ITSI Gilbane

TRANSMITTAL MEMORANDUM

To:	Distribution	**Date:**	09/28/12

Subject: Final Track 2 Munitions Response, Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area, Former Fort Ord, California

DCN: 07202.2001.075

This submittal includes the *Final Track 2 Munitions Response, Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area, Former Fort Ord, California*, dated July 2012, prepared by ITSI Gilbane Company (formerly Innovative Technical Solutions, Inc. [ITSI]). The work was performed to evaluate the previous investigation activities at MRS-34 with regard to completion of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

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FINAL

TRACK 2 MUNITIONS RESPONSE REMEDIAL INVESTIGATION MUNITIONS RESPONSE SITE 34

Former Fritzsche Army Airfield Area
Former Fort Ord, California

Document Control Number: 07202.2001.075

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September 2012

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LIST OF ACRONYMS

AAR	after action report
ARAR	Applicable or Relevant and Appropriate Requirement
ASR	archives search report
AT	antitank
bgs	below ground surface
BLM	Bureau of Land Management
BRA	Basewide Range Assessment
BRAC	Base Realignment and Closure
CDFG	California Department of Fish and Game
CEHND	U.S. Army Corps of Engineers, Huntsville Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRUP	Covenant to Restrict Use of Property
CSM	conceptual site model
DDESB	Department of Defense Explosives Safety Board
DGM	digital geophysical mapping
DMM	Discarded Military Munitions
DoD	Department of Defense
DOI	Department of the Interior
DTSC	Department of Toxic Substances Control
EC	Engineering Control
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineer Manual
EMCX	Environmental and Explosives Center of Expertise
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
EPA	U.S. Environmental Protection Agency
EROA	Environmental Response Obligation Addendum
F	Fahrenheit
FAAF	Fritzsche Army Airfield
FFA	Federal Facility Agreement
FORA	Fort Ord Reuse Authority
FOSET	Finding of Suitability for Early Transfer
FO-SVA	Fort Ord-Salinas Valley Aquiclude
FS	Feasibility Study
GPS	global positioning system

LIST OF ACRONYMS

HE	high explosive
HEAT	high explosive antitank
HLA	Harding Lawson Associates
HMP	Habitat Management Plan
IC	Institutional Control
ITRC	Interstate Technology and Regulatory Council
ITSI	Innovative Technical Solutions, Inc.
LDSP	Land Disposal Site Plan
LE	low explosive
LUC	Land Use Control
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MR	Munitions Response
MRA	Munitions Response Area
MRS	Munitions Response Site
NAVSCOLEOD	Naval School, Explosive Ordnance Disposal
ODDS	Ordnance Detection and Discrimination Study
OE	Ordnance and Explosives
OSWER	Office of Solid Waste and Emergency Response
Parsons	Parsons Engineering Science
QA	quality assurance
QC	quality control
RA	risk assessment
RAO	remedial action objective
RDX	cyclotrimethylene trinitramine
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSP	Render Safe Procedures
RWQCB	Regional Water Quality Control Board
TCRA	Time-critical removal action
TechLaw	TechLaw, Inc.,

LIST OF ACRONYMS

TIP	technical information paper
TNT	trinitrotoluene
USA	USA Environmental, Inc.
USACE	U.S. Army Corps of Engineers
USAEDH	U.S. Army Engineer Division, Huntsville
USFWS	U.S. Fish and Wildlife Service
UXB	UXB International
UXO	Unexploded Ordnance

GLOSSARY

Construction Support: Assistance provided by the Department of Defense (DoD), explosive ordnance disposal (EOD), or Unexploded Ordnance (UXO)-qualified personnel during intrusive construction activities on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., discarded military munitions [DMM]), or munitions constituents in high enough concentrations to pose an explosive hazard, to ensure the safety of personnel or resources from any potential explosive hazards. Source: (7).

Discarded Military Munitions (DMM): 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 unexploded ordnance, 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) (6)). For the purposes of the Basewide Munitions Response Program being conducted at the former Fort Ord, DMM does not include small arms ammunition .50 caliber and below. Source: (1).

Engineering Control (EC): Engineering controls are used to mitigate the effects of unintentional or intentional explosions if the calculated minimum separation distance for the munitions and explosives of concern (MEC) items to be destroyed cannot be met. The primary goals of engineering controls are to improve personal safety and/or reduce the minimum separation distance. Some examples of ECs include fences, signs, guards, landfill caps, soil covers, and provision of potable water, slurry walls, sheet pile (vertical caps), pumping and treatment of groundwater, monitoring wells, and vapor extraction systems. Source: (3).

Explosive Ordnance Disposal (EOD) Personnel: Military personnel who have graduated from the Naval School, Explosive Ordnance Disposal (NAVSCOLEOD); are assigned to a military unit with a Service-defined EOD mission; and meet Service and assigned unit requirements to perform EOD duties. EOD personnel have received specialized training to address explosive and certain chemical agent hazards during both peacetime and wartime. EOD personnel are trained and equipped to perform Render Safe Procedures (RSP) on nuclear, biological, chemical, and conventional munitions, and on improvised explosive devices. Source: (7).

Expended: The state of munitions debris in which the main charge has been expended leaving the inert carrier. Source: (1).

Explosive Soil: Explosive soil refers to mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself is explosive.

> (a) Because of some past munitions-related activities (e.g., settling ponds or explosives sumps at munitions production or demilitarization facilities), concentrations of explosives in soil (e.g., sand, sludge, clay) can exist such that the mixture itself presents an explosive hazard. Such mixtures are referred to as "explosive soil."

(b) The net explosive weight for quantity-distance (NEWQD) of explosive soil is the weight of the mixture multiplied by the explosives concentration (e.g., 1,000 lbs [454 kg] of explosive soil that is 10 percent trinitrotoluene (TNT) has an NEWQD of 100 lbs [45.4 kg]).

(c) The concentration necessary to present an explosive hazard depends on the distribution and type of explosives in the soil and the soil's characteristics.

(c.1) Primary (Initiating) Explosives

(c.1.1) Soil containing 2 percent or more by weight of any primary explosive or mixture of primary explosives presents an explosive hazard and shall be treated as hazard division (HD) 1.1.

(c.1.2) Soil containing less than 2 percent by weight of any primary explosive does not present an explosive hazard.

(c.2) Secondary Explosives

(c.2.1) Secondary explosives are much less sensitive than primary explosives.

(c.2.2) Soil containing 10 percent or more by weight of either any secondary explosives or a mixture of secondary explosives presents an explosive hazard and shall be treated as HD 1.1.

(c.2.3) Soil containing less than 10 percent by weight of any secondary explosive or a mixture of secondary explosives does not present an explosive hazard.

(c.3) Nitroglycerin, Nitrocellulose, and Nitroguanidine

(c.3.1) Soil containing 10 percent or more by weight of nitroglycerin, nitrocellulose, or nitroguanidine presents an explosive hazard and shall be treated as HD 1.1.

(c.3.2) Soil containing less than 10 percent by weight of nitroglycerin, nitrocellulose, or nitroguanidine does not present an explosive hazard. Care must be taken when applying this threshold rule to less-permeable soils, such as clay, that may cause nitroglycerin to pond, rather than be absorbed.

(c.4) Other Energetic Materials Mixtures. The potential explosive hazard of such mixtures in soil may be unknown and may require testing. If the hazard is unknown, manage soil mixtures containing only propellants as secondary explosives, and all other soil mixtures containing energetics (e.g., liquid propellants) as primary explosives. Source: (9).

Feasibility Study (FS): *Feasibility study* (FS) means a study undertaken by the lead agency to develop and evaluate options for remedial action. The FS emphasizes data analysis and is generally performed concurrently and in an interactive fashion with the remedial investigation (RI), using data gathered during the RI. The RI data are used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives. The term also refers to a report that describes the results of the study. Source: (8).

Impact Area: The impact area consists of approximately 8,000 acres in the southwestern portion of former Fort Ord, bordered by Eucalyptus Road to the north, Barloy Canyon Road to the east, South Boundary Road to the south, and North-South Road to the west. Source: (1).

Institutional Control (IC): (a) Non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use; (b) are generally to be used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment; (c) can be used during all stages of the cleanup process to accomplish various cleanup-related objectives; and (d) should be "layered" (i.e., use multiple ICs) or implemented in a series to provide overlapping assurances of protection from contamination. Source: (6).

Land Use Controls: Land use controls (LUCs) are physical, legal, or administrative mechanisms that restrict the use of, or limit access to, real property, to manage risks to human health and the environment. Physical mechanisms encompass a variety of engineering remedies to contain or reduce contamination and/or physical barriers to limit access to real property, such as fences or signs. Source: (7).

Magnetometer: An instrument used to detect ferromagnetic (iron-containing) objects. Total field magnetometers measuring the strength of the earth's natural magnetic field at the magnetic sensor location. Gradient magnetometers, sensitive to smaller near-surface metal objects, use two sensors to measure the difference in magnetic field strength between the two sensor locations. Vertical or horizontal gradients can be measured. Source: (5).

Military Munitions Response Program (MMRP): DoD-established program to manage the environmental, health and safety issues presented by MEC. Source: (1).

Military Munitions: Military munitions means 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 thereof. The term does not include wholly inert items, improvised explosive devices, or 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)). Source: (4).

Mortar: Mortars typically range from approximately 1 inch to 11 inches in diameter or larger, and can be filled with explosives, toxic chemicals, white phosphorus or illumination flares.

Mortars generally have thinner metal casing than projectiles but use the same types of fuzing and stabilization. Source: (2).

Material Potentially Presenting an Explosives 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 potentially contains 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 with munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within the DoD 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. Source: (7).

Munitions Constituents (MC): Any materials originating from UXO, DMM, 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 (e) (3)). Source: (4).

Munitions Debris (MD): Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarizations, or disposal. Source: (7).

Munitions and Explosives of Concern (MEC): Distinguishes specific categories of military munitions that may pose unique explosives safety risks, such as: UXO, as defined in 10 U.S.C. 101 (e) (5); discarded military munitions, as defined in 10 U.S.C. 2710 (e) (2); or munitions constituents (e.g., TNT, Cyclotrimethylene trinitramine [RDX]), as defined in 10 U.S.C. 2710 (e) (3), present in high enough concentrations to pose an explosive hazard. Source: (11). For the purposes of the Basewide Munitions Response Program being conducted for the former Fort Ord, MEC does not include small arms ammunition .50 caliber and below. Source: (1).

Munitions Response Area (MRA): Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. A MRA comprises one or more munitions response sites. Source: (7).

Munitions Response Site (MRS): A discrete location within a MRA that is known to require a munitions response. Source: (7).

MEC Sampling: Performing MEC searches within a site to determine the presence of MEC. Source: (1).

Operating Grids: Typically, 100-foot by 100-foot parcels of land as determined by survey and recorded by global positioning system (GPS), marked at each corner with wooden stakes. Sites are divided into operating grids prior to the commencement of work by brush removal or MEC sweep teams. A single grid may be occupied by only one team at any time, and the grid system facilitates the maintenance of safe distances between teams. They are identified sequentially using an alphanumeric system (e.g., E-5). Source: (1).

Projectile: An object projected by an applied force and continuing in motion by its own inertia, such as a bullet, bomb, shell, or grenade. Also applied to rockets and to guided missiles. Source: (2).

Range-Related Debris: Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g., target debris, military munitions packaging and crating material). Source: (7).

Remedial Investigation (RI): *Remedial investigation* (RI) is a process undertaken by the lead agency to determine the nature and extent of the problem presented by the release. The RI emphasizes data collection and site characterization, and is generally performed concurrently and in an interactive fashion with the feasibility study. The RI includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for remedial action and to support the evaluation of remedial alternatives. Source: (8).

Removal Depth: The depth below ground surface to which all ordnance and other detected items are removed. Source: (1).

Track 0 Areas: Areas of the former Fort Ord that contain no evidence of MEC and have never been suspected of having been used for military munitions-related activities of any kind. This definition has been clarified in the Explanation of Significant Differences, Final Record of Decision, No Action Regarding Ordnance-related Investigations (Track 0 ROD), former Fort Ord, California (March 2005) to include areas not suspected as having been used for military munitions-related activities of any kind, but where incidental military munitions have been discovered. Source: (1).

Track 1 Sites: Sites at the former Fort Ord where military munitions were suspected to have been used, but based on the results of the Munitions Response Remedial Investigation/Feasibility Study (MR RI/FS) each site falls into one of the following three categories: Category 1: There is no evidence to indicate military munitions were used at the site (i.e., suspected training did not occur); or Category 2: The site was used for training, but the military munitions items used do not pose an explosive hazard (i.e., training did not involve explosive items); or Category 3: The site was used for training with military munitions, but military munitions items that potentially remain as a result of that training do not pose an unacceptable risk based on site-specific evaluations conducted in the Track 1 Ordnance and Explosives (OE) RI/FS. Field investigations identified evidence of past training involving military munitions, but training at these sites involved only the use of practice and/or pyrotechnic items that are not designed to cause injury. In the unlikely event that a live item of the type previously observed at the site is found, it is not expected that the item would function by casual contact (i.e., inadvertent and unintentional contact). Source: (1).

Track 2 Sites: Sites at the former Fort Ord where MEC items were present, and MEC removal has been conducted. These areas are evaluated in area-specific RI/FSs to assess whether they are in a protective state based on their reasonably anticipated future land uses. Possible outcomes of

a Track 2 RI/FS and ROD could include no further action, land use controls, and/or additional MEC removal. Source: (1).

Track 3 Sites: Track 3 Sites are those areas where MEC is suspected or known to exist, but investigations are not yet complete or need to be initiated, or any area identified in the future. Source: (1).

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, installations, personnel, or materials; and (C) Remain unexploded, whether by malfunction, design, or any other cause. (10 U.S.C. 101 (e) (5)). Source: (4). For the purpose of the Basewide Munitions Response Program being conducted for the former Fort Ord, UXO does not include small arms ammunition .50 caliber and below. Source: (1).

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 Operations contractor positions: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor. Source: (7).

UXO Technician: Personnel who are qualified for and filing Department of Labor, Service Contract Act, and Directory of Operations contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III. Source: (7).

Sources of the Above Definitions: (1) Non-standard definition developed to describe Fort Ord-specific items, conditions, procedures, principles, etc. as they apply to issues related to the MEC cleanup.

(2) "Unexploded Ordnance (UXO): An Overview", October 1996. DENIX.

(3) Military Munitions Response Actions Engineer Manual (EM) 1110-1-4009. U.S. Army Corps of Engineers, June 15, 2007.

(4) Federal Register/Volume 70. No. 192/Wednesday, October 5, 2005/Rules and Regulations, 32 Code of Federal Regulations (CFR) Part 179, Munitions Response Site Prioritization Protocol, Department of Defense, Final Rule. October, 2005.

(5) Survey of Munitions Response Technologies, June 2006. ITRC (Interstate Technology and Regulatory Council) with ESTCP (Environmental Security and Technology Certification Program) and SERDP (Strategic Environmental Research and Development Program).

(6) Institutional Controls: A Site Managers' Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups. US Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) 9355.0-74FS-P, EPA 540-F-00-005.

(7) Department of Defense Manual Number 6055.09-M, Volume 8, February 29, 2008, Administratively Reissued August 4, 2010.

(8) National Oil and Hazardous Substances Pollution Contingency Plan, Title 40, Code of Federal Regulations Part 300.

(9) Department of Defense Manual Number 6055.09-M, Volume 7, (Criteria for Unexploded Ordnance, Munitions Response, Waste Military Munitions, and Material Potentially Presenting an Explosive Hazard), Section V7.E4.4.1 (Explosive Soil). February 29, 2008, Administratively Reissued August 4, 2010.

1.0 INTRODUCTION

This report presents the results of a Remedial Investigation (RI) performed by ITSI Gilbane Company (formerly Innovative Technical Solutions, Inc. [ITSI]) for the U.S. Army Corps of Engineers (USACE) in regard to Munitions Response Site (MRS)-34 at the former Fort Ord in Monterey County, California. The work was performed to evaluate the adequacy of previous investigation activities with regard to completion of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

Fort Ord is a former U.S. Army base located in the coastal maritime area of northwestern Monterey County. The base was used by the Army for various training operations from 1917 through 1994. Included among the numerous training operations pursued at the former Fort Ord were firing ranges that were used for training in the use of various weapons and military munitions.

MRS-34 (formerly identified as Ordnance and Explosives (OE)-34) is a 70.5 acre site located in the northwestern portion of the former Fort Ord, in the vicinity of what was formerly the Fritzsche Army Airfield (FAAF) and is now the Marina Municipal Airport (Figure 1-1). Review of former Fort Ord archives identified a 1946 Fort Ord Master Plan map that pre-dated the presence of the airfield and showed a practice area for bazooka and rifle grenades north of the current airport runways in areas that now are open grasslands. Multiple sampling and removal actions have been performed at MRS-34 to address concerns regarding the presence of munitions and explosives of concern (MEC). Surveys and removal actions performed in 1994 by UXB International (UXB) identified the approximate boundaries of the practice range and removed MEC items. Additional surveys and removal actions were also performed in 1999 and 2000.

The FAAF property, including MRS-34, the airfield, and associated structures, was transferred to the City of Marina in 2001 under CERCLA provisions for a Finding of Suitability for Early Transfer (FOSET), as requested by the City to expedite reuse and provide potential stimulus to the local economy.

