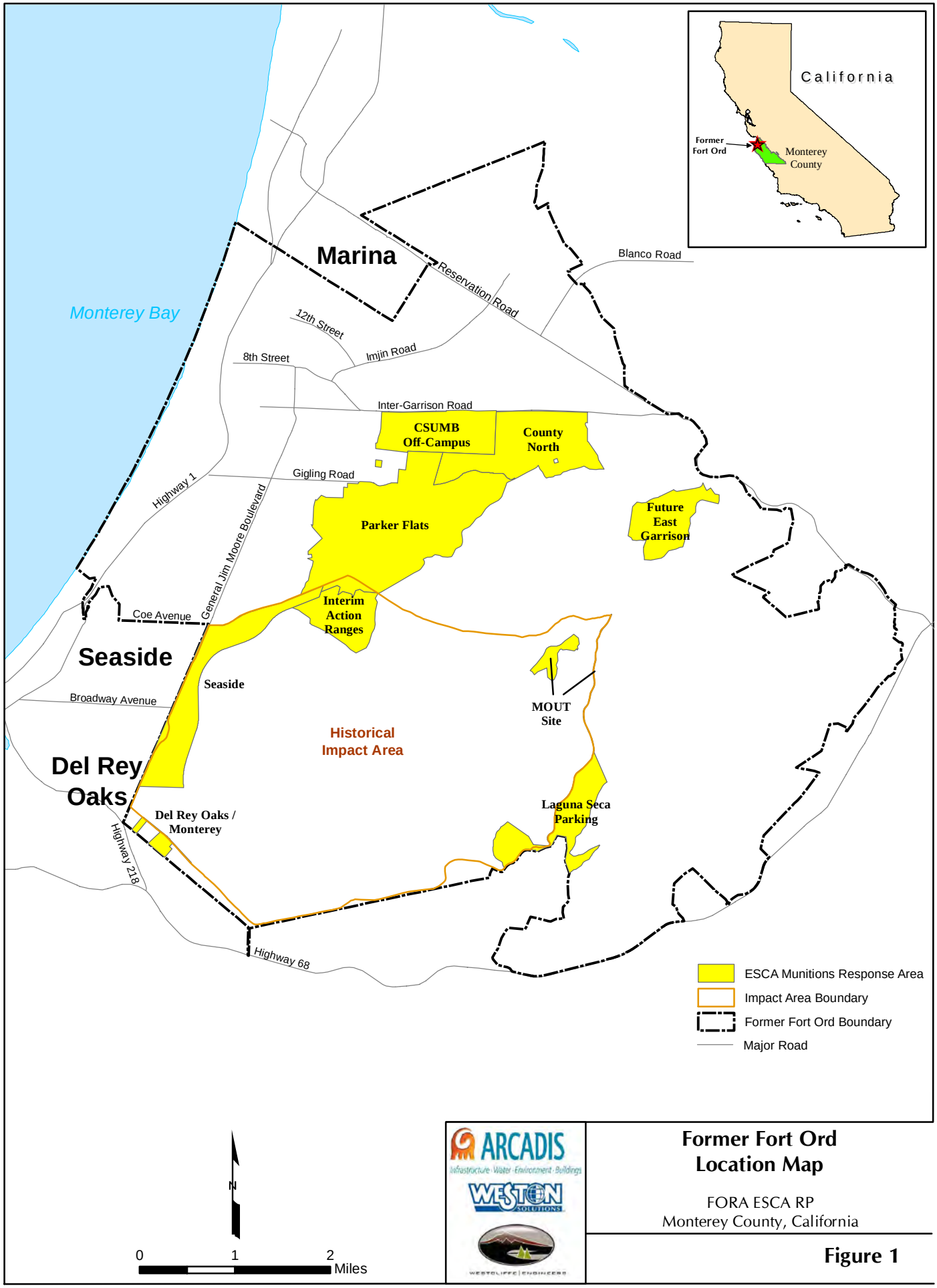
[1] = Assumes digital geophysical survey using best appropriate technology followed by anomaly reacquisition and excavation of identified anomalies and detonations where required
[2] = Reporting includes Remedial Design/Remedial Action Work Plan and After-Action Report

Table 5-5
Summary of Comparison of Remedial Alternatives

	EPA's 9 CERCLA EVALUATION CRITERIA	Remedial Alternative		
		Alternative 1 - No Further Action	Alternative 2 - Land Use Controls	Alternative 3 - Additional MEC Remediation
Threshold Criteria	Overall Protectiveness of Human Health and the Environment	○	●	◐
	Compliance with ARARs	N/A	N/A	●
Balancing Criteria	Short-Term Effectiveness	○	●	◐
	Long-Term Effectiveness & Permanence	○	●	◐
	Reduction of Toxicity, Mobility, or Volume Through Treatment	○	○	●
	Implementability	◐	●	●
	Cost	$	$$	$$$
Modifying Criteria[1]	State Acceptance	TBD	TBD	TBD
	Community Acceptance	TBD	TBD	TBD

Notes:

ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
MEC	munitions and explosives of concern
N/A	not applicable
●	Has high ability to meet the CERCLA criteria
○	Does not meet the CERCLA criteria
◐	Has moderate ability to meet the CERCLA criteria
$	Low or minimal costs to implement relative to other alternatives evaluated
$$	Moderate costs to implement relative to other alternatives evaluated
$$$	High costs to implement relative to other alternatives evaluated
[1]	Modifying criteria (state and community acceptance) will be further evaluated following the comment period for the Group 2 Remedial Investigation/Feasibility Study Report
TBD	to be determined



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Former Fort Ord Location Map

FORA ESCA RP
Monterey County, California

Figure 1

CSUMB Off-Campus MRA

County North MRA

Parker Flats MRA

Future East Garrison MRA

Interim Action Ranges MRA

Seaside MRA

MOUT Site MRA

Laguna Seca Parking MRA

Del Rey Oaks/ Monterey MRA

Legend

Former Fort Ord Boundary

Group 1 MRAs

Seaside MRA
Parker Flats MRA

Group 2 MRAs

CSUMB Off-Campus MRA
County North MRA

Group 3 MRAs

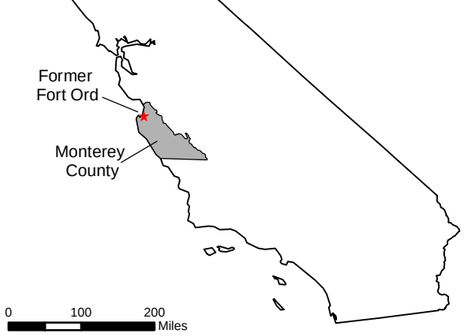
MOUT Site MRA
Del Rey Oaks/Monterey MRA
Laguna Seca Parking MRA

Interim Action Ranges MRA

Group 4 MRA

Future East Garrison MRA

Former Fort Ord Location Map



N

0 3,000 6,000 Feet

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ESCA Munitions Response Area Groups

FORA ESCA RP
Monterey County, California

Figure 2

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INTER-GARRISON RD

ABRAMS DR

8TH AVE

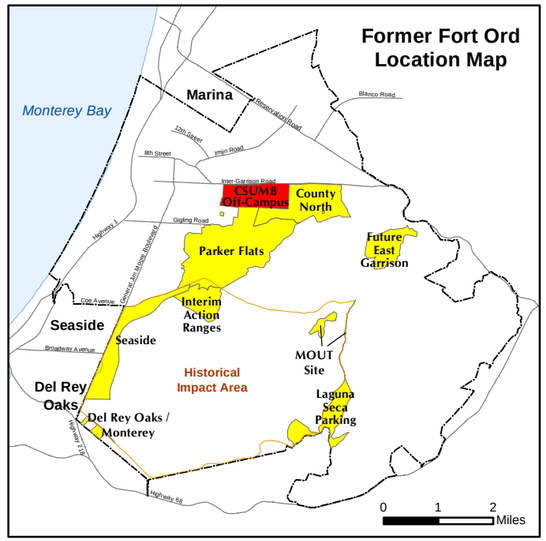
4545

4B13

S1.3.2

Legend

- Gate
- Hydrant
- High-Power Transmission Line Tower
- Munitions Response Area
- Major Road
- Electrical Line
- Fence
- Gas Line
- Storm Line
- Telephone Line
- Water Line
- Sewer Line
- High-Power Transmission Line and Right of Way
- 4545 Structure
- S1.3.2 USACE Parcel



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0 600 1,200 Feet

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CSUMB Off-Campus MRA
USACE Land Transfer Parcels, Structures, and Utilities