This report and a subsequent decision document are required to complete the CERCLA process under the Fort Ord MR Remedial Investigation/Feasibility Study (RI/FS) program. This report was prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance for completion of a RI/FS (EPA, 1988, 2000a, 2000b, 2005). Evaluations and conclusions presented herein are based on reviews of data acquired during previous investigations. No new field data was acquired and no new investigation activities were performed for completion of this report. The previously generated data were reviewed, as described in greater detail below, to evaluate quality and acceptability for use in the RI process.

Based on the OE RI/FS Work Plan (USACE, 2000) and the Remaining RI/FS Areas Management Plan (Shaw/MACTEC, 2010), the site was recommended to be evaluated under the Track 2 process (described in Section 1.1). This RI provides an evaluation of whether the previous investigation work performed has adequately mitigated potential risks to public safety from hazards associated with the potential presence of MEC from the historical practice range.

Potential chemical contamination is addressed separately under the Basewide Range Assessment (BRA) (Shaw/MACTEC, 2009, 2012).

1.1 DESCRIPTION OF THE FORMER FORT ORD MUNITIONS RESPONSE RI/FS PROGRAM

This section describes the Munitions Response (MR) RI/FS program for the former Fort Ord. The MR RI/FS program at the former Fort Ord is being conducted in accordance with CERCLA. The Fort Ord MR RI/FS program addresses only the physical or explosive risk from MEC. Potential soil contamination from small arms and military munitions ranges is being addressed separately under the BRA, and is not within the scope of this document.

The MR RI/FS program includes provisions for the following:

- identification of historical site use by review of historical literature and archived documentation;
- evaluation of previous munitions response actions performed;
- development of applicable work plans and sampling and analysis plans for additional characterization (including the OE RI/FS Work Plan);

- completion of an Ordnance Detection and Discrimination Study (ODDS);
- identification of Applicable or Relevant and Appropriate Requirements (ARARs) pertaining to site history and potential subsequent use; and
- Evaluation of potential risks and long-term risk management requirements..

The Fort Ord MR RI/FS program is organized as a "tracking" process whereby sites with similar characteristics will be grouped to expedite cleanup, reuse, and/or transfer based on current knowledge. A site or area is assigned to a specific "track" (i.e., Track 0, 1, 2, or 3) according to the level of military munitions usage, military munitions investigation, sampling, or removal conducted to date, as described in the OE RI/FS Work Plan (USACE, 2000). Track 0 areas at the former Fort Ord contain no evidence of MEC and have never been suspected as having been used for military munitions-related activities of any kind. Track 1 sites were suspected to have been used for military training with military munitions, but based on a remedial investigation, no further action is required. Track 2 sites are areas at the former Fort Ord where MEC items were present, and MEC removal has been conducted. Track 3 sites are those areas where MEC investigation had not yet been completed at the time. MRS-34 is being evaluated as a Track 2 site because MEC removal actions have been performed.

1.2 TRACK 2 MR RI/FS

The evaluation of MRS-34 data as summarized in this report was performed in accordance with the Final Plan for Evaluation of Previous Work (HLA, 2000a), which provides the approved framework for evaluation of previously completed investigation and MEC removal activities at the former Fort Ord. The following subsections summarize the evaluation process.

1.2.1 Purpose

The purpose of this report is to summarize and present the results of previous evaluations of former and current site conditions in the context of a site-specific RI to comply with CERCLA requirements for site evaluation and closure. The primary objectives of this evaluation are (1) to determine whether the existing data can be used to complete a Risk Assessment (RA) (2) if the data are useable, to complete the RA and (3) if actionable potential risk is identified based the RA, to evaluate remedial alternatives in an FS. The evaluation was performed in accordance with the Final Plan for Evaluation of Previous Work (HLA, 2000a), in addition to specifying the

methods that will be used to evaluate hazards associated with the site using the Fort Ord-specific MEC Risk Protocol.

1.2.2 Elements of the Track 2 MR RI/FS

The evaluation of site data is divided into four separate elements:

- Review of existing literature
- Review of site reconnaissance activities
- Review of sampling activities
- Review of removal actions.

The results of evaluation of these data are integrated into the RI, RA, and Feasibility Study (FS) to include the following, details of which are provided in appropriate sections elsewhere in this report:

(1) Remedial Investigation (RI) (Section 3.0)
The sources of information used in preparation of the RI include, but are not limited to, historical training maps, aerial photographs, MEC removal contractor after action reports (AARs), technical information papers (TIPs), archives search reports (ASRs), evaluation of previous work including data quality criteria, the ODDS reports (USA, 2000b, Parsons, 2002), field training manuals, and interviews with individuals familiar with historical site operations.

The RI includes discussion of background information, site physical descriptions, site history and development, the anticipated future reuse for the site, a description of the MEC potentially present based on historical use of the area, and history of MEC investigations. Additionally, the RI includes a summary of the evaluation of previous work including evaluation of archival documentation, sampling, and removal data, and adequacy of the removal actions conducted, evaluation of the performance of the geophysical equipment used during the investigation, and assessment of data quality. Results of these evaluations are integrated into the presentation of the conceptual site model.

(2) Risk Assessment (RA) (Section 4.0)
The RA presents a description of the elements used for evaluation of potential risk from MEC-related issues integrating the site data with the Fort Ord Ordnance and Explosives Risk Assessment Protocol (Risk Protocol; Malcolm Pirnie, 2002) that was developed to qualitatively estimate the potential risks associated with any MEC that may remain at a site for each receptor expected to be present during development and reuse of the area.

(1) Feasibility Study (FS)

If actionable potential remaining risk is identified, the results of the RI and RA are used to develop applicable remedial alternatives for the site to meet regulatory criteria and achieve an appropriate level of protection for potential receptors. The FS describes the remedial action objectives (RAOs); the screening, development, evaluation, and comparison of remedial alternatives; and identification of a preferred alternative for the site. Based on results of the RI and RA as presented in this document, completion of a FS is not required.

2.0 BACKGROUND

The following subsections describe the physical setting of the former Fort Ord, including the location, general history, land use, site features, and subsurface conditions, and background.

2.1 PHYSICAL SETTING

This section describes the physical setting of the site, to provide context for discussions of site issues.

2.1.1 Location

Fort Ord is a 28,000-acre former U.S. Army base located in the coastal maritime area in the western portion of Monterey County, California, adjacent to the City of Marina (Figure 1-1). MRS-34 is a 70.5-acre site located in the northwestern portion of the former Fort Ord north of Reservation Road, in the vicinity of what was formerly the FAAF and is now the Marina Municipal Airport. The former practice range comprising MRS-34 is north of the current airport runways in undeveloped open grasslands about 3 miles inland from Monterey Bay.

2.1.2 General History

Fort Ord was used by the Army for various training operations from 1917 through 1994. Camp Ord initially was used by the 11th Cavalry and 76th Field Artillery stationed at the Presidio of Monterey for maneuvers and training exercises. By 1933 the Camp Ord Military Reservation included Camp Ord, Camp Clayton, and Camp Huffman. In 1940 the land north of Reservation Road was acquired and Fort Ord was designated as a permanent Army post with the activation of the 7th Infantry Division, and subsequent activation of the 4th, 5th, and 6th Divisions. By 1962 construction of the FAAF was completed (USADEH, 1997a). Fort Ord was the United States Army Infantry Training Facility between 1957 and 1974, until the reactivation of the 7th Infantry Division. In 1991 Fort Ord was identified for Base Realignment and Closure (BRAC), and was officially closed in September 1994 after redeployment of the 7th Infantry Division.

Among the various maneuvers and exercises that took place at the Former Fort Ord, training operations included use of weapons including small arms, artillery, and other explosive devices and explosive weapons launchers. Review of former Fort Ord archives identified a 1946 Master

Plan map that pre-dated the presence of the airfield and showed a bazooka and rifle grenade practice range located in the area now designated MRS-34. The duration of these activities is unknown, but subsequent historical maps (1954 and onward) do not indicate the presence of the same range and indicate the presence of driver training in the same area beginning in 1957.

2.1.3 Land Use

The MRS-34 site and immediate vicinity is currently undeveloped, and comprises generally flat to gently undulating terrain covered by grasslands with scattered shrubs.

2.1.3.1 Developed Land

The site is currently undeveloped other than the presence of unpaved access roads. The nearest development is associated with the Marina Airport. A radar structure is located southeast of the site, and the runways are approximately 1,000 feet south of the site. In addition to airport support facilities, multiple commercial and office structures are present south and southeast of the runways.

2.1.3.2 Undeveloped Land

Other than development associated with the Marina Airport and Blanco Road, east of the site, the land in the immediate vicinity of the site is undeveloped and adjacent land is undeveloped or is used for agricultural purposes. A natural biological reserve area managed by the University of California is located west and southwest of the airport facilities.

2.1.3.3 Future Land Use

The Fort Ord Base Reuse Plan developed by the Fort Ord Reuse Authority (FORA) (Reuse Plan; FORA, 1997) identified land use categories for various areas of the former Fort Ord that included development of public, commercial, and residential areas as well as areas for open space, recreation, and habitat management. Various development areas also were identified in accordance with the Installation-Wide Habitat Management Plan for Fort Ord (USACE, 1997). MRS-34 is coincident with USACE property transfer parcel L5.1.1 (Figure 1-2) and is designated as a development parcel under the HMP and in the Fort Ord Reuse Plan.

The City of Marina requested an early transfer of the property (Parcel L5.1.1) as a public benefit conveyance (PBC) through Federal Aviation Administration. On the basis of completed MEC removals that had been performed, Finding of Suitability for Early Transfer for property including L5.1.1 (Army, 2000) was approved by EPA. The property was transferred in 2001 for airport purposes. The Environmental Response Obligation Addendum (a part of the deed) clarifies the suitable uses as follows: "The Property is suitable only for the intended use as resort hotel, golf course, business park, airport support, and related infrastructure modifications. In addition, the following uses as hereinafter described shall be allowed provided that they do not include private landscaping or unsurfaced yard areas: timeshare and vacation club rooms, spa, health, athletic and related facilities, commercial recreation, employee recreational facilities, day care facilities and nurseries, caretaker units, and airport loft living units." Similar conditions were also documented in the Covenant to Restrict Use of Property (CRUP), a California state land use covenant. Further, in consideration of former site use and the potential for encountering MEC at the site, the City of Marina adopted an ordinance (City Ordinance 98-04, Municipal Code Chapter 15.56) regarding construction activity in the area that requires acquisition of permits that specifically address appropriate precautionary measures and notifications.

2.1.4 Site Features

Physical features of the site area are summarized in the following subsections.

2.1.4.1 Climate

The Mediterranean climate of the area is strongly influenced by proximity to the Pacific Ocean, which generally moderates the temperature range. Fog is common, especially during the summer months, and prevailing winds typically are from the west. Average daily high temperatures range from around 60° Fahrenheit (F) in winter to 70° F in summer, with a record high temperature of 104° F and a record low of 20° F in nearby Monterey. Rainfall typically occurs between November and April, with annual rainfall accumulation of about 14 inches in the vicinity of Marina and 19 inches in Monterey.

2.1.4.2 Ecological Setting

Environmental conditions in the vicinity of the former Fort Ord support a diverse biological community that includes floral and faunal species considered rare, threatened, endangered, or of special concern or status. The Flora and Fauna Baseline Study of Fort Ord, California (Jones and Stokes, 1992) provided results of initial field surveys that were performed to catalog the species present and ascertain the presence of special status species. The various floral and faunal species of concern, collectively referred to as "special status natural resources," are subject to various levels of protection under federal, state, and local regulations that include the federal Endangered Species Act (ESA).

Implementation of a management program to address concerns over special status natural resources resulted in preparation of the Multispecies Habitat Management Plan (HMP; USACE, 1997) in response to the U.S. Fish and Wildlife Service's (USFWS) Final Biological Opinion for the Disposal and Reuse of Fort Ord (USFWS, 1993), which required development of a plan to minimize adverse effects on listed species. Subsequent biological opinions (USFWS, 1999, 2002, 2005), evaluations (Zander, 2002), agreements (FORA, 2004), and a revision to the management plan (Revised Attachment A, Habitat Management Plan Map [USACE, 2005]) further clarified and defined the parameters of the management program.

The area occupied by the former Fort Ord contains substantial portions of the populations or available habitats for special status species and therefore presents important management issues for protection of habitat-dependent species. For example, approximately 50-70% of the entire population of sand gilia is located on former Fort Ord Lands (USACE, 1993). However, the MRS-34 area is not included in any critical habitat areas and is designated in the HMP as a "Development" parcel. Habitat resources in the development parcels "are not considered critical to the long-term survival of the species" (USACE, 1997). Furthermore, the 1993 Biological Opinion states that "… it is assumed that a complete loss of biological resources would occur in the development parcels. The development parcels could be transferred with no covenants, deed restrictions, or conservation easements required."

Although the HMP classified the MRS-34 area as a development parcel, two special status species, the Monterey spineflower and the California black legless lizard, were identified within the parcel (Parcel L5.1.1). Monterey spineflower is listed as federal threatened species with designated Critical Habitat. The legless lizard is not currently listed as a federal threatened species, but was listed when the HMP was published. The HMP did not identify the presence of any other federal or state listed species at the site.

The California Department of Fish and Game (CDFG) considers two plant communities that are present at the former Fort Ord as items of particular concern (CDFG, 1997) because of the biota that they support and the diminishing number of similar communities elsewhere. Central maritime chaparral and valley needlegrass grassland are two of the priority biological communities that exist in the area. These communities typically support special status wildlife species. However, the MRS-34 site is not within a valley needlegrass or central maritime chaparral area.

2.1.4.3 Topography and Surface Waters

The vicinity of the site consists predominantly of low-relief, slightly west-to-northwest sloping rolling grassland on typically well-drained sandy soil at an elevation approximately 120 to 130 feet above mean sea level. The underlying sandy soil is composed primarily of highly permeable dune sands that allow rapid infiltration of precipitation. Consequently, few well-developed surface drainage features are present. The few drainage depressions that are present typically are closed, and surface water features such as wetland areas or water bodies are generally not present in the vicinity of the site.

2.1.5 Subsurface Conditions

This section provides a summary of subsurface conditions at the former Fort Ord, emphasizing conditions (including subsurface geology and hydrogeology) specific to the Marina Airport and the MRS-34 area.

2.1.5.1 Geology

In the Fort Ord area, Mesozoic granitic and metamorphic basement rock is overlain by a succession of mostly Miocene marine sedimentary rocks, Pleistocene eolian and fluvial sands,

and poorly consolidated Pleistocene to Holocene gravels, sands, silts, clays, and dune deposits up to 250 feet thick . Deposition of sediment since Pleistocene time has been largely associated with a series of sea level fluctuations resulting in marine transgression/regression cycles and associated sediment deposition and erosion. The unconsolidated sands and gravels typically represent periods of relatively lower sea levels, and clays typically represent higher sea levels and deposition in estuarine environments.

2.1.5.2 Hydrogeology

The former Fort Ord is located within the Salinas and Seaside groundwater basins, and the MRS-34 site and Marina Municipal Airport are wholly within the Salinas groundwater basin. Hydrostratigraphic units identified at the former Fort Ord are described in detail in the Draft Final Basewide Remedial Investigation/Feasibility Study (HLA, 1995). The described units include the A-aquifer, Fort Ord-Salinas Valley Aquiclude (FO-SVA), the Upper and Lower 180-foot aquifers, and the 400-foot aquifer. The 180-foot aquifers and the 400-foot aquifer are the most common supply sources for local production wells, although no significant water production occurs in the immediate vicinity of MRS-34.

Recharge of shallow groundwater is primarily the result of rainwater infiltration. In the uppermost, or A-aquifer, groundwater flows northwesterly on top of the clay of the FO-SVA. Where the FO-SVA terminates, approximately one mile inland from Monterey Bay, the A-Aquifer groundwater recharges the underlying Upper 180-foot Aquifer and reverses flow direction toward the southeast.

South and west of MRS-34, remediation of solvent contamination in the A-aquifer and 180-foot aquifers is in progress. The groundwater contamination that is being addressed by these remediation programs is unrelated to historical activities at MRS-34. Approximately two miles west of the site, encroachment of seawater into the 180-foot aquifers has occurred as a result of extensive historical inland groundwater extraction for agricultural uses.

2.2 MR RI/FS BACKGROUND

This section provides a summary of the MR RI/FS and regulatory background of the former Fort Ord to provide the basis for the evaluation at MRS-34.

2.2.1 Summary of Military Munitions Response Program

Since BRAC listing of Fort Ord in 1991 and closure in 1994, MEC removal actions have been performed and documented by the Army in preparation for transfer and reuse of the former Fort Ord property. These removal actions have not only reduced imminent hazards, but have also provided information about the type of MEC and level of hazard at each of the sites that can be used in the basewide MR RI/FS.

Work performed under the existing MR program has been conducted in accordance with the following documents:

- Time-critical removal actions (TCRAs) have been implemented as described in the Fort Ord Ordnance and Explosive Waste Time-Critical Removal Action Memorandum (Army, 1994).
- Non-time-critical removal actions are addressed according to the Final Action Memorandum, Phase 2 Engineering Evaluation/Cost Analysis, Ordnance and Explosive Sites, Former Fort Ord, Monterey County, California (USAEDH, 1999). The Action Memorandum, Phase 2 Engineering Evaluation/Cost Analysis (EE/CA) identifies and describes the rationale for continuing with MEC removal actions at MRSs while the basewide MR RI/FS is being conducted, and addresses recommendations for future MEC removal actions.
- All removal actions have been implemented in accordance with the Land Disposal Site Plan (LDSP), LDSP amendments, and explosive safety submissions, which have been approved by the Department of Defense Explosives Safety Board (DDESB). These plans are required to describe the nature, extent, and types of known or suspected MEC contamination, the proposed future use of each area, and procedures for mitigating MEC hazards in a manner compatible with the proposed land reuse and in accordance with the Department of Defense (DoD) safety standards.

Other elements of the MR program implemented prior to the basewide MR RI/FS include the following:

- Archives Search Report – MRSs were identified and listed in the 1997 Draft Revised Archives Search Report (ASR; U.S. Army Engineer Division, Huntsville [USAEDH], 1997a), which is an update of previous ASRs (USAEDH, 1993; 1994). A preliminary site reconnaissance was conducted as part of the ASR to further identify/characterize potential MRSs; the results are contained in the 1997 ASR.
- Site Investigation/Sampling – Based on the 1993 ASR, several MRSs were identified for investigation. Human Factors Applications, Inc., UXB, and USA performed sampling.

- Phase 1 EE/CA (USAEDH, 1997) and the Phase 2 EE/CA USAEDH, 1998b) – The Phase 1 and Phase 2 EE/CAs were developed to describe the Munitions Response to MEC and management activities for sites known or suspected to contain MEC. The Phase 1 EE/CA addressed 29 MRSs and subsites (USAEDH, 1997b). The Phase 2 EE/CA addressed the remaining MRSs, including future sites (USAEDH, 1999).

Elements of the MR Program implemented as part of the basewide MR RI/FS include the following:

- *Draft Final Literature Review Report, Ordnance and Explosives, Remedial Investigation/ Feasibility Study, Former Fort Ord, California* (HLA, 2000b) – This report was the first step in evaluating existing MEC related information for the former Fort Ord as part of the MR RI/FS program.
- *Draft Final Ordnance and Explosive Remedial Investigation/Feasibility Study Work Plan, Former Fort Ord, California* (USACE, 2000) – The OE RI/FS Work Plan describes the overall process for implementing the CERCLA process for MRSs at the former Fort Ord and introduces the management of sites within the four tracks (Tracks 0 through 3).
- *Record of Decision, Interim Action for Ordnance and Explosives at Ranges 43-48, Range 30A, and Site MRS-16, Former Fort Ord, California* (Army, 2002a) – This ROD describes the Interim Action for removal of MEC at two areas within the Fort Ord Impact Area and one area just to the north of the Impact Area. The interim action included vegetation removal through prescribed burns and removal of surface and subsurface MEC. The action within MRS Ranges 43 through 48 is documented in the Final Ranges 43 through 48 TIP (Parsons, 2007). The action within MRS-16 is documented in the Final MRS-16 Remedial Action Report (Shaw, 2009).
- *Record of Decision, No Action Regarding Ordnance-Related Investigation* (Army, 2002b) – This ROD addresses areas at the former Fort Ord that have no known history of munitions-related activities of any kind and have no evidence of MEC. The Track 0 "plug-in" process, which is described in the Track 0 ROD, defines the documentation and procedures required to prepare an Approval Memorandum for identification of Track 0 areas, which can then be considered for a No Action decision.
- *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 Constituents at Site 3* (Army, 2005a) – This ROD addresses sites at the former Fort Ord that were suspected to have been used for military training with military munitions, but based on the Track 1OE RI/FS, each site falls into one of three categories (Categories 1 through 3) and require no further action. The ROD also outlines a 'plug-in' process by which an Approval Memorandum will be prepared that presents the rationale for designating future sites as Track 1 sites. When approved by the regulatory agencies, the Approval Memorandum will become the decision document for the specific Track 1 site. Twenty one sites were identified for no further action as part of the Track 1 ROD. Several other groups of sites have also been identified as Track 1 sites and have proceeded through the Track 1 'plug in' process.
- *Record of Decision, Parker Flats Munitions Response Area, Track 2 Munitions Response Site, Former Fort Ord, California* (Army, 2008b). This ROD formalizes land use restrictions as part of the remedy for the Parker Flats Munitions Response Area (MRA) where MEC removal actions were previously conducted.

- *Record of Decision, Del Rey Oaks Munitions Response Area, Track 2 Munitions Response Site, Former Fort Ord, California* (Army, 2008c) –The ROD identifies land use restrictions for portions of the Del Rey Oaks MRA property where MEC removal actions were previously conducted. The property was transferred to the City of Del Rey Oaks under the Early Transfer Authority, as authorized under CERCLA, with approval by the EPA.
- *Record of Decision, Impact Area Munitions Response Area, Track 3 Munitions Response Site, Former Fort Ord, California* (Army, 2008a). This document presents the selected remedy for addressing MEC in the impact area including surface and subsurface MEC remediation, Land Use Controls (LUCs), and post-remediation habitat monitoring.
- *Final Remaining Remedial Investigation/Feasibility Study Areas Management Plan Former Fort Ord, California* (Shaw, 2010). This work plan addresses the process for evaluating remaining areas within the former Fort Ord where Munitions Response activities and associated CERCLA documentation are not complete (including MRS-34). The remaining RI/FS areas include both previously identified Munitions Response Sites (MRSs) and some areas between existing MRSs.

The Army has also conducted a number of basewide efforts to promote MEC safety because of Fort Ord's history as a military base. Many of these activities are included in the Army's Community Relations Plan and the Munitions Response Site Security Program. Activities include the following:

- Five Year Review. The purpose of the five year review is to determine if remedies implemented at the former Fort Ord continue to be protective of human health and the environment after a period of five years from the time of implementation of the remedy. The Third Five Year Review will be completed in 2012.
- Deed Notice. A deed notice is typically included in the deed for any property transferring from the former Fort Ord. Transfer Parcel L5.1.1 (MRS-34) has been early-transferred and the Deed included a notice of the potential presence of munitions and explosives of concern (Army, 2000).
- MEC Incident Reporting. 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 competent Unexploded Ordnance (UXO)-qualified personnel, who will promptly be dispatched to dispose of any discovered MEC. A "Safety Alert" pamphlet and an Incident Reporting Form are provided to property users.
- MEC Recognition and Safety Training. The Army offers "MEC recognition and safety training" to anyone conducting ground disturbance 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. This training includes a lecture on what type of MEC might be found and the procedure to follow if something is found.
- School Education. Since 1997, the former Fort Ord has had a MEC Safety Education Program that is offered to local public and private schools annually. The objective of the program is to provide school-age children with the ability to recognize the visible attributes of various MEC items likely to exist on the former Fort Ord, associate danger with the MEC items and former Fort Ord areas, and understand the actions to be taken when a possible item is observed.

- Community Involvement. The Army is committed to develop 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 conducts public information sessions through booths or tables at local community events. Additionally, the Army administers a public environmental cleanup web site and mails monthly cleanup updates (www.fortordcleanup.com).
- Local and State Ordinances. Some 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. The City of Marina in consideration of former site use and the potential for encountering MEC at the site, adopted an ordinance (City Ordinance 98-04, Municipal Code Chapter 15.56) regarding construction activity in the area that requires acquisition of permits that specifically address appropriate precautionary measures and notifications.

2.2.2 Regulatory Background

In 1991 Fort Ord was selected for closure. MEC removal actions began in 1993 and continued after the base was officially closed in 1994 in preparation for subsequent transfer and reuse of the property. Removal actions were performed pursuant to the President's authority under CERCLA Section 104, as delegated to the Army in accordance with Executive Order 12580 and in compliance with the process set out in CERCLA Section 120. The regulatory agencies (EPA and the California Department of Toxic Substances Control [DTSC] as part of the California Environmental Protection Agency) were provided copies of work plans and AARs for review. The agencies had the opportunity to provide input during MEC investigation and removal actions; however, the removal actions were completed by the Army using its delegated removal authority under CERCLA.

In November 1998, the Army agreed to evaluate MEC at the former Fort Ord in an MR RI/FS consistent with CERCLA. The basewide MR RI/FS, which the Army is preparing to address MEC hazards on the former Fort Ord and consists of multiple documents, will include input from the community and will require regulatory agency review and approval. The basewide MR RI/FS will evaluate past removal actions as well as recommend 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 Fort Ord Federal Facility Agreement (FFA). The signatories agreed that the FFA provided the appropriate framework and process to address

the Army's MEC activities. The FFA was originally signed in 1990 by the Army, EPA, California Department of Health Services (now known as DTSC), and the Regional Water Quality Control Board (RWQCB). The FFA established schedules for performing RIs and FSs, and requires completion of remedial actions as expeditiously as possible.

In addition, to remain consistent with the ESA, the Army has completed consultations with the USFWS on the Army's predisposal actions, including cleanup of MEC. These consultations have resulted in biological opinions that include incidental take permits. If the Track 2 RI/FS results in impacts not previously considered, the Army will consult with the USFWS in accordance with the ESA.

The basewide MR RI/FS will contain a comprehensive evaluation of all MEC-related data for the entire former Fort Ord, and will evaluate long-term response alternatives for cleanup and risk management of MEC.

3.0 REMEDIAL INVESTIGATION

This section presents a description of site features, site history, site investigations, and removal actions. The descriptions and discussions are based on archival data, and previously completed investigations and removal actions. No new investigations were performed for the preparation of this document.

3.1 SITE DESCRIPTION

The 70.5-acre MRS-34 site is in an area of generally flat to gently undulating grassland with scattered shrubs. Surface drainage is generally to the west, but there is little development of surface drainage features or other significant morphological variation due to the highly permeable dune sands comprising the underlying soils. A lightly used, partially overgrown dirt road accesses the site. Review of former Fort Ord archives identified a 1946 Master Plan map that pre-dated the presence of the airfield and showed a bazooka and rifle grenade practice range located in the area now designated MRS-34.

3.2 SITE HISTORY AND DEVELOPMENT

No documentation of specific activities performed within the area now designated as MRS-34 prior to 1946 has been identified. A 1946 Fort Ord Master Plan map (USAEDH, 1997a) indicated the presence of a bazooka and rifle grenade practice range in the area, which was confirmed by the results of site surveys and MEC removal actions, as described below. It is unknown when range use began, but according to historical maps the area was used for other purposes by 1956 when the site was part of a "Ranging Area" used for tank gun siting; and 1957 and subsequent maps indicate that the area was used for driver training, at least until development of the FAAF in the early 1960s (USAEDH, 1997a). FAAF was completed in 1962 and was actively used until Fort Ord closure in 1994 and use resumed upon the completion of property transfer to the City of Marina. No further development has occurred in the immediate vicinity of MRS-34.

3.3 HISTORY OF MR INVESTIGATIONS

This section summarizes the investigations performed at the site and provides a general description of the methods used. Additional detail on the field methods is provided in Section 3.5.2.

In 1994, UXB surveyed the site on behalf of the USACE to identify the range boundaries and determine whether MEC was present. Site boundaries were established using magnetometers and visual observations regarding the relative density and distribution of munitions debris (MD) at the site. The site boundary delineated by UXB subsequently became the MRS-34 boundary (Figure 3-1). The UXB survey identified MD items including five M18 hand-deployed smoke grenades, one M22 rifle-launched smoke grenade, five M7 series 2.36-inch practice rockets, and eleven rocket motors (UXB, 1995). Based on the initial findings, the entire site was then divided into 100-foot by 100-foot grids for further detailed investigation including additional geophysical surveying and excavation of geophysical anomalies. All geophysical anomalies were excavated and identified, with the deepest excavation to a depth of 3 feet. During this phase of the removal action, UXB identified and disposed of "live" items including 23 M6 2.36-inch rockets, one rocket motor, and five demolition charges (based on Quality Control [QC]/Quality Assurance [QA] review of the data, the quantities in the Fort Ord Military Munitions Response Program (MMRP) database are currently listed as 21 M6 2.36-inch rockets and one demolition charge). Additionally, MD found included portions of five M18 hand-deployed smoke grenades, four M22 rifle-launched smoke grenades, eight M11 series anti-tank (AT) practice rifle grenades, five grenade fuzes, 44 M7 series 2.36-inch practice rockets, 241 M7 series 2.36-inch practice rocket motors, small arms, and other scrap (UXB, 1995).

It should be noted that standard practice at the time of the UXB investigation was to detonate all suspect items in-place as a safety precaution. There is insufficient documentation to ascertain whether the items reported as M6 rockets by UXB were actual M6 rockets, or could not be positively identified as M7 practice rockets and were therefore assumed to be M6s and destroyed in place (USA, 2000).

A digital geophysical survey was performed at the site in 1999 by UXB under the direction of Techlaw in support of EPA's oversight of environmental cleanup and closure of Fort Ord. The resurvey evaluated seven 200-foot by 200-foot grids and two 100-foot by 200-foot grids using a Geonics EM61 electromagnetic metal detector and the Geometrics G-858 cesium vapor total field magnetometer. A test plot designed by UXB was used to demonstrate whether the instruments detected the buried targets effectively before the formal resurvey of the site began. This survey identified 16 geophysical anomalies that were subsequently excavated, from which one M7 series 2.36-inch practice rocket (MD) and one ballast counterweight from an M7 series 2.36-inch practice rocket (MD) were recovered. The remaining anomalies consisted of other scrap not related to munitions or for which no ferrous source could be identified.

Based on the discovery of two MD items related to practice rockets, a 100-percent resurvey of the entire site was performed by the Army using digital instrumentation (EM-61 and G-858). The comprehensive digital resurvey was performed over a system of 100-foot by 100-foot grids comprising the entire MRS-34 site by Parsons Engineering Science (Parsons) under the direction of USA. Anomalies were identified to the resolution limits of the system and ambient background interference. The resurvey identified 655 geophysical anomalies that were subsequently investigated. The anomalies included 25 munitions debris items including fragments or components of 2.36-inch practice rockets. However, no potentially explosive items were discovered during the resurvey investigation. The investigation report concluded that the potential for additional MEC items remaining at the site was unlikely (USA, 2000a).

3.4 CONCEPTUAL SITE MODEL

The Conceptual site model (CSM) used for guiding site investigations and interpretation of site conditions is presented below. The CSM is developed to provide the most representative model of former site use and conditions, and to provide guidance for selection of investigation methods and identification of potential data gaps requiring resolution. The CSM includes parameters such as potential MEC items that might be found on site based on evaluation of historical data, potential release mechanisms that may create exposure hazards, potential exposure routes, the physical features and limits of the area of concern, and the nature and source of the contamination, in this case MEC. The discussion also cites the basis for development of the

various CSM parameters such as literature reviews, aerial photographs, historical maps, training manuals, and field observations.

The CSM is divided into the following four sections for this report: (1) Training Practices, (2) Site Features, (3) Potential Sources and Locations of MEC, and (4) Potential Exposure Pathways.

3.4.1 Training Practices

Little documentation of training activity at Fort Ord prior to 1940 is available. The available information is limited to brief documentary film footage from 1938 entitled A Year on a Cavalry Post, 1938 – 11th Cavalry, Presidio, Monterey, California; National Archives footage from 1940; topographic maps from 1918, 1933, and 1938 (Department of the Interior [DOI], 1918; Army, 1933-1934, 1938); a set of aerial photographs from 1941; and information presented in The American Arsenal (Hogg, 2001). There is no site-specific documentation regarding the training practices used. However, site practices have been inferred based on MEC items found at the site, review of literature, maps, training manuals, technical manuals, and field observations. Training practices are discussed below to provide information on the types of military munitions that may have been used at the site based on identification of munitions and debris found during removal actions at the site.

2.36-Inch Rocket

The 2.36-inch rocket was a shoulder-launched projectile designed to be used against tanks and other armored ground targets. The M6 series 2.36-inch rocket was designed to be effective against the armor plate of tanks and armored vehicles. The M6 series 2.36-inch rocket had a range of up to 600 yards with an optimum range of about 200 yards (Hogg, 2001). The M7 series rocket was designed to exhibit the firing characteristics of the M6 rocket, but contained an inert warhead for use as a practice weapon.

Rifle Grenade

Rifle-launched grenades in the M11 series and M22 series were identified at the site. The M11 series anti-tank (AT) practice rifle grenade was available for use in the 1940s and 1950s. This

item was an inert grenade similar in shape and weight to the M9 series high-explosive antitank (HEAT) grenade, but the M11 contained no explosive charge. Practice rifle grenades such as the M11 are propelled downrange by a special blank cartridge used to fire the grenade from a launcher attached to the rifle.

Rifle grenade practice ranges typically include a firing area located behind a protective barrier of sandbags 0.5 meter thick or a reinforced concrete wall 0.16 meter thick (Army, 1983; Army, 1987). It is likely that a sandbag barrier was used for training at the site because no remnants of a concrete protective wall were identified. The maximum range of the M11 series rifle grenade was approximately 150 meters. According to information in The American Arsenal (Hogg, 2001), the depth to which the launcher is inserted into the rifle stabilizer tube determines the range attained by the fired grenade. Therefore, it is expected that targets would be placed at various distances to practice firing at different ranges.

The M22 rifle grenade can be used for signaling or laying smoke screens (Army, 1977; 1987). The grenades are fired from a rifle equipped with a grenade launcher and are ignited on impact. At impact, a firing pin strikes a primer producing a flame that ignites a starter mixture charge, which in turn ignites a smoke mixture charge.