FORA ESCA RP
Monterey County, California

Figure 3

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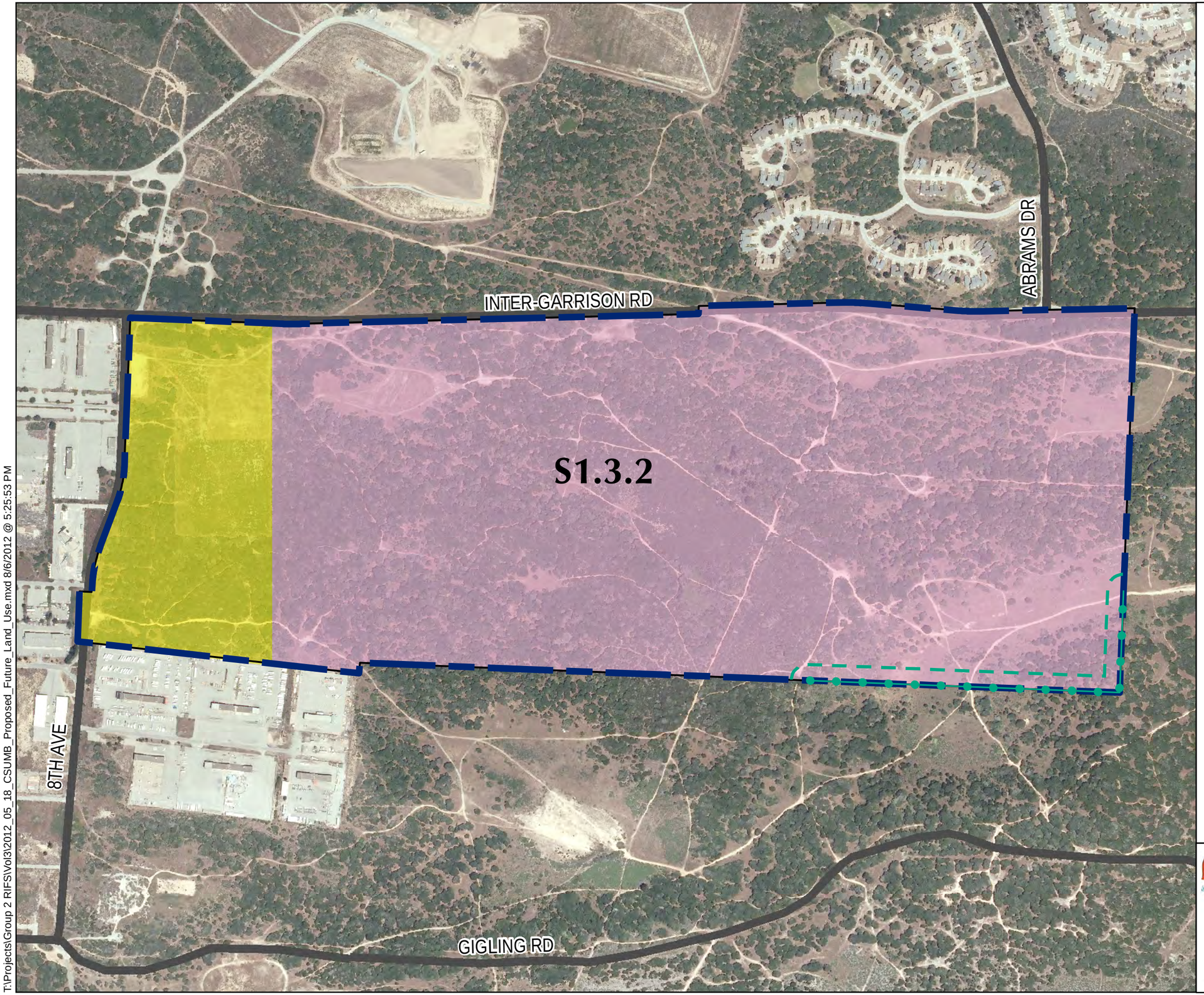

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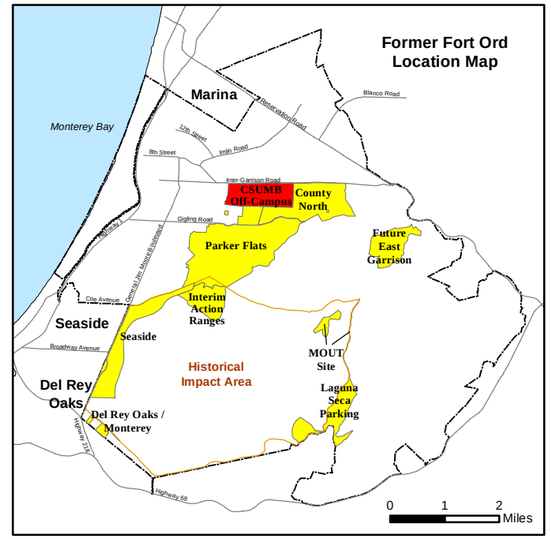
Legend

- Munitions Response Area
- Major Road
- S1.3.2 — USACE Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Proposed Future Land Use

- Residential (CSUMB Campus Housing)
- Non-Residential (CSUMB Open Space Park)



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0 600 1,200 Feet

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CSUMB Off-Campus MRA
Proposed Future Land Use

FORA ESCA RP
Monterey County, California

Figure 4

APPENDIX A

Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Appendix A
Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks
Federal ARARs				
Endangered Species Act (16 U.S.C. §§ 1531-1543)	16 U.S.C. § 1536 (a) and (c); 16 U.S.C. § 1538 (a)(1)	Applicable [1, 2, 3] / Location	Federal agencies are required under Section 7 of the ESA to ensure that their actions do not jeopardize the continued existence of a listed species or result in destruction of or adverse modification of its critical habitat (16 U.S.C. § 1536). If the proposed action may affect the listed species or its critical habitat, consultation with the United States Fish and Wildlife Service (USFWS) and/or California Department of Fish and Game (CDFG) may be required (50 CFR § 402.14). Additionally, Section 9 of the ESA prohibits the illegal taking of a listed species (16 U.S.C. § 1538(a)(1)).	Endangered plant and animal species and critical habitats occur at the former Fort Ord. Each reuse area will be screened for potential impacts to any endangered species identified in the Installation-Wide Multispecies Habitat Management Plan (HMP; USACE 1997) and additional requirements identified in subsequent documents (USFWS 1999, 2002, and 2005; and Zander 2002). The provisions of the HMP and referenced additional requirements satisfy the requirements of the ESA. If additional MEC remediation were selected as a component of the preferred remedial alternative, FORA's work would be conducted in accordance with the provisions of the HMP as they apply to the CSUMB Off-Campus MRA.
Migratory Bird Treaty Act (MBTA)	16 U.S.C. §§ 703-712	Applicable [1, 2, 3] / Location	The statute sections prohibit the taking, possession of, buying, selling, purchasing, or bartering of any migratory bird, including feathers or other parts, nest eggs, or products, except as allowed by regulations.	The requirement includes specific standards of control.
Hazardous Materials & Transportation Act	49 CFR Part 172.101	Applicable [3] / Chemical and Action	These regulations impose procedures and controls on the transportation of hazardous materials.	The regulations include specific standards of control and substantive requirements, criteria, and limitations that may apply to the transport of detonation materials and off-site transportation of certain recyclable ordnance materials.
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122, 123, 124	Relevant and Appropriate [1, 2] / Location	Regulates the discharge of pollutants to waters of the U.S.	The regulations include specific standards of control and substantive requirements, criteria, and limitations that may apply to discharges of pollutants to waters of the U.S. Under CERCLA, procedural requirements such as obtaining a permit while conducting MEC investigation/remediation do not apply.
Federal Resource Conservation and Recovery Act (RCRA), Subpart M (Military Munitions Rule ["the Military Munitions Rule"])	40 CFR Parts 266 and 270	Relevant and Appropriate [2, 3] / Chemical and Action	The regulations identify when military munitions on active ranges become subject to the regulatory definition of "solid waste," for purposes of RCRA Subtitle C and, if these wastes are hazardous, the management standards that apply.	Portions of the Military Munitions Rule may be relevant and appropriate, but those provisions of the Rule that exclude military munitions from RCRA Subtitle C regulations are not appropriate to the remediation of a closed range. The relevant portions relate to the management of MEC, which is recovered, including characterization as hazardous waste and requirements for treatment, storage, and transportation. The Rule provides for the storage and transportation of recovered military munitions in accordance with Department of Defense Explosives Safety Board (DDESB) standards.
State of California ARARs				
California Endangered Species Act	Fish and Game Code §§ 2051 et seq. and §2080	Relevant and Appropriate [1, 2, 3] / Location	The statute sections provide a declaration of policy and definitions. Section 2080 provides that no person shall take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the commission determines to be an endangered species or a threatened species, or attempt any of those acts.	Section 2080 includes specific standards of control with respect to the taking of endangered or threatened species. Under CERCLA, complying with non-substantive, procedural, and administrative provisions of § 2051 does not apply during MEC investigation/remediation. The Army has previously coordinated the development of the HMP with the California Department of Fish and Game (CDFG). The mitigation measures to protect both State and federal rare, threatened, and endangered species will be implemented during FORA's additional MEC remediation, if selected for implementation.