Smoke Grenades

Fragments or components of M18 smoke grenades were identified at MRS-34. The M18 smoke grenade was hand deployed for generating a smoke screen or as a ground-to-ground or ground-to-air signaling device. Throwing distance for an M18 is typically up to about 30 meters. The M18 is a sheet metal cylinder containing 19 ounces of a chemical compound that produces smoke for about 2 minutes upon ignition by the pyrotechnic ignition fuze. A striker activated by release of the spring-loaded safety lever after removal of the pin ignites the contents, which bursts pressure-sensitive tape covering emission holes on the ends of the cylinder and allows smoke to escape (Army, 1977).

Demolition Charges

Demolition charges were found at one site location during the 1994 UXB removal action. No other similar items or evidence of historical use were identified at the site during any of the removal actions. There is insufficient evidence to support use of demolition charges as part of historical training practices at MRS-34.

MK23 Miniature Practice Bomb

During installation of a fence along the boundary of MRS-34 a single 3-pound MK23 miniature practice bomb was discovered buried 4 inches below the surface. The MK23is a practice bomb that normally contains a small photoflash spotting charge. However, the item found had been expended and contained no energetic material. No other similar items or evidence of their historical use at the site were found (USA, 2000). The presence of this item is believed to be an isolated anomaly and is not believed to be associated with historical practices at MRS-34 or the extent of the historical range. However, because it was discovered during MRS-34 removal actions it is included here for completeness.

3.4.2 Site Features

The site is within an undeveloped area comprised of low-relief, gently rolling hills within a broad, shallow natural drainage covered with native grasses and limited brush. Several lightly used or overgrown dirt roads are present, but there are no other significant physical features such structures, berms, or disturbed areas indicative of historical site use. The extent of the area of potential concern was established during the initial site evaluation based on investigation data as described in Section 3.5.2.1.

3.4.3 Potential Sources and Locations of MEC Discovered and Removed

Figures 3-2 and 3-3 illustrate the locations where MEC was discovered and removed from the site. A list of the MEC and MD items found at the site is presented in Appendix C. Recent site reconnaissance identified no significant physical features at the site indicating range orientation or use. The presence of an apparent access road as indicated on the 1946 map relative to the site suggests that the range likely was accessed from the west and that firing likely was to the east,

away from the access road. Field observations during the initial removal action also led to the conclusion that range firing occurred from west to east (UXB, 1995).

3.4.4 Potential Exposure Routes

This section discusses the anticipated potential site reuse, the potential exposure associated with this site use, and potential receptors.

At the time of property transfer, the proposed site reuse included development of a resort hotel, golf course, business park, airport support, and related infrastructure modifications. The Environmental Response Obligation Addendum (EROA) also specifies additional use criteria provided that they do not include private landscaping or unsurfaced yard areas. These additional uses include timeshare and vacation club rooms, spa, health, athletic and related facilities, commercial recreation, employee recreation facilities, day care facilities and nurseries, caretaker units, and airport loft living units. All of the proposed reuse scenarios could result in ground-disturbing activities (e.g., construction/excavation and landscaping). Although two complete removal actions to depth have been completed across the site using multiple detection technologies and appropriate QA and QC measures, and all detected MEC was removed, the detection efficiency of the geophysical instruments used to detect anomalies is not 100 percent, and it is possible that MEC could still be present. It is expected that any remaining MEC would be similar to the types of MEC items that were found previously at the site, as described above. It should also be noted that the M6 rockets (MEC) reported by UXB from the 1994 survey were not confirmed to be M6 rockets and may have been M7 practice rockets (MD) (USA, 2000).

Potential receptors include construction workers, outdoor maintenance workers, office workers, residential, and recreational users. Based on the proposed reuse, office workers and recreational users are not expected to encounter MEC because their activities are not expected to include subsurface intrusion. Residential activities other than landscaping are also not expected to include subsurface intrusion.

Construction and outdoor maintenance worker activities are more likely to include subsurface intrusion, but it is unlikely that these receptors will encounter MEC because a 100 percent

removal to depth has been completed during two separate removal actions. However, the risk from unidentified MEC potentially remaining at depth is considered in the RA (Section 4.0, Appendix B).

3.5 SITE EVALUATION

The available data (e.g., archival and removal data) regarding MRS-34 were reviewed and evaluated according to procedures described in the Final Plan for Evaluation of Previous Work (HLA, 2000a). The evaluation process is documented through the completion of a series of checklists. Checklists were prepared for MRS-34. Copies of the checklists are provided as Appendix A. This section presents a summary of the results of the checklist evaluation. It is divided into two sections: an assessment of the literature review and an assessment of the removals performed at the site.

3.5.1 Literature Review

The only indication of the presence of a practice rocket range in the vicinity of MRS-34 was a 1946 Fort Ord Master Plan Map that identified a square area labeled "Practice Bazooka and Rifle Grenades." There is no indication on facility use maps or other documents dated before or after the 1946 map that a range existed in this area. Review of the same 1946 Fort Ord Master Plan Map, shows formal range fans elsewhere, including the "Austin Anti-tank" range within the Fort Ord historical impact area, where M6 high explosives (HE) 2.36 inch rockets were known to have been used. Subsequent historical maps (1954 and onward) do not indicate the presence of the same practice area in the vicinity of MRS-34. A 1956 map indicates that the site was part of a "Ranging Area", which is used for tank gun siting, but by 1957 the entire area was designated for driver training. Historical aerial photos (HLA, 2000b, Table 3) indicate that some driver training may have continued even after construction of the FAAF in the early 1960s.

Based on the range type named on the 1946 map, the expected types of military munitions associated with the site included shoulder-launched practice rockets, and practice rifle grenades,. Details regarding these types of training and munitions and other types identified at the site are presented in Section 3.4.

Subsequent Use of the Area

The use of MRS-34 for military munitions-related training is not identified on post 1940s training maps (USAEDH, 1997a), and the property remains undeveloped. The1951 map shows a Tank Siting Area, used for calibrating tank gunsights, at MRS-34, and maps from 1957 and 1958 identify Driver Training Areas over the entire area including MRS-34 and the future FAAF site (now the Marina Municipal Airport), which was completed in 1962. From base closure to the present, all of MRS-34 has remained undeveloped. Use of the area as a practice driving area in the 1950s and subsequent use as an airport, suggests that training using military munitions did not continue after the 1940s or mid-1950s.

Establishment of Site Boundaries

Range boundaries for MRS-34 are not indicated on the 1946 Master Plan map. The establishment of the physical MRS-34 site boundary was based on field identification of range boundaries using the physical presence and distribution of range debris using visual and geophysical indications (UXB, 1995). The site boundaries were subsequently used to establish property parcel boundaries to facilitate property transfer for reuse.

Summary of Literature Review Analysis

Although references to site use were limited to a single document, the nature of the site use as indicated on the 1946 Master Plan Map was sufficient historical evidence to warrant sampling for military munitions within MRS-34. Subsequent site investigation has verified that a variety of training activities have been conducted within MRS-34, including activities involving the use of military munitions.

3.5.2 Removal Action Review

This section describes the results of military munitions investigations and removal activities performed to date at MRS-34. This section primarily discusses the investigation design, methodology, equipment, and quality control measures. The three known phases of fieldwork are described in chronological order.

3.5.2.1 UXB International (1994)

The boundary of MRS-34 is based on the initial round of sampling and investigation carried out by UXB in August 1994. The initial indication of the general location and nature of the military munitions contamination was derived from the 1946 Fort Ord Master Plan map. It indicated that a "Practice Bazooka and Rifle Grenade" training area had been located in the general area of FAAF before the airfield was established. On August 22, 1994, UXB was instructed by the US Army Corps of Engineers, Huntsville Division (CEHND) Safety Specialist to carry out a search of the area in order to better define the site boundary. Using both visual and Schonstedt-assisted techniques, an area of concern was found and its perimeter was established on August 25, 1994. This perimeter subsequently became the boundary of MRS-34. MEC clearance operations on the 70.5 acre site began on August 29, 1994 and were completed on December 2, 1994 (UXB, 1995). Brush cutting was required in some grids to allow access to perform the work. All anomalies were investigated and identified or resolved to the satisfaction of the CEHND (UXB, 1995). Standard procedures at the time included detonation and destruction of any suspect items found as a precautionary measure whether or not the item could be positively identified as MEC. Based on this protocol, it should also be noted that the M6 rockets (MEC) reported by UXB were not confirmed to be M6 rockets and may have been M7 practice rockets (MD) (USA, 2000).

3.5.2.1.1 Investigation Design and Methods

The site was subdivided into 323 grids, each measuring 100 feet by 100 feet. Each grid was divided into 5-foot-wide search lanes, delineated by ropes laid on the ground. Unexploded ordnance (UXO) technicians then walked each lane using Schonstedt metal detectors, marking each anomaly location with a pin flag. After the grid was completed, the technicians excavated each anomaly location by hand, digging to the source of the anomaly or a depth of 3 feet, whichever came first. If an anomaly source was not located within the 3-foot depth, the on-site CEHND Safety Specialist was consulted to determine whether further digging was appropriate. As reported by UXB, a total of 427 military munitions-related items were discovered – 23 of which were 2.36 inch rockets and 69 of which were small arms items (UXB, 1995). All work was carried out in accordance with the UXB Fort Ord Work Plan (UXB, 1994).

3.5.2.1.2 Equipment

UXB used Schonstedt metal detectors for all of their work. Initially, the Model GA-52C and Model GA-72CV were used until Schonstedt produced the Model GA-52Cx. These models use the same geophysical principles, the primary difference being the increased sensitivity of the GA-52Cx. The changeover occurred in October of 1994 and some of the grids that had been cleared using the GA-72Cv were re-swept using the GA-52Cx. A qualitative technical description of the GA-52Cx is given below.

The GA-52Cx Magnetic Locator detects the magnetic field of ferromagnetic objects. It responds to the difference in the magnetic field between two sensors spaced about 20 inches apart. The response is a change in the frequency of the signal emitted by a piezoelectric speaker. The nature of the instrument is analog, as opposed to digital - data is not stored and real-time interpretation is carried out by the instrument operator. The volume and pitch of this tone can provide an experienced operator with qualitative information about the nature of the detected object (e.g., size, location, subsurface depth). It should be noted, however, that Schonstedt magnetometers will also respond to soil and rock containing ferrous minerals ("hot rocks"). Accordingly, it is recognized that the interpretation of the Schonstedt instrument response can be subjective; for deeper targets, especially, the operator often must analyze a subtle change in the audio output and decide whether the instrument is responding to a potential MEC item or to soil mineralization. Additionally, it can be difficult to determine the exact location of a more deeply buried object because the Schonstedt's audio response may be dispersed over an area that is several feet wide. The GA-52Cx utilizes five different, operator-selectable sensitivity levels and is one of the primary instruments used on North American ordnance clearance projects.

The performance of the Schonstedt GA-52/C, GA-52Cx, and GA-72/Cv magnetometers was evaluated as part of the Ordnance Detection and Discrimination Study (ODDS; Parsons, 2002). Studies were performed as part of ODDS to evaluate:

- Signatures of inert military munitions items suspended in air at varying orientations and distances from the geophysical sensor (static tests).
- The ability of various geophysical instruments to detect and discriminate between different military munitions items buried at various depths (seeded tests).

- Geophysical instrument performance at actual munitions response sites (field trial site testing).

The Schonstedt tools were not evaluated during the static tests; therefore, only the seeded test results and the field trial tests are discussed herein. It is recognized that the ODDS study areas may not represent the same field conditions as MRS-34, therefore, differences in field conditions, if applicable, should be considered when using information from the ODDS.

For the purposes of evaluating the geophysical instruments used at this site, it is assumed that the majority of munitions potentially used for training at MRS-34 area would be located at the surface (smoke hand grenades) or potentially just below ground surface (2.36 inch rockets and rifle grenades). As part of the ODDS, non-penetrating items (hand grenades [ODDS Type I]) were evaluated as were penetrating items (2.36-inch rockets, and rifle grenades [ODDS Type II]). Therefore, the Type I and II seeded test results were used for comparison purposes in evaluating the performance of the geophysical equipment used at this site in identifying surface and buried munitions items.

During the seeded tests, the Schonstedt Model GA-52/C located between 56 percent (search radius of 1.6 foot and maximum lane width of five feet) and 59 percent (search radius of 3.3 feet and maximum lane width of five feet) of the Type I items buried at depths ranging from just below the ground surface to one foot below ground surface (bgs) and the Schonstedt Model GA-72/Cv located between 63 percent (search radius of 1.6 foot and lane width of five feet) and 78 percent (search radius of 3.3 feet and lane width of five feet) of the Type I items. The detection rate for Type I items for the Schonstedt Model GA-52Cx ranged between 67

percent (search radius of 1.6 feet and line spacing of 5 feet) and 78 percent (search radius of 3.3 feet and land width of five feet) of Type I items. The detection rate for Type II items for the Schonstedt Model GA-52/C ranged from 44 percent (search radius of 1.6 foot and lane width of five feet) to 49 percent (search radius of 3.3 feet and lane width of five feet) and the detection rate for Type II items for the Schonstedt Model GA-72/Cv ranged from 41 percent (search radius of 1.6 foot and lane width of five feet) to 51 percent (search radius of 3.3 feet and lane width of five feet). The detection rate for Type II items for the Schonstedt Model GA-52Cx ranged from 64 percent (search radius of 1.6 feet and lane width of five feet) to 74 percent (search radius of 3.3 feet and lane width of five feet) using the Schonstedt Model GA-52Cx.

The detection rate percentages presented in the ODDS varied according to the search radius, which ranged from 1.6 to 3.3 feet and the search lane width which was three to five feet wide. Five-foot wide search lanes were used during the UXB sampling program at MRS-34. Results for the three-foot wide search lanes were not included in the detection percentages presented above because three-foot search lanes were not used during the site investigations. A standard search radius for investigation anomalies was not specified in work plans or reports, therefore, the detection range for the different search radii are presented above.

The seeded test detection rates are considered conservative because one foot was added to the item's calculated penetration depth to allow for soil deposition over time. Because the field conditions at the seeded test site and orientation of the subsurface item may not be comparable to MRS-34 conditions, the results should only be used as an indication that the equipment is capable of detecting the same types of items at depths that are the same as used in the seeded tests.

Results of the ODDS Field Trial Sites (FTS) were also reviewed for potential use in evaluating instrument performance at the site. Detection rates were calculated for four of the six test sites; the remaining sites did not have enough MEC or MEC-like MD detected to allow calculation of site statistics. The calculated detection rates for the combined sites ranged from 52 to 96 percent for the Schonstedt Model GA-52/C, 64 to 98 percent for the Schonstedt Model GA-72/Cv, and from 97 to 100 percent for the Schonstedt GA-52Cx, depending on the search radius used for the calculation. As previously discussed, results for the three-foot wide search lanes were not included in the detection percentages presented above because three-foot search lanes were not used during the site investigations. The lower detection rates were for a 1.6-foot search radius and the higher detection rates were for a 3.3-foot search radius

Although not directly comparable to MRS-34, the results of the ODDS indicate that the Schonstedt Models GA-52/C, GA-72/Cv, and GA-52Cx are capable of detecting ferrous surface and subsurface MEC if present in the surface or shallow subsurface at the site. The results of the ODDS do indicate that the detection rates for the Schonstedt magnetometers drop off between 6 and 12 inches and to zero for some items below 2 feet; however, the items found at MRS-34 are not expected to penetrate deeper than 1 foot based on the results of a study of penetration of projectiles into earth reported in the Phase 1 EE/CA (USAEDH, 1997b). For example, the maximum penetration depth for a 2.36-inch rocket was identified as 0.8 inches in clay and the penetration depth of an M9 rifle grenade was reported as 0.2 feet in clay.

3.5.2.1.3 Quality Control/Quality Assurance

QC checks were performed on each and every grid, after ordnance detection and removal operations were complete for a given grid. UXB quality control specialists re-checked at least 10% of the area of each grid using their metal detectors. Following the QC check, QA checks were performed by the CEHND Safety Specialist prior to acceptance of the grid as a finished product.

3.5.2.2 TechLaw, UXB, and USA (1999)

TechLaw, Inc. (TechLaw) was retained by EPA (Region 9) to aid in their oversight of the environmental cleanup and closure of Fort Ord. As part of this activity, TechLaw hired UXB to conduct digital geophysical mapping (DGM) over selected portions of MRS-34 to check the efficacy of the cleanup work that had been previously performed. USA provided the UXO technicians who supported the field activities and carried out investigations of selected anomalies. Results of this investigation are presented in Appendix B of the USA After Action Report (USA, 2000).

3.5.2.2.1 Investigation Design and Methods

Approximately 13% of MRS-34 was subjected to geophysical mapping, using the Geonics Model EM-61 metal detector. The 8 acres of coverage was distributed over nine different grids (seven of which measured 200 feet by 200 feet; the remaining two measured 200 feet by 100 feet). Grids were established at:

- Locations where items had been blown-in-place during the 1994 removal action.
- Locations where MEC and munitions debris had been found during the 1994 removal action.
- Locations where no MEC or munitions debris was found during the 1994 removal action (the objective being to confirm the apparent absence of contamination).
- Locations where future construction was most likely to occur.

These locations were agreed upon during meetings between EPA, TechLaw, the Fort Ord BRAC Office, the USACE, and UXB.

Following the initial DGM effort, 1.5 acres of the 8 acre study area were resurveyed using the Geometrics Model G-858 magnetometer.

Before beginning the DGM on the grids, UXB set up a test plot to demonstrate the detection capabilities of the geophysical instruments. A practice 2.36 inch rocket and a "practice M9 rifle grenade" were buried at a depth of 2 feet. The "practice rifle grenade" indicated in the source text (UXB, 1995) was probably an M11 practice grenade rather than an M9 grenade, which is a high explosive device unlikely to be used in a test of this type. Use of the M9 is also inconsistent with the "practice" designation used in the source text. Test runs over the items indicated that both items were detected by both instruments using a transect spacing of 5 feet. Consequently, the geophysical production work carried out over the nine grids used the 5-foot line spacing. The anomaly selection criteria used during analysis of the collected data also were based on the observed test plot results.

A total of 50 anomalies were selected by UXB from the DGM results; 13 of these were selected for reacquisition and investigation by UXO technicians. These investigations yielded two munitions debris items – one ballast counterweight from an M7 2.36 inch rocket and one expended "2.36 inch practice rocket," likely an M7 model. The other anomaly locations resulted in either "nothing found" or other (non-munitions) scrap metal. USACE personnel selected three more anomalies from the dataset (different from the list of 50). These anomalies were investigated, but no metallic material was found at any of the three locations.

3.5.2.2.2 Equipment

The Geonics Model EM61 metal detector is a digital, wheel-mounted, time-domain instrument that is capable of detecting both ferrous and non-ferrous items. The instrument operates by causing a pulsed current to flow in a 1 meter by 1 meter coil of wire which, in turn, induces the flow of electrical current in nearby metallic items. The magnetic field associated with these secondary currents is then detected and measured by the EM61. The data is stored on a small computer (the data logger) for later analysis and anomaly selection. For this survey work, the data was collected in "wheel mode," whereby an odometer on one of the wheels triggers a measurement with each turn of the wheel. Positions were calculated using fiducial techniques whereby digital "markers" were inserted in the dataset, by the operator, at known points. The collected geophysical data was then interpolated between the known points and coordinates assigned to each data point.

The Geometrics Model G-858 magnetometer utilizes cesium-vapor technology to detect and record changes in the earth's magnetic field caused by the presence of nearby metallic (ferrous only) objects. The sensor is mounted on the end of a counter-balanced aluminum pole and carried by the operator, using a strap that lies across the shoulder. The data is stored digitally on a small datalogger that is carried on the operator's belt. The information is later downloaded for processing and analysis.

A discussion of the detection capabilities of the Geometrics G-858 and the Geonics EM-61as evaluated during subsequent performance testing at MRS-34 (USA, 2000) is presented in Section 3.5.2.3.1.

3.5.2.2.3 Quality Control /Quality Assurance

Quality control (defined as processes carried out by the contractors) of the geophysical processes was carried out by UXB on a daily basis. These activities included:

- Daily testing of the geophysical instruments over items buried in the test plot and comparing the observed responses to the expected responses, prior to carrying out production work. No inconsistencies were observed.
- Testing the global positioning system (GPS) equipment that was used to establish the grid corners against the coordinates of three previously established survey control points. During these tests, horizontal positioning errors did not exceed 0.05 feet. Grid corners were staked to the nearest 1/10 of a foot.
- Comparison of the data collected by the G-858 magnetometer for consistency with that collected by the EM-61 with respect to the identification of anomalies caused by buried metallic objects.
- USA's role in QC activities involved inspecting operational activities and ensuring that all anomaly investigation documentation was complete.

USACE reviewed geophysical data and data interpretation results, and provided observations and analysis, which is included in Appendix N of the USA AAR (USA, 2000). The review included the geophysical data and data interpretation results including:

- Inspection of collected geophysical data, with emphasis on looking for incomplete DGM coverage, unreasonable data spikes, and improper transect locations.
- Verification of proper file naming and other data management processes.
- Inspection of data interpretation results, looking for improper or incomplete anomaly selection.
- Inspection of post-excavation results, including complete documentation.

Results of the QA effort produced some serious concerns, as summarized below:

- The test grid work that resulted in the survey design and anomaly selection guidelines was not well documented and left questions in the mind of the government geophysicist. These included concerns regarding the placement of the seeded items (Why was the two-foot depth chosen? What were the orientations); the transect spacing (Were line separations other than five feet considered? What was the spatial relationship between the seed items and the transect lines?); the anomaly selection protocol that was developed (Why was the average EM61 response of the items, as opposed to the minimum response, used for anomaly selection on the production grids?)
- Many data gaps and, occasionally, missing transects were noted.
- Field notes documenting the locations of surface items (e.g., manhole covers) that would cause anomalous responses in the data were incomplete.
- Anomaly investigations were incomplete in some cases (e.g., reporting "nothing found" after digging less than a foot).
- Raw data files were missing.

3.5.2.3 USA and Parsons Engineering Science (1999)

Based on the results of the 1994 UXB investigation and 1999 TechLaw/UXB investigation described above, a decision was made to conduct a complete geophysical survey and investigation in MRS-34 using digital geophysical technologies. The project was awarded to USA by the USACE. In turn, Parsons was subcontracted by USA to carry out the geophysical work. USA provided the UXO technicians who supported the field activities and carried out investigations of selected anomalies.

3.5.2.3.1 Investigation Design and Methods

A limited amount of vegetation clearance was necessary prior to the beginning of investigation activities to allow full access for geophysical equipment. Prior to beginning production DGM at MRS-34, the EM-61 and the G-858; as well as a smaller coil, hand-held version of the EM-61, were tested at a geophysical prove-out (GPO) plot located within MRS-34. The GPO was seeded with a variety of inert and simulated items, as presented in the following table which also includes the detection results for each instrument at different line spacing.

Item	Depth (ft.)	Orientation	EM61 2.0 ft. lanes	G-858 2.5 ft. lanes	G-858 3.0 ft. lanes	EM-61 Hand held 1.0 ft. lanes	EM-61 Hand held 2.0 ft. lanes
2.36 inch Rocket	4.4	Horizontal	No	No	No	No	No
2.36 inch Rocket	2.9	Vertical	Yes	Yes	Yes	No	No

Item	Depth (ft.)	Orientation	EM61 2.0 ft. lanes	G-858 2.5 ft. lanes	G-858 3.0 ft. lanes	EM-61 Hand held 1.0 ft. lanes	EM-61 Hand held 2.0 ft. lanes
2.36 inch Rocket	3.2	Horizontal	Yes	Yes	Yes	No	No
2.36 inch Rocket	3.6	Vertical	Yes	Yes	Yes	No	No
Grenade Fuze	1.1	Vertical	No	No	No	No	No
Grenade Fuze	2.0	Vertical	No	No	No	No	No
Grenade Fuze	1.5	Horizontal	No	No	No	No	No
Grenade Fuze	2.5	Horizontal	No	No	No	No	No
TNT Simulation*	3.1	Horizontal	No	No	No	No	No
TNT Simulation*	4.0	Horizontal	No	No	No	No	No
TNT Simulation*	3.4	Vertical	No	No	No	No	No
TNT Simulation*	2.0	Vertical	No	No	No	No	No
Smoke Grenade	2.0	Vertical	No	No	No	No	No
Smoke Grenade	2.1	Horizontal	No	No	No	No	No
Smoke Grenade	3.0	Vertical	No	Yes	Yes	No	No
Smoke Grenade	2.6	Horizontal	No	No	No	No	No

* TNT was simulated using a 4-inch by 1-inch wooden dowel with metal washers attached to the ends.

Other testing work carried out at the GPO included that of testing two different Schonstedt metal detectors. Those results are documented in the following table.

Item	Depth (ft.)	Orientation	GA-72Cv	GA-52Cx
2.36 inch Rocket	4.4	Horizontal	No	No
2.36 inch Rocket	2.9	Vertical	No	Yes
2.36 inch Rocket	3.2	Horizontal	No	Yes
2.36 inch Rocket	3.6	Vertical	No	Yes
Grenade Fuze	1.1	Vertical	No	Yes
Grenade Fuze	2.0	Vertical	No	No
Grenade Fuze	1.5	Horizontal	No	No
Grenade Fuze	2.5	Horizontal	No	No
TNT Simulation*	3.1	Horizontal	No	No
TNT Simulation*	4.0	Horizontal	No	No
TNT Simulation*	3.4	Vertical	No	No
TNT Simulation*	2.0	Vertical	No	Yes
Smoke Grenade	2.0	Vertical	No	No
Smoke Grenade	2.1	Horizontal	No	No
Smoke Grenade	3.0	Vertical	No	No
Smoke Grenade	2.6	Horizontal	No	No

* TNT was simulated using a 4-inch by 1-inch wooden dowel with metal washers attached to the ends.

The number of false positives in the EM data was very low compared to the number of false positives in the magnetic data. The high false positive rate in the magnetic data was attributed to

animal burrows, with signatures similar to those caused by the holes dug for the item burials. The results from the GPO plot tests supported the use of either the EM-61 standard unit or the G858 magnetometer. Both had about equal detection results over the entire test grid. It was recommended that data for either G858 or EM61 surveys be acquired over lines spaced 2.5 feet apart. This line spacing would increase the probability of detecting the smaller items. Given the higher false positive rates of the G-858, the decision was made to use the EM-61 for the production work at the site. Parsons carried out 100% coverage of the 70.5 acres that make up MRS-34. The data was collected on transect lines spaced 2.5 feet apart, located on grids that measured 100 feet by 100 feet. The data was collected with the Geonics Model EM-61 metal detector.

To ensure the most complete investigation possible, anomaly selections were made by selecting every geophysical response that exceeded the background/instrument noise threshold. This very conservative approach yields the maximum amount of metallic items detected, but at the cost of an elevated number of false positive (i.e., "nothing found" results).

A total of 655 anomalies were identified during the data interpretation phase of the project, and all the anomalies were investigated. An additional anomaly, located 15 feet outside the MRS-34 perimeter, was discovered while a temporary fence was being erected at that location. This anomaly was investigated and was found to be caused by a MK23 practice bomb. Of the 656 anomalies, 26 were MD items while the rest were false positives (209), QA seed items (15), non-ordnance items (390), or for which no ferrous basis for the anomaly could be identified (16). No MEC were discovered. All the items found were classified as munitions debris or small arms (4 shotgun shells) (USA, 2000).

3.5.2.3.2 Equipment

A description of the Geonics Model EM61 that was used for during this portion of the investigation is provided in Section 3.5.2.2.2. For a portion of the work, the EM61 was coupled with a real time kinematic GPS mounted on top of the instrument. The GPS provided positional information that was later merged with the geophysical data, providing horizontal coordinates for each data point. For the rest of the work, the data was collected in "wheel mode", whereby an odometer on one of the wheels triggers a measurement with each turn of the wheel. Positions

were calculated using fiducial techniques whereby digital "markers" were inserted into the dataset by the operator at known points (no more than 100 feet apart). The collected geophysical data was then interpolated between the known points and coordinates assigned to each data point.

The original plan was to use GPS in conjunction with the EM61 for the entire DGM program. However, logistical problems (uneven ground surface causing tipping problems when the GPS was attached to the EM61) and interference with the EM61's top coil (caused by metal within the GPS) led to the use of fiducial techniques for the assignment of coordinates to each geophysical data point. The detection capability of the EM61 is included in Section 3.5.2.3.1 discussion of the GPO performance testing conducted at MRS-34. The EM61 was also evaluated during the ODDS (Parsons, 2002). Although site conditions at MRS-34 are not identical to those of the ODDS location, results of the testing were consistent with those of the GPO, and further support the results obtained during the site-specific GPO.

3.5.2.3.3 Quality Control /Quality Assurance

QC of the geophysical program was carried out by Parsons on a daily basis and included:

- Calibrating GPS equipment by comparing the observed coordinates to known coordinates at a survey control point. These results were well within survey specifications.
- Observing the response of the EM61 over a known standard (metal tent stake) at least twice daily. The acceptance criterion was that the observed response had to be within 20% of the known response. This objective was met.
- Re-mapping and re-interpretation of a significant part of the site (100% of 16 grids, 30% of 3 grids, 20% of 3 grids and 10% of the remaining grids). This QC effort did not result in the discovery of any new anomalies.
- Inspection of the geophysical datasets, looking for unusual data spikes, abnormal fluctuations in background noise levels and inadequate mapping coverage (data gaps).

QC evaluation by Parsons also found variance up to 1 foot in the precision of the pre-existing grid corners. These inaccuracies led to increased error (up to 1 foot of additional error) in the positions assigned to data points and anomaly selections after the conversion from grid coordinates to state plane coordinates. Given the use of metal detectors during the anomaly

reacquisition process (pinpointing the location of metallic items), the positional inaccuracies were not significant enough to cause any anomalies to go uninvestigated.

QC steps taken by USA included:

- Checking the geophysical data for completeness and accuracy.
- Checking each anomaly excavation to ensure that proper techniques had been used and that the anomalies had been resolved.

QA steps taken by the government included:

Inspection of collected geophysical data, with emphasis on looking for incomplete DGM coverage, unreasonable data spikes, and improper transect locations.

- Verification of proper file naming and other data management processes, including timely submission of data to the government.
- Inspection of data interpretation results, looking for improper or incomplete anomaly selection.
- Inspection of post-excavation results, including complete documentation.
- Blind seeding: 12 items were buried within MRS-34. Nine of the twelve items were discovered during the project work. Two of the remaining three items were determined to be undetectable within the datasets recorded during the DGM effort. The final item had been identified as a weak anomaly by Parsons, but it was not discovered by the dig team.
- Independent surveying: Several grids were independently surveyed by the government, using an EM61. No new anomalies were identified.

3.5.3 Data Management

This section describes QC/QA related to data management performed on the removal data associated with MRS-34. It also describes limitations associated with the presentation and analysis of the data.

Parsons performed a 100 percent QC review of the MEC data associated with MRS-34. This review followed the guidelines presented in the Quality Control Review Procedures for *OE Data Collected Under Previous Contracts* prepared by Parsons. This evaluation included a review of the field grid records and the former Fort Ord Munitions Response database. The USACE implemented QA review of ten percent of the data reviewed by Parsons. The QA review included a comparison of the data set reported in the AARs. The requirements of the USACE QA review are described in the MMRP Database User's Manual (USACE, 2004b). The purpose of the QC data review was to complete a 100 percent check of all available grid records to

identify discrepancies between the AARs and the grid record, if any. Discrepancies were then researched and corrections made, if appropriate, prior to loading the data into the project database. Based on this QC/QA effort, differences between items reported in the database and in the AARs may occur. Differences could include revisions to specific munitions model numbers or changes to status of items as MEC or MD.

In addition to the QC/QA effort conducted on the data, limitations to the UXB data have been identified related to limited collection of site specific information during the removal action. Current data collection methods require collection of depth and location information for MEC identified during removal actions; however, collection of this data was not required during the time period of the UXB removal. Because this information was not collected, all items removed by UXB were assigned a depth of zero in the database. Assigning a depth of zero was considered conservative because items found on the surface represent a higher risk to potential receptors. Because location information was not collected, all items found within a grid were assigned a location of the grid centroid for mapping purposes. This results in the appearance that all items within a particular grid were found at a single location within a grid. A note that the locations of items are represented by the grid centroid is provided on the figures.

It should also be noted that the MMRP Database includes data for survey grids in the southeastern portion of the site that were not included in figures presented in the 1995 UXB report of site investigations, but were subjected to the same investigation procedures and evaluation criteria as the remaining site grids even though no MEC or MD were found. These additional grids (6X through 11X) have been included in site figures for this RI report for completeness.

3.5.4 Data Evaluation/Data Usability Summary

Evaluation of data for the purposes of this report included assessments of the data acquisition methods, the applicability of the methods used and limitations of the instruments used to support the removal action decisions made. These assessments did not include a comprehensive re-evaluation of the acquired data, but rather an assessment whether the previous evaluations included appropriate integration of project quality criteria to support the conclusions made.

Review of the data indicates that the instruments used during sampling and removal actions are capable of detecting the types of munitions items potentially present. Coordinate data were collected for MEC and MD items found at the site, except for some of the items found during the 1994 removal action. Information concerning depth of found items was not collected by UXB in 1994, and corresponding locations of MEC items are listed in the database at the center of the grid in which they were found.

Although data collection and management procedures employed during some of the previous MEC sampling and removal efforts performed at MRS-34 were less rigorous than requirements in place today, the quantity and quality of the available information is sufficient to make an informed decision regarding the site, and the sampling and removal data are sufficient to confirm the types of military munitions used at the site. Based on the results of the evaluation, these data were then used for completion of the Risk Assessment summarized in Section 4.0 and Appendix B.

3.6 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations for the site based on the review and analysis of the historical data and MEC removal data.

3.6.1 Conclusions

3.6.1.1 Site Use and Development

Based on the results of the literature review, site investigations, and munitions removal actions, the site appears to have been used for AT training and practice rifle grenade training, which included firing of shoulder-launched projectiles including practice rifle grenades and 2.36-inch rockets that occurred in the 1940s and possibly into the 1950s. Expended hand-launched smoke grenades and small arms debris also were identified, indicating that training activity for those items also occurred at the site. The site currently remains undeveloped, with multiple reuses planned.