Appendix A
Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks
California Fish and Game Code	§ 3511	Relevant and Appropriate [1, 2, 3] / Location	This statute section prohibits taking or possessing fully protected birds or parts thereof, listed as: (a) American peregrine falcon *(Falco peregrinus analum)*; (b) Brown pelican; (c) California black rail *(Lateralhus jamaicensis coturniculus)*; (d) California clapper rail *(Rallus longirostris obsoletus)*; (e) California condor *(Gymnogyps californianus)*; (f) California least tern *(Sterna albifrons browni)*; (g) Golden eagle; (h) Greater sandhill crane *(Grus canadensis tabida)*; (i) Light-footed clapper rail *(Rallus longirostris levipes)*; (j) Southern bald eagle *(Haliaeetus leucocephalus leucocephalus)*; (k) Trumpeter swan *(Cygnus buccinator)*; (l) White-tailed kite *(Elanus leucurus)*; and (m) Yuma clapper rail *(Rallus longirostris yumanensis)*.	The requirement includes specific standards of control that may apply to the American peregrine falcon (some possibility), golden eagle (slight possibility), brown pelican (not likely but possible), and California least tern (not likely but possible).
California Fish and Game Code	§ 3513	Relevant and Appropriate [1, 2, 3] / Location	This statute section declares that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA or any part of such migratory non-game bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the MBTA.	The requirement includes specific standards of control.
California Fish and Game Code	§ 3503.5	Relevant and Appropriate [1, 2, 3] / Location	This statute section prohibits the take, possession, or destruction of any birds in the orders of Falconiformes or Strigiformes, or to take, possess, or destroy the nest or eggs of any such bird, except as provided in the code.	The requirement includes specific standards of control that may apply to vultures, hawks, ospreys, falcons, and owls.
California Fish and Game Code	Title 14, CCR § 472	Relevant and Appropriate [1, 2, 3] / Location	This regulation limits the taking of non-game birds and mammals except for specified species.	The requirement includes specific standards of control that may affect American crows.
California Fish and Game Code	Title 14, CCR §§ 40-42	Relevant and Appropriate [1, 2, 3] / Location	These regulations make it unlawful to take, possess, purchase, propagate, sell, transport, import, or export any native reptile or amphibian, unless under special permit.	The requirement includes specific standards of control that may apply to California black legless lizard and coast horned lizard. The CDFG was involved in the development of the HMP with the Army, which includes mitigation measures to protect the California black legless lizard. If additional MEC remediation were selected as a component of the preferred remedial alternative, FORA's work would be conducted in accordance with the provisions of the HMP as they apply to the CSUMB Off-Campus MRA.
California Health and Safety Code, Division 20	Title 22, CCR Division 4.5	Applicable [3] / Chemical and Action	The statute and regulations provide for identification of hazardous waste in §§ 66261. If a material is a hazardous waste, Division 4.5 provisions further regulate hazardous waste generators, transporters, and treatment, storage, and disposal facilities.	The ESCA RP Team will evaluate discovered items in accordance with the approved work plan to determine the presence of energetic materials or other constituents that would cause it to be characterized as a hazardous waste. Substantive requirements: • Storage: on-site storage of MEC items occur in a designated bunker that meets the standard of DDESB 6055.9 STD, including security measures such as fences, signs, and an alarm system. • Transportation: off-site transportation of small arms ammunition will incorporate applicable manifesting and placarding requirements. Conforms to Defense Reutilization and Marketing Office (DRMO) instruction. • Disposal/recycling: off-site disposal or recycling facility or facilities for small arms ammunition will be state and/or RCRA-authorized.

Appendix A
Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks
California Health and Safety Code	Title 22, CCR § 66264.601-603	Relevant and Appropriate [2] / Action	These regulations apply to hazardous waste treatment, which is conducted in a device that does not meet the definition of a "container" in 22 CCR § 66260.10 or is characterized as a "Miscellaneous Unit" subject to the provisions of 22 CCR § 66264.601-603. For activities where detonations are in a device that meets the 22 CCR § 66260.10 definition of a container, the requirements for "temporary units," as set forth in 22 CCR § 66264.553, apply.	The regulations include generally described narrative standards. Compliance with substantive requirements is achieved through regulatory coordination of work plans in accordance with CERCLA and the Administrative Order on Consent (AOC). Under CERCLA, procedural requirements such as obtaining a permit while conducting MEC investigation/remediation do not apply.
California Health and Safety Code	Title 22, CCR § 66265.382	Relevant and Appropriate [3] / Chemical and Action	Open burning of hazardous waste is prohibited except for the open burning and detonation (OB/OD) of waste explosives. Waste explosives include waste that has the potential to detonate and bulk military propellants that cannot safely be disposed of through other modes of treatment. Detonation is an explosion in which chemical transformation passes through the material faster than the speed of sound (0.33 kilometer/second at sea level). Owners or operators choosing to open burn or detonate waste explosives shall do so in accordance with the following table and in a manner that does not threaten human health or the environment. Pounds Waste Explosives — Minimum Distance from OB/OD to property 0 to 100 — 204 meters (670 feet) 101 to 1,000 — 380 meters (1,250 feet) 1,001 to 10,000 — 530 meters (1,730 feet) 10,001 to 30,000 — 690 meters (2,260 feet)	The requirement includes specific standards of control and addresses situations similar to those that may be encountered during MEC remediation if selected as a component of a preferred remedial alternative; detonation of MEC will comply with these requirements.
California Fish and Game Code	§ 1900 et seq.	Relevant and Appropriate [1, 2, 3] / Action	These statute sections sets forth programmatic and administrative provisions and, in § 1908, provides that no person shall import into the state, or take, possess, or sell within this state, except as incident to the possession or sale of the real property on which the plant is growing, any native plant, or any part or product thereof, that the commission determines to be an endangered native plant or rare native plant.	The standards of control are relevant and appropriate, and the citation is therefore considered as an ARAR. The HMP contains mitigation measures designed to protect the continued survival of rare and endangered plants. If additional MEC remediation were selected as a component of the preferred remedial alternative, FORA's work would be conducted in accordance with the provisions of the HMP as they apply to the CSUMB Off-Campus MRA.
California Fish and Game Code	Title 14, CCR § 783 et seq.	Relevant and Appropriate [1, 2, 3] / Action	These regulations provide that no person shall import into the State, export out of the State or take, possess, purchase, or sell within the State, any endangered species, threatened species, or part or product thereof, or attempt any of those acts, except as otherwise provided in the California Endangered Species Act, Fish and Game Code Section 2050, et seq., the Native Plant Protection Act, the Natural Community Conservation Planning Act, the California Desert Native Plants Act, or as authorized under this article in an incidental take permit. The regulations also provide programmatic and administrative procedures for incidental take permits.	The section includes specific standards of control with respect to taking rare or endangered plants. The standards of control are relevant and appropriate, and the citation is therefore considered as an ARAR. The HMP contains mitigation measures designed to protect the continued survival of rare and endangered plants. If additional MEC remediation were selected as a component of the preferred remedial alternative, FORA's work would be conducted in accordance with the provisions of the HMP as they apply to the CSUMB Off-Campus MRA.
Porter Cologne Water Quality Control Act	California Water Code, Division 7, Section 13200	Relevant and Appropriate [1, 2] / Action	Requires submission of Report of Waste Discharge (ROWD) and obtaining waste discharge requirements (WDRs) for specified waste discharges.	Under CERCLA, procedural requirements such as obtaining a permit while conducting MEC investigation/remediation do not apply.