Site boundaries were identified during the 1994 removal action based on field observations and geophysical data regarding the relative density and distribution of MD at the site. Subsequent

removal actions identified additional MD, but no additional field or historical data has been identified that indicates the historical area of use associated with MRS-34 extended outside the current site boundaries, or that any modification of site boundaries is needed.

3.6.1.2 Removal Adequacy

Subsurface MEC investigations were performed twice throughout MRS-34, utilizing multiple detection technologies. All anomalies were investigated or resolved, and all detected MEC items were removed or destroyed. Appropriately detailed QC and QA procedures were included as part of the investigation objectives to provide a high level of confidence that potential hazards were addressed.

- Initial MEC removal action in 1994 addressed the majority of the MRS-34 site footprint. Grid records were not located for small sections within the MRS-34 boundary established in the EE/CA.
- Digital geophysical surveys and subsequent MEC removal using the cart-mounted EM61 geophysical instrument were completed in the site, excluding a small section at the southeastern end of the site.
- The Geonics EM61 is capable of detecting both ferrous and non-ferrous metallic objects while being less sensitive to cultural features such as fences, buildings, and power lines than other geophysical instruments.
- The Schonstedt Model GA-52Cx, Geonics EM61, and Geometrics G-858 were evaluated as part of a Geophysical Survey Quality Assurance Technical Analysis and also as part of MEC investigations. The results of the evaluation indicate that the instruments are capable of detecting the types of MEC potentially present at the site. The 1999 AAR also stated that based on the QA analysis the data quality criteria for the investigation were achieved for the whole site.
- Between the 1994 UXB and 1999 USA/Parsons work, the entire footprint of MRS-34 was investigated at least once, except for two small portions of the site (adjacent to UXB Grids 5W and 14O). No MEC items were located in the vicinity of the eastern boundary. Based on the locations of these grids, and distribution of MEC and MD throughout the site, MEC is not expected to be present in these portions.

Review of the above data has resulted in the determination that the data is usable for conducting a Risk Assessment.

3.6.2 Recommendations

Reviews of the available literature, removal results, and equipment performance results indicate that the MRS-34 geophysical investigation successfully detected, excavated, and recovered MEC items and that the potential safety hazard has been removed. However, it is possible, although unlikely, that MEC could remain at the site. Therefore, it is appropriate to complete a RA for the site (Presented in Appendix B and summarized in Section 4.0).

4.0 RISK ASSESSMENT

This section presents a summary of the RA performed for MRS-34 based on the previous MEC removal activities and current potential exposure risks. A more detailed description of the risk assessment methods and results is presented in Appendix B.

The RA is based on the potential reuse of the site and the nature of the activities that would lead to a potential exposure. The nature of these types of risk assessments is largely qualitative, in part because of the inherent uncertainty associated with the potential presence of MEC (i.e., the inability to verify with certainty that all MEC have been removed). The established method for evaluating potential risk at former Fort Ord sites, given this inherent uncertainty, is to use the Risk Assessment Protocol (Protocol) developed by Malcolm Pirnie, the Army, DTSC, and EPA (Malcolm Pirnie, 2002). The Protocol provides a qualitative evaluation of the risk related to a potential receptor upon encountering MEC.

Unlike typical RAs that evaluate potential exposures to hazardous substances in environmental media, the Protocol does not calculate a numerical probability of adverse effects or a hazard index. Rather, it relies on an a priori assumption that any encounter with MEC will result in an adverse effect, and provides a qualitative description of the potential risk based on the likelihood of encountering a MEC item combined with the potential of the item to cause a serious injury if detonated. The output of the RA consists of an overall MEC Risk Score, designated by the letters A through E, with A representing the lowest potential risk and E representing the highest potential risk. The results of the evaluation are used for a comparative evaluation of various remedial alternatives.

Proposed Reuse

The City of Marina has proposed reuse of the Marina Municipal Airport area to include development of a resort hotel and golf course, a business park, airport support, and related infrastructure modifications. A small portion of the proposed development involves the MRS-34 site. The Army's FOSET (Army, 2000) indicated that the property is suitable for the uses described above. The EROA states that the following uses also are allowed, provided that they

do not include private landscaping or unsurfaced yard areas: timeshare and vacation club rooms, spa, health, athletic and related facilities, commercial recreation, employee recreation facilities, day care facilities and nurseries, caretaker units, and airport loft living units.

Potential Receptors

Based on the proposed reuses described above for MRS-34, the following receptors were identified for evaluation in the risk assessment:

- Recreational user (golfer, hotel guest);
- Indoor worker (office and hotel staff);
- Residential user (adult or child);
- Outdoor maintenance worker (landscaping, golf course maintenance); and
- Construction worker (heavy equipment operator).

Summary of Risk Assessment Results

The post-removal (current) risks for all receptors identified for MRS-34 are at the lowest risk level (Level A). Although the risk scores are at the lowest level, uncertainties are associated with MEC removal and geophysical instrument detection efficiencies are not expected to be 100 percent. Therefore, based on the possibility that MEC may remain below the surface at the site, it is also possible that an intruding receptor (i.e., the outdoor maintenance worker and construction worker) could encounter a MEC item. However, the potential that MEC will be encountered in the future is highly unlikely.

5.0 CONCLUSIONS

As described above, subsurface MEC investigations were performed twice throughout MRS-34, using multiple detection technologies. All anomalies were investigated or resolved and MEC and MD detected were removed or destroyed. Therefore, MEC are not expected to be present at the site. The RA found potential risk to subsequent site users from MEC is at the lowest risk level, and primarily limited to those involved with subsurface intrusive activity.

According to CERCLA guidance (EPA, 1988), the results of the RA should help establish acceptable remediation levels for use in developing remedial alternatives; however, all detected MEC/MD have already been removed and the lowest risk levels for the site have already been achieved as indicated by the RA results. Therefore, all reasonable remedial criteria for the site have already been achieved. On the basis of the RI and RA as presented in this document, no actionable risk was identified regarding current conditions at the site, therefore no further action is recommended.

The planned reuse of the underlying parcel L5.1.1 is development, therefore, digging and intrusive activities may occur in the future. No actionable risk was identified through the RI process; however, in the interest of safety, reasonable and prudent precautions should be taken when conducting intrusive operations in this area. As a basewide effort to promote safety and because of Fort Ord's history as a military base, the Army provides "MEC recognition and safety training" to anyone who requests that training. Construction personnel involved in intrusive operations at the former Fort Ord are encouraged to attend the Army's "MEC recognition and safety training" to increase their awareness of and ability to identify MEC items. Construction personnel will contact an appropriate local law enforcement agency if a potential MEC item is encountered. The local law enforcement agency will arrange a response by the Army. It should be noted the City of Marina in consideration of former site use and the potential for encountering MEC at the site, adopted an ordinance (City Ordinance 98-04, Municipal Code Chapter 15.56) regarding construction activity in the area that requires acquisition of permits that specifically address appropriate precautionary measures and notifications.

6.0 APPROVAL PROCESS

The approval process for the MRS-34 RI includes the following elements:

- Preparation of the RI report with regulatory agency and public review of the Draft and Draft Final reports.
- Preparation of a Proposed Plan that presents the Army's preferred alternative for the site and summarizes the results of the RI and RA.
- Solicitation for public comments on the Proposed Plan during a 30-day review period.
- Provide an opportunity for a public meeting on the Proposed Plan where written and verbal comments can be submitted.
- Preparation of the Record of Decision (ROD) that (1) summarizes the results of the RI and RA, (2) includes a Responsiveness Summary that summarizes any public comments received on the Proposed Plan, and Army responses to comments, and (3) specifies the details of the selected remedy.
- Receive EPA approval of the ROD, and review by DTSC.
- Announcement of the decision regarding the remedy selection in a local major newspaper and placement of copies of the RI, Proposed Plan, and ROD in the Administrative Record and local information repositories.

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FIGURES

Note:
Background map from Microsoft® Bing™, 2011.

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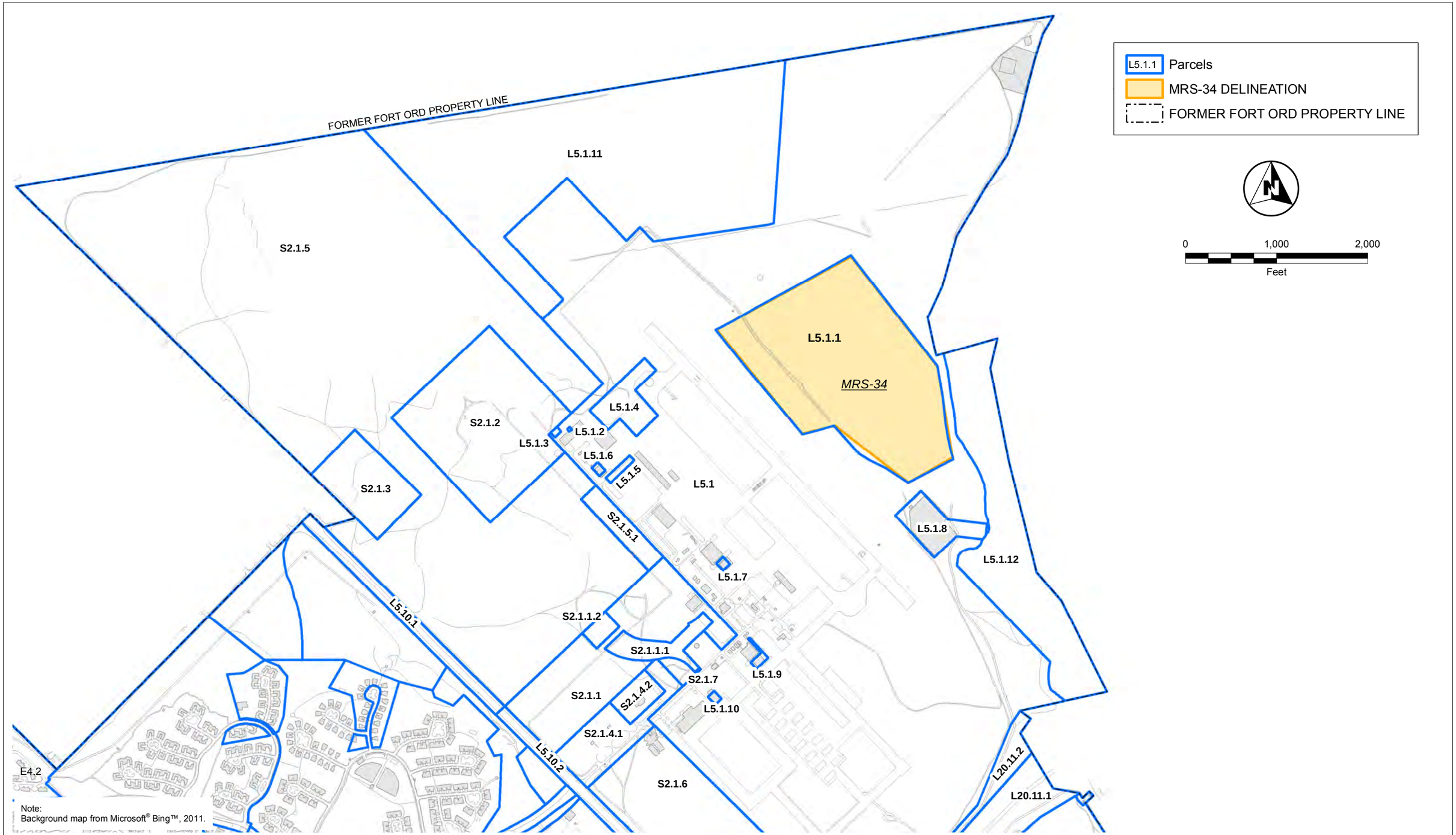
N

MRS-34 FORMER FRITZSCHE ARMY AIRFIELD
FORMER FORT ORD
USACE - SACRAMENTO DISTRICT
MONTEREY COUNTY, CALIFORNIA

0 1,000 2,000 3,000 4,000
Feet

FIGURE 1-1
SITE LOCATION

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Fritzsche_MEC34\Risk_Assessment\Figure_1_1_MRS-34_Location.mxd 4/3/2012 [12:06 PM] LCARR, ITSI



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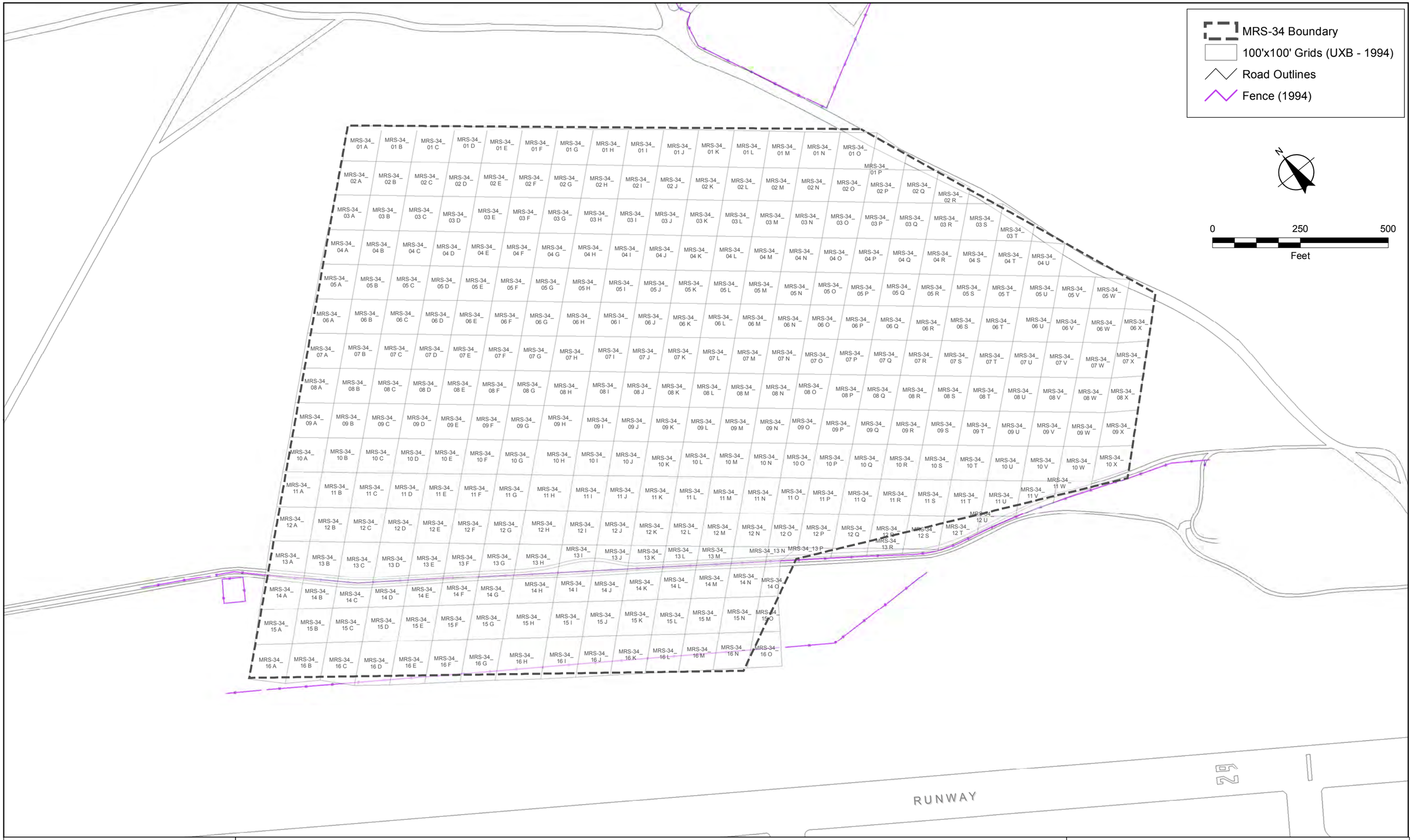
MRS-34 FORMER FRITZSCHE ARMY AIRFIELD
FORMER FORT ORD
USACE - SACRAMENTO DISTRICT
MONTEREY COUNTY, CALIFORNIA

FIGURE 1-2
PARCELS

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Fritzsche_MEC34\Risk_Assessment\Figure_1_2_MRS-34_Parcels.mxd 3/2/2012 [11:51 AM] LCARR, ITSI



ITSI Gilbane

MRS-34 / FORMER FRITZSCHE ARMY AIRFIELD
FORMER FORT ORD
USACE - SACRAMENTO DISTRICT
MONTEREY COUNTY, CALIFORNIA

FIGURE 3-1
SITE OVERVIEW

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Fritzsche_MEC34\RI\Map_Docs\Final\Figure_1_3_Site_Overview.mxd 7/16/2012 [14:51 PM] LCARR, ITSI

Munitions Items Removed (1994, 1999)

Munitions and Explosives of Concern (MEC)

Munitions Debris (MD)

The MEC and MD items presented on this figure were created from a comprehensive data output from the MMRP database accessed through the FODIS web site on March 8, 2012. This data set is also the same data presented in Appendix C. http://fodis.net

100' x 100' Grid (UXB - 1994)

MRS-34 (70.5 Acres)

Notes:
1) Point locations are based on the coordinate of the centroid of the grid the item was found in.
2) Some single location points represent multiple munitions items. (Items found in the same grid were assigned the same XY coordinates).