Appendix A
Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Source or Authority	Requirement, Standard, or Criterion	Type	Description	Remarks
State of California To-Be-Considered Criteria (TBCs)				
California Fish and Game Commission	Wetlands Resources (pursuant to § 703 of California Fish and Game Code; not a statute)	Policy [1, 2, 3] / Location	This policy: (1) seeks to provide for the protection, preservation, restoration, enhancement, and expansion of wetland habitat in California; (2) strongly discourages development in or conversion of wetlands; and (3) opposes, consistent with its legal authority, any development or conversion that would result in a reduction of wetland acreage or wetland habitat values. To that end, the Commission: (1) opposes wetland development proposals unless, at a minimum, project mitigation assures there will be "no net loss" of either wetland habitat values or acreage; and (2) strongly prefers mitigation that would achieve expansion of wetland acreage and enhancement of wetland habitat values.	The policy provides for the protection of wetland resources. There are no surface-water features or delineated wetlands reported to be present on the CSUMB Off-Campus MRA; however, an aquatic feature (i.e., vernal pool, pond) is known to exist to the southeast of the MRA.
Regulations that were considered as Potential ARARs but were not considered applicable				
California Fish and Game Code	§ 4800 et seq.	Relevant and Appropriate [1, 2, 3] / Location	This statute section declares that it is unlawful to take, injure, possess, transport, or sell any mountain lion.	Due to the size of vegetation clearance and MEC remediation activities that may be selected for implementation, it is unlikely that mountain lions will be negatively affected.
California Fish and Game Code	§ 3005		The statute section prohibits the taking of birds or mammals, except non-game mammals, with any net, pound, cage, trap, set line, or wire, or poisonous substance. Included in the term "taking" is the killing of birds or mammals by poison.	The scope of the remedial actions does not include intentional taking of birds and mammals with unlawful devices.
California Fish and Game Code	§ 4000 et seq.		This statute section provides that a fur-bearing mammal may be taken only with a trap, firearm, bow and arrow, poison under a proper permit, or with the use of dogs.	The scope of the remedial actions does not include intentional taking of fur-bearing mammals with unlawful devices.
California Fish and Game Code	Title 14, CCR § 460		This regulation makes it unlawful to take Fisher, marten, river otter, desert kit fox and red fox.	The remedial actions will not result in the take of Fisher, marten, river otter, desert kit fox, and red fox.

Notes:
1. Vegetation Clearance
2. MEC Remediation
3. Detonation of MEC

APPENDIX B

Distribution List

Print	CD	Name	Organization	Address	City and State	Zip
1	1	Stan Cook	Fort Ord Reuse Authority	920 2nd Avenue, Suite A	Marina, CA	93933
1	1	Michael Houlemard	Fort Ord Reuse Authority	920 2nd Avenue, Suite A	Marina, CA	93933
1	1	Judy Huang	U.S. Environmental Protection Agency	75 Hawthorne Street, Mail SFD-8-3	San Francisco, CA	94105
1	1	Tom Hall	TechLaw, Inc.	7 Shore Point Road	North Little Rock, AR	72116
1	1	Ed Walker	California Department of Toxic Substances Control	8800 California Center Drive	Sacramento, CA	95826
2	2	William K. Collins	Department of the Army	BRAC, Bldg. #4463 Gigling Road	Seaside, CA	93955
1	1	Lindsay Alexander	Fort Ord Administrative Record	BRAC, Bldg. #4463 Gigling Road	Seaside, CA	93955
1	1	Mike Weaver	Fort Ord Community Advisory Group	52 Corral de Tierra Road	Salinas, CA	93908
1	1	Richard Bailey	Fort Ord Community Advisory Group	440 Ramona Avenue, Apt 16	Monterey, CA	93940
0	1	Dan Amadeo	Marina in Motion	P.O. Box 1641	Marina, CA	93933
1	1	LeVonne Stone	Fort Ord Environmental Justice Network	P.O. Box 361	Marina, CA	93933
1	1	Linda Millerick	Save Our Air Resources (SOAR)	751 Montery - Salinas Highway	Salinas, CA	93908
1	1	Nick Nichols	Monterey County, Resources Management Agency Office of Housing & Redevelopment	168 West Alisal Street, Third Floor	Salinas, CA	93901
0	1	Project File	ARCADIS, Attention: Jane Thompson	2000 Powell Street, 7th Floor	Emeryville, CA	94608
1	1	Project Library	ARCADIS Project Office	100 12th Street, Bldg. 2903	Marina, CA	93933

Approved:

Christopher G. Spill, P.G.
ESCA Technical Project Manager
ARCADIS U.S., Inc.