N

200 0 200

Feet

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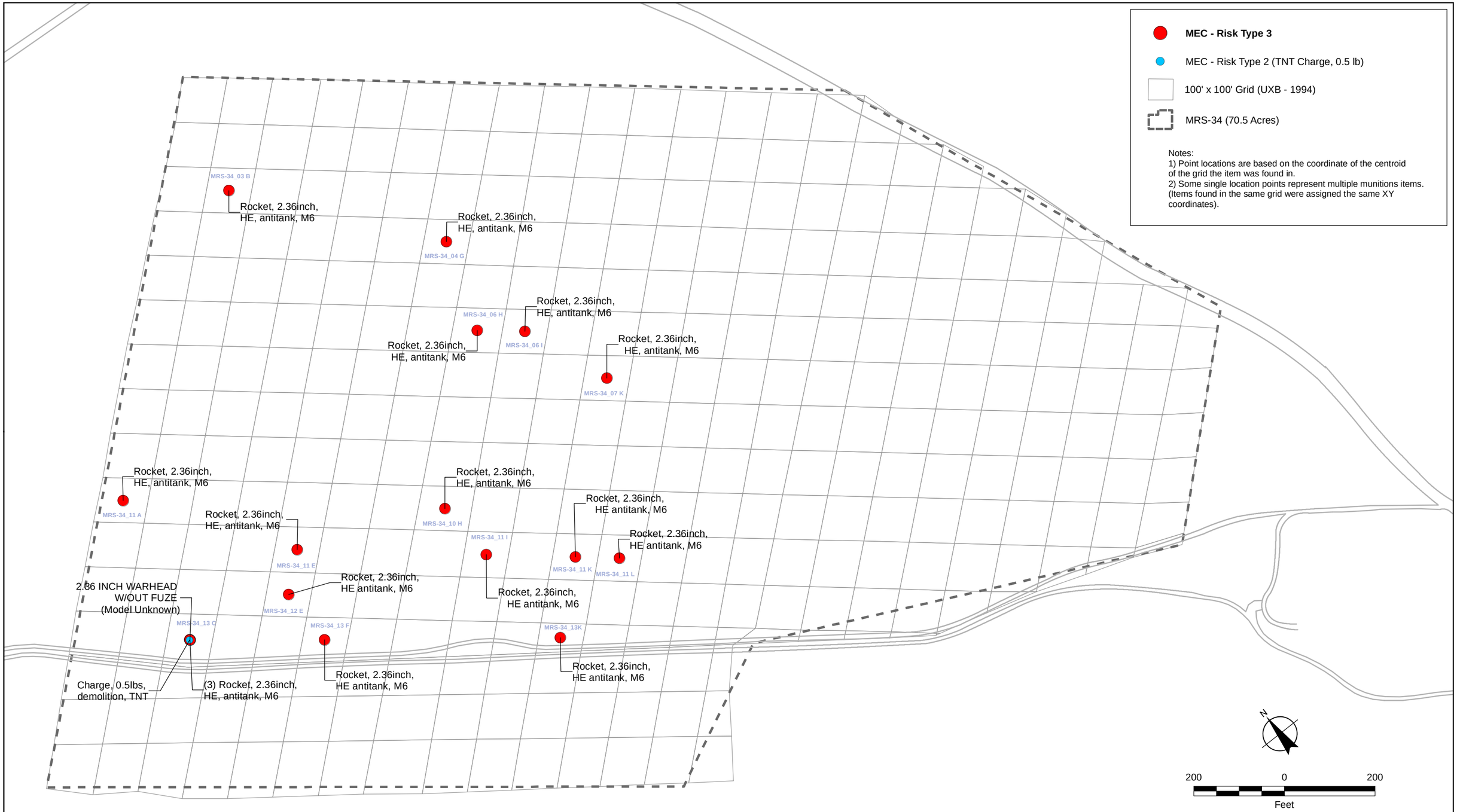
MONTEREY COUNTY, CALIFORNIA

FIGURE 3-2

MEC / MD ITEMS RECOVERED

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Fritzsche_MEC34\RI\Map_Docs\Draft_Final\Figure_3_2_MRS_34_OE_All.mxd 7/30/2012 [22:31 PM] LCARR, ITSI



ITSI Gilbane

MRS-34 / FORMER FRITZSCHE ARMY AIRFIELD
FORMER FORT ORD
USACE - SACRAMENTO DISTRICT
MONTEREY COUNTY, CALIFORNIA

FIGURE 3-3

MEC ITEMS RECOVERED

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APPENDIX A

EVALUATION OF PREVIOUS WORK CHECKLIST

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34, Fritzsche Army Airfield
EVALUATION CHECKLIST PART 1: LITERATURE REVIEW

TYPE OF TRAINING AND MEC EXPECTED

	Yes	No	Inconclusive
1. ***Is there evidence that the site was used as an impact area (i.e., fired military munitions such as mortars, projectiles, rifle grenades or other launched ordnance)?***	Yes		

Sources reviewed and comments
A 1946 Master Plan map identified a bazooka and rifle grenade range at the location of MRS-34. During removal actions in MRS-34 evidence of impact areas for MEC (possible M6 2.36-inch rockets) and MD (M7 2.36-inch practice rockets and M11 practice grenades and M22 rifle-launched smoke grenades) were identified.

References
USAEDH, 1997; USA, 2000; UXB, 1995.

	Yes	No	Inconclusive
2. ***Is there historical evidence that training involved use of High Explosive (HE) or Low Explosive (LE) items?***	Yes		

Sources reviewed and comments

Items found at MRS-34 included M6 2.36-inch anti-tank rockets (MEC), which are HE items, although documentation indicates that these may have been incorrectly identified M7 practice rockets (MD).

References
USAEDH, 1997; UXB, 1995; USA, 2000

	Yes	No	Inconclusive
3. ***Is there historical evidence that training involved use of pyrotechnic and/or smoke producing items (e.g., simulators, flares, smoke grenades) but not explosives?***			Inconclusive

Sources reviewed and comments
Pyrotechnic and smoke producing items appear to have been used at MRS-34 in addition to HE items.

References
USAEDH, 1997;UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34, Fritzsche Army Airfield
EVALUATION CHECKLIST PART 1: LITERATURE REVIEW

	Yes	No	Inconclusive

DEVELOPMENT AND USE OF THE SURROUNDING AREA

4. Does subsequent development or use of the area indicate that military munitions would have been used at the site?			Inconclusive

Sources reviewed and comments
The area encompassing MRS-34 has not been developed.

References
USAEDH, 1997; ITSI Gilbane site reconnaissance 2011.

5. Does use of area surrounding the site indicate that military munitions would have been used at the site?			Inconclusive

Sources reviewed and comments

No other military munitions firing ranges appear to have been used in the site vicinity. A 1956 map indicates the presence of a Ranging Area, which is typically associated with small arms rifle training, and maps from 1957 until base closure indicate that the entire area was used for driver training until at least 1962 upon completion of the airfield.

References

USAEDH, 1997; Aerial photograph 1941.

ESTABLISHMENT OF SITE BOUNDARIES

6. Is there evidence of training areas on aerial photographs that could be used to establish boundaries?		No	

Sources reviewed and comments

Review of aerial photographs from the 1940s and 1950s do not show significant evidence of range use sufficient to establish range boundaries.

References
Aerial photographs dated 7/25/1941; 8/17/1949; 5/14/1956; 11/4/1988, and 7/6/1992

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34, Fritzsche Army Airfield
EVALUATION CHECKLIST PART 1: LITERATURE REVIEW

	Yes	No	Inconclusive
7. *Is there evidence of training on historical training maps that could be used to establish boundaries?*	Yes		

Sources reviewed and comments

A 1946 Fort Ord Master Plan Map shows the approximate area of the MRS-34 practice rocket range. The map and field surveys were used to establish the range boundaries.

References

USAEDH, 1997;

8. *Should current boundaries be revised?*		No	

Sources reviewed and comments
The site boundaries are primarily based on field determination of boundaries based on the presence and distribution of munitions debris. Therefore, no changes to the boundaries are suggested.

References
USAEDH, 1997; UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34, Fritzsche Army Airfield
EVALUATION CHECKLIST PART 1: LITERATURE REVIEW

RESULTS OF LITERATURE EVALUATION

	Yes	No	Inconclusive
Does the literature review provide sufficient evidence to warrant further investigation?	Yes		

Comments
Based on the types of weapons used for training at the site as indicated by the 1946 map additional investigation was warranted.

References
USAEDH, 1997. Revised Archives Search Report, Former Fort Ord, California, Monterey County, California. Prepared by US Army Corps of Engineers St. Louis District. HLA#33006

USA Environmental, Inc., (USA) 2000. Final After Action Report, Geophysical Sampling, Investigation and Removal, Inland Range Contract, Former Fort Ord, California, Site OE-34 (FAAF).

Army, 1991. Training, Fort Ord Range/Training Area Operating Procedures and Usage Guide. June 20.

Army, 1945. Training Facilities, Fort Ord and Vicinity, California. Revise August 1945.

Training Areas That Cannot Be Used at The Same Time, Circa 1954. (HR 00035) LR03.

Fort Ord Training Areas and Facilities, December 20, 1956. LR08

Army, 1957. Map of Fort Ord Training Areas & Facilities. Revised July 15.

Army, 1958. Map of Fort Ord Training Areas & Facilities. Revised January 10.

Basic Information Ranges & Training Facilities, December 31, 1958.

Basic Information Ranges & Training Facilities, Revised December 31, 1961

Field training Areas and range Map, April 27, 1964 (HR_lit0007) LR07.

Army, 1967. Back Country Roads, Field Training Area and Range Map. January.

Ranges And Training Area Overlay, Revised July 15, 1976

Ranges And Training Area Overlay, Revised January 1978

Ranges And Training Area Overlay, Revised June 1, 1981

Ranges And Training Area Overlay, Revised April 1, 1982

Ranges And Training Area Overlay, Revised November 15, 1987

UXB International, 1995. Final Report for Ordnance and Explosives Removal Action, Fort Ord, California, Fritzsche Army Airfield (FAAF).

Note: Checklist questions have been updated to reflect current Department of Defense military munitions terminology.

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

HISTORICAL INFORMATION

	Yes	No	Inconclusive
1. Is there evidence that the site was used as an impact area (i.e., fired military munitions such as mortars, projectiles, rifle grenades or other launched ordnance)?	Yes		

Sources reviewed and comments

Practice rifle grenades (MD), smoke grenades (MD), 23 suspected HE 2.36-inch rocket components (suspected MEC), and 5 TNT demolition charges (MEC) were reported in the UXB AAR (1995) that are now updated in the MMRP database as 21 rockets and 1 demolition charge.

References

USA, 2000; Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995

2. *Is there evidence that training involved use of explosive items?*	Yes		

Sources reviewed and comments

21 components of suspected M6 anti-tank 2.36-inch rockets (suspected MEC) were found within MRS-34. These may have been incorrectly identified M7 practice rockets (MD). If M6, these are high explosive items (MEC); evidence suggested that they had been fired.

References

USA, 2000; Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995

3. *Is there evidence that training involved use of pyrotechnic and/or smoke producing items (e.g., simulators, flares, smoke grenades) but not explosives?*	Yes		

Sources reviewed and comments

Evidence of smoke-producing or pyrotechnic items was found within MRS-34 including hand-launched and rifle-launched smoke grenades (MD).

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive

References
Fort Ord Military Munitions Response Program Database
(USACE, 2012); UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

REMOVAL RESULTS

	Yes	No	Inconclusive
4. *Was removal performed within the appropriate area?*	Yes		

Sources reviewed and comments

The removal actions were performed within identified site boundaries. Review of 1994 UXB and 2000 USA removal action information for MRS-34 indicate that the removal was performed in the appropriate area.

References
USA, 2000; UXB, 1995

	Yes	No	Inconclusive
5. *Were the type(s) of items found consistent with the type of training identified for the site?*	Yes		

Sources reviewed and comments

The items found within MRS-34 were consistent with the types of training identified on the historical Fort Ord Master Plan map with the exception of suspected M6 HE rockets (suspected MEC), hand-deployed smoke grenades (MD) and demolition charges (MEC).

References
Fort Ord Military Munitions Response Program Database (USACE, 2012) and Fort Ord training facilities maps, 1946 Fort Ord Master Plan Map; UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
6. *Were the type(s) of items found consistent with the era(s) in which training was identified?*	Yes		

Sources reviewed and comments
Items found were consistent with training in this area occurring from the 1940s through the 1950s

References
Fort Ord Military Munitions Response Program Database (USACE 2012), various Fort Ord Training maps

7. *Was HE fragmentation found?*	Yes		

Sources reviewed and comments
Fragments and components of 2.36-inch rockets and rocket motors suspected to be M6 models (MEC), but may have been M7 models (MD), were found within MRS-34.

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

8. *Was HE found?*	Yes		

Sources reviewed and comments
21 suspected M6 2.36-inch rockets/rocket components (MEC) were found in MRS-34. These may have been M7 practice models (MD).

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

9. *Was LE found?*		No	

Sources reviewed and comments
LE items were not found within the MRS-34.

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
10. *Were pyrotechnics found?*	Yes		

Sources reviewed and comments
Pyrotechnic items found within MRS-34 include M-17 and M125 illumination flares (MD).

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

	Yes	No	Inconclusive
11. *Were smoke producing items found?*	Yes		

Sources reviewed and comments
Smoke producing items including rifle-launched and hand-deployed smoke grenades MD) were found within MRS-34.

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

	Yes	No	Inconclusive
12. *Were explosive items found (e.g. rocket motors with explosive components, fuzes with explosive components)?*	Yes		

Sources reviewed and comments
Explosive items including suspected M6 2.36-inch rockets (suspected MEC) and grenade fuzes (MD) were found within MRS-34.

References
Fort Ord Military Munitions Response Program Database (USACE, 2012); UXB, 1995; USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
13. *Do items found in the area indicate training would have included use of training items with other energetic components?*	Yes		

Sources reviewed and comments

Items found indicate that training using practice grenades and smoke items may have occurred within MRS-34.

References

Fort Ord Military Munitions Response Program Database (USACE, 2012)

14. *Were items found in a localized area (possibly the remnants of a cleanup action)?*	Yes		

Sources reviewed and comments

Suspected MEC rockets were found primarily in the western portion of the site.

References

Fort Ord Military Munitions Response Program Database (USACE, 2012,) USA, 2000; UXB, 1995

SITE INVESTIGATION DESIGN

15. Was *the site divided into subareas to focus on areas of common usage, similar topography and vegetation, and/other unique site features?*		No	

Sources reviewed and comments

The site was not divided into sectors based on site usage or site features. Distinct site features indicating former use were largely absent. The approximate site boundaries were identified based on the 1946 Fort Ord Master Plan Map. The apparent range boundaries were established based on site surveys and the distribution of range debris.

References

USA 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
16. Should the site be divided into subareas based on the above features?		No	

Sources reviewed and comments
The removal action was designed to clear the entire site as distinct site features or use areas were not apparent.

References
Ford Ord Military Munitions Response Program Database (USACE, 2012)

17. *Should current site boundaries be revised based on sampling results?*		No	

Sources reviewed and comments

Current site boundaries are based on existing parcel boundaries and were appropriately established according to the distribution of munitions debris encountered at the site. There is no data to indicate that the boundary should not be modified.

References
USA, 2000; UXB, 1995

EQUIPMENT REVIEW

18. *Was equipment used capable of detecting items suspected at the site at the maximum expected depth?*	Yes		

Sources reviewed and comments

The types of items that might be expected at MRS-34 are detectable using the Schonstedt 52Cx, G858, and the EM-61 at the expected penetration depths, as indicated by results of test plot use at the site and testing during the ODDS. However, 100-percent detection certainty is not achievable.

References
USAESCH, 1997; UXB, 1995; Parsons 2001; USA 2000.

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
19. ***Was equipment used capable of detecting the types of items (e.g., non-ferrous) suspected at the site?***	Yes		

Sources reviewed and comments

The types of items that might be expected at MRS-34 are detectable using the Schonstedt 52Cx, G858, and the EM-61 based on the results of the ODDS; however, detection capabilities below begin to decrease at a depth of about 12 inches. Quality control criteria associated with all instruments was met. However, detection cannot be assured with 100 percent certainty.

References
USAEDH, 1997; UXB, 1995; USA, 2000

	Yes	No	Inconclusive
20. ***Do the results of the ODDS indicate that items suspected at the site would have been detected by the instrument used at the time of investigation?***			Inconclusive

Sources reviewed and comments
The results of the ODDS seeded test indicate that the items suspected at the site, (practice rifle grenades, practice smoke grenades, 2.36-inch rockets) and used in the ODDS study were detectable in the top 6 inches using a Schonstedt 52CX; however, the detection rates decrease between 6 inches and 1 foot bgs and to zero for some items below 2 feet, although a atudy of projectile penetration indicated that expected penetration depths for rifle grenades is typically less than 0.2 feet and less than 0.8 feet for rockets. The ODDS seeded test indicated that the suspected items were detectable using the EM61 and G-858 instruments; however, several of the seeded items were indistinguishable from the background "noise" due to their locations. Testing performed onsite at the time the work was performed indicated that detectability was acceptable. The technical analysis provided in the After Action Report concluded that the work completed met the objectives of the work plan and the potential safety hazards had been removed.

References
Parsons, 2001; USAESCH, 1997, USADEH, 1997, USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
21. *Do results of the investigation indicate that suspected items could be detected with a high level of confidence at observed and expected depth ranges?*	Yes		

Sources reviewed and comments

Results of the ODDS suggest that the equipment used should be able to detect ferrous MEC to a depth of 2 feet bgs, which is greater than the typical penetration depth of the expected items.

References
USA, 2000; UXB, 1995

	Yes	No	Inconclusive
22. *Were all the instruments used to evaluate the site maintained and calibrated in accordance with associated work plan and manufacturer's specifications?*	Yes		

Sources reviewed and comments
According to USA, 2000 and UXB, 1995 work was completed in accordance with the approved Work plans.

References
USA 2000; UXB, 1995

DATA PROCESSING AND DATA MANAGEMENT

	Yes	No	Inconclusive
23. *Was the appropriate data processing scheme used for the site, and how was the data processed?*	Yes		

Sources reviewed and comments
All EM61 and G858 data were processed according to the approved work plan for the site.

References
USA, 2000

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive
24. *Has the field data been collected and managed in accordance with quality control standards established for the project?*	Yes		

Sources reviewed and comments

The data was collected and maintained according to the Project work plans and QA/QC procedures as documented in the UXB After Action Report and the USA After Action Report.

References
USA 2000; UXB, 1995

RESULTS OF REMOVAL EVALUATION

A. *Can the data be used to perform a risk assessment?*	Yes		

Comments

Review of the available data indicates that the data can be used for performance of the risk assessment.

B. *Can the data be used to perform a feasibility study?*	Yes		

Comments

Review of available data indicates that the data can be used to prepare the feasibility study.

References
USAEDH, 1997. Revised Archives Search Report, Former Fort Ord, California, Monterey California. Prepared by US Army Corps of Engineers St Louis District.
Army, 1980. Fort Ord Regulation 350-5, Appendix-B Training Area and Assignment of Training Facilities B-1, Department of the Army. September 9.
USACE, 1961. Basic Information, Training Facilities. June 30.

APPENDIX A
EVALUATION OF PREVIOUS WORK: MRS-34
EVALUATION CHECKLIST PART 2: REMOVAL CHECKLIST

	Yes	No	Inconclusive

USACE, 2012. Fort Ord Military Munitions Response Program Database.

Parsons, 2001. Draft Final Ordnance Detection And Discrimination Study, Volume I Text, Former Fort Ord, California, Presidio of Monterey, California. Prepared for US Army Corps of Engineers Sacramento District. December.
USAESCH, 1997. Penetration of Projectiles Into Earth, An Analysis of UXO Clearance Depths at Ft. Ord. September 10. Appendix F of the Phase 2 EE/CA.
USA Environmental, Inc., (USA) 2000. Final After Action Report Geophysical Sampling and Investigations, Inland Range Contract, Former Fort Ord, California, OE-34.

Note: Checklist questions have been updated to reflect current Department of Defense military munitions terminology.

APPENDIX B

RISK ASSESSMENT

APPENDIX B RISK ASSESSMENT

This appendix presents the results of the munitions and explosives of concern (MEC) risk assessment (RA) that addresses the explosive hazards associated with MEC at munitions response site (MRS)-34 adjacent to the Fritzsche Army Airfield (FAAF) at the former Fort Ord. The risks associated with chemical hazards were addressed as part of the Basewide Range Assessment, which is a component of the Hazardous and Toxic Waste (HTW) Remedial Investigation/ Feasibility Study (RI/FS) program, separate from the Munitions Response RI/FS program.

This RA focuses on the post-removal risks or risk associated with the current site conditions. This RA presents a description of the process used for preparing MEC risk assessments, summarizes the data used, describes the receptors evaluated and the inputs used to determine the Risk Scores, presents the results of the risk assessment, and provides an uncertainty analysis.

B.1 MEC Risk Assessment Process for Fort Ord

The MEC RA for the former Fort Ord provides a qualitative description of the risks of a receptor encountering a MEC item. Because the nature of these types of RA is largely qualitative, a specific protocol was developed to evaluate current and future MEC risks to humans at Fort Ord. The Fort Ord Ordnance and Explosives Risk Assessment Protocol (Protocol) (Malcolm Pirnie, 2002) was developed through the combined efforts of the Army, California Department of Toxic Substances Control (DTSC), and the U.S. Environmental Protection Agency (EPA), and allows for a comparative review of MEC risks at impacted sites.

Unlike typical RAs that evaluate potential exposures to hazardous substances in environmental media, the Protocol does not calculate a numerical probability of adverse effects or a hazard index. Rather, it relies on an *a priori* assumption that any encounter with MEC will result in an adverse effect, and provides a qualitative description of the risk based on the likelihood of encountering a MEC item combined with the potential of the item to cause a serious injury if detonated. The Army is required to conduct MEC RAs as part of the RI/FS process for MRSs at Fort Ord. The protocol is used to develop and allow for a comparative evaluation of various remedial alternatives in the FS. The output of the RAs consists of an overall MEC Risk Score, designated by the letters A through E, with A representing the lowest risk and E representing the highest risk. The scores are supported by a brief narrative describing the assumptions used in developing the input factors. A summary of the protocol and the scoring tables is provided below.

B.1.1 Data and Data Usability

The data quality assessment for MRS-34 is presented in Sections 3.5 and 3.6 of the RI. “Usable data” is defined as those data with sufficient quality for use in the decision-making process. In the case of MRS-34, the removal was conducted according to the Base Realignment and Closure (BRAC) Cleanup Team (BCT), consisting of the Army, EPA, and DTSC. The BCT approved the work plans, and all detected MEC was removed.

Selection of Dataset

The data available for performing the RA for MRS-34 included:

- Data collected during the initial MEC Removal Action (100 percent coverage) at MRS-34 (formerly known as OE-34), performed by UXB International (UXB) in 1994;
- Data collected during a digital geophysical survey conducted by UXB under contract with TechLaw, Inc. (TechLaw/UXB) as directed by the EPA in 1999;
- Data collected during a 100 percent re-survey, geophysical sampling, and investigation of MRS-34, performed by Parsons Engineering Science (Parson), under contract with USA, in late 1999-2000.

Data Usability

1994 Ordnance and Explosives Removal Action - UXB

The initial removal action performed by UXB in 1994 removed all identified MEC items at the site (Section 3.5.2.1). Quality control (QC) checks were performed on each grid after MEC detection and removal operations were complete for a given grid. UXB quality control specialists re-checked at least 10 percent of the area of each grid using their metal detectors. Following the QC check, quality assurance (QA) checks were carried out by the U.S. Army Corps of Engineers (USACE), Huntsville Division (CEHND) Safety Specialist prior to acceptance of the grid as a finished product. At the conclusion of the clearance efforts, UXB recommended, and CEHND concurred, that no further clearance operations were required at OE-34.

1999 Geophysical Survey - TechLaw/UXB TechLaw was retained by the EPA (Region 9) to aid in the oversight of the environmental cleanup and closure of Fort Ord (described in Section 3.5.2.2). As part of this activity, TechLaw hired UXB to conduct digital geophysical mapping (DGM) over selected portions of MRS-34 to check the efficacy of the cleanup work that had been performed previously. USA provided the unexploded ordnance (UXO) technicians who supported the field activities and carried out investigations of selected anomalies.

1999-2000 Geophysical Sampling and Investigations - USA/Parsons

Based on the fact that two pieces of munitions debris were discovered during the EPA's oversight work (described in Section 3.5.2.2), the decision was made to do a 100 percent re-clearance of MRS-34, using digital geophysics as the metal detection approach. The project was awarded to USA by the USACE. In turn, Parsons was subcontracted by USA to carry out the geophysical work. USA provided the UXO technicians who supported the field activities and carried out investigations of selected anomalies. QC of the geophysical program was carried out by Parsons and USA, and QA was performed by the government. As stated in the after action report: "The results of the 1999 OE digital geophysical investigation at Site OE-34 support the following recommendation: No UXO was discovered on Site OE-34 during these OE digital geophysical

survey sampling and investigation operations, and it is the evaluation of USA management personnel that efforts on Site OE-34 have been adequate to support current and planned reuse of the property." (USA, 2000).

All data collected from the previous work was subjected to a complete QA/QC review and the MMRP database was updated as described in Section 3.5.3 of the RI Report.

B.1.2 Description of Proposed Reuse and Potential Receptors

Proposed Reuse

The City of Marina has proposed reuse of the Marina Municipal Airport area to include development of a resort hotel and golf course, a business park, airport support, and related infrastructure modifications. A small portion of the proposed development involves the MRS-34 site. The Army's assessment of the site, conducted as part of the Finding of Suitability for Early Transfer (FOSET) (Army, 2000), indicated that the property could be transferred and is suitable for the intended uses for a resort hotel, golf course, business support, airport support, and related infrastructure modifications. The Environmental Response Obligation Addendum states that the following uses also are allowed provided that they do not include private landscaping or unsurfaced yard areas: timeshare and vacation club rooms, spa, health, athletic and related facilities, commercial recreation, employee recreation facilities, day care facilities and nurseries, caretaker units, and airport loft living units.

Due to the potential presence of UXO, the City of Marina (in accordance with an agreement with DTSC) has adopted an ordinance (No. 98-04) that requires permits for certain excavation activities. The ordinance requires that a person obtaining a permit inform workers of the potential for encountering UXO and describe precautions to be taken. This ordinance cannot be modified or terminated without notice to DTSC.

In accordance with California Health and Safety Code Section 25232 (1) the property is restricted from the following uses: residential, day care center for children (except day care centers that meet certain requirements to prevent contact with soil), a school for persons under 21 years of age, and a hospital for humans.

Potential Receptors

Based on the proposed reuses described above for MRS-34, the following receptors were identified for evaluation in the RA:

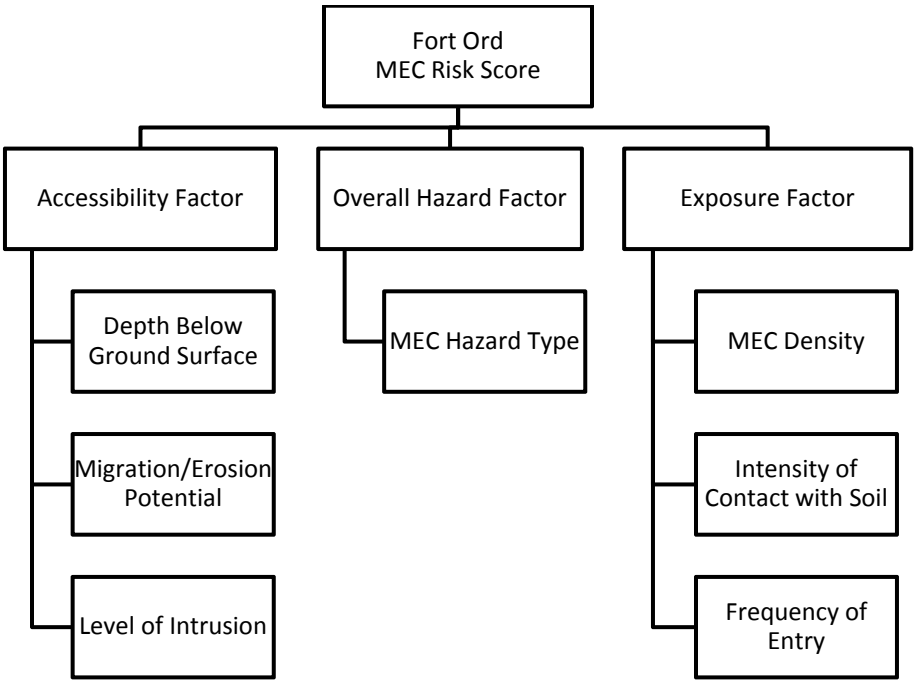
- Recreational user (golfer, hotel guest);
- Indoor worker (office and hotel staff);
- Outdoor maintenance worker (landscaping, golf course maintenance);
- Construction worker (heavy equipment operator); and
- Adult/Child Resident (full time resident).

A description of each receptor evaluated and the associated activities and exposure assumptions is presented in Table B.1.

B.1.3 Discussion of MEC Risk Assessment Protocol

As discussed above, the Fort Ord MEC Risk Assessment Protocol is a qualitative RA approach, with seven qualitative and quantitative input factors. Two matrices combine six of the input factors into scores for accessibility and exposure. A third matrix combines the scores for accessibility and exposure with overall hazard (the seventh input factor) into a qualitative score for estimating MEC risk. The seven input factors are shown below on Figure 1.

Figure 1: Fort Ord MEC Risk Assessment Protocol Process



B.1.3.1 Definition of Input Factors and Assumptions

The following paragraphs, adapted from the Fort Ord Ordnance and Explosives Risk Assessment Protocol (Malcolm Pirnie, 2002), discuss each of the input factors and matrices used to determine an overall MEC risk score.

Accessibility Factor

The accessibility factor reflects how likely it is that any MEC present at the site would be accessible to receptors. Three input factors are considered: (1) depth of MEC below ground surface (Table B.2), (2) the level, or depth, of soil intrusion by the receptor (Table B.3), and (3) migration/erosion potential, which evaluates whether the apparent depth of MEC items will

decrease over time as a consequence of soil erosion (Table B.4). A score is assigned for each factor using the established criteria, and these input factors are combined to produce an overall score for the accessibility factor using the scoring matrix presented in Table B.5.

MEC Depth Below Ground Surface

For the Baseline RA (Post-Removal), a MEC Depth Below Ground Surface Score of 1 was used for all receptors because 100 percent of the detected MEC had been removed and the detection and removal procedures met the investigation objectives outlined in the work plan (See Section B.1.1).

Level of Intrusion

The level of intrusion is dependent on the receptor. Recreational users and indoor receptors are not expected to intrude below the ground surface, resulting in use of a score of 1 for level of intrusion. The outdoor maintenance worker is assumed to intrude up to 3 feet, resulting in an intrusion score of 4. The construction worker is assumed to intrude to 5 feet, which results in an intrusion score of 5. The adult/child resident is assumed to intrude up to 1 foot also resulting in an intrusion score of 1.

Migration/Erosion Potential

This potential is estimated using the Universal Soil Loss Equation, and is assumed to be less than 3/100 inches per year for MRS-34. This is consistent with the estimates for the Del Rey Oaks and Parker Flats munitions response areas (MRAs; Malcolm Pirnie, 2005). This is a reasonable estimate for soil loss for areas of established vegetation; however, higher rates of erosion could be expected in disturbed areas such as roads and excavation areas. The migration/erosion potential score of 1 was therefore applied for this factor.

Exposure Factor

The exposure factor (Table B.10) assesses the likelihood that someone will be exposed to the MEC when in the exposure area. Three input factors are evaluated: (1) MEC density, (2) intensity of contact with soil; and (3) frequency of entry. MEC density, intensity of contact with soil, and frequency of entry are combined in an overall Exposure Factor Scoring Matrix (Table B.10) to an overall score for the exposure factor.

MEC Density

MEC density is based on the number of MEC items per acre, and is assessed to the level of intrusion for the specific receptor (Table B.6). MEC densities for the Baseline RA (Post-Removal) for MRS-34 are assigned a MEC Input Factor Score of 1 for all receptors because 100 percent of detected MEC was removed to level of intrusion and the removal action met the objectives as noted above in Section B.1.1. Table B.7 presents MEC density based on post- removal. This information was used to evaluate post-removal risk scores that could be used for comparison purposes as discussed in Section B.1.4.

Intensity of Contact with Soil

The intensity of contact with soil (Table B.8) represents an hours-per-day assessment of the receptor's contact with soil. The intensity of contact with soil is receptor dependent and was assumed to be only 0.5 hours per day for the indoor worker, 2 hours for the adult/child resident, 6 hours per day for the recreational user, and up to 8 hours per day for the outdoor maintenance worker and the construction worker.

Frequency of Entry

The frequency of entry (Table B.9) evaluates the number of entries per year, month, and week based on a person-days-per-year approach. Thus, the frequency of entry is the same if one person visits the site one day each month for a year or if 12 people visited the site for one day during the year. The exposure duration is fixed at one year for all receptors, and the number of exposures during that year is evaluated. All receptors were expected to enter the area frequently.

Overall Hazard Factor

The overall hazard factor is an assessment of the inherent hazard of the specific MEC item, and must be determined by UXO-trained personnel. The overall hazard factor relates to the MEC Hazard Classification score that considers the energetic material present in the MEC item and the functioning of the item, and assumes that all items are fuzed and portable. The scoring is based on both the likelihood that the MEC will cause an injury, and the severity of the injury. Based on the factors identified above, four scores for the MEC Hazard factor are possible and are presented in Table B.11. The scores range from 0 to 3, with 0 assigned to inert items and 3 representing the highest hazard. In August 2005, the explosive hazard risk code classifications were updated (USACE, 2005). The explosive hazard risk codes are periodically updated (e.g. code is assigned to a new munitions item); the Fort Ord MMRP database version is the most current version. This updated information was used in selecting the hazard factors used in this RA. At MRS-34, 2.36 inch M6 rockets were the only type 3 items recovered during the removal action, and a 0.5 lb. TNT charge was the only type 2 item recovered. Type 1 items recovered at the site include 2.36 inch rocket motors, and grenade fuzes. Inert items such as 2.36 inch M7 practice rockets and M11 practice rifle grenades are considered hazard type 0.

Overall MEC Risk

The overall MEC risk is determined by combining the accessibility, exposure, and overall hazard factors in a matrix (Table B.12) to yield an overall risk score designated by the letters A through E, where A represents the lowest risk, and E represents the highest risk. A narrative accompanying the letter score explains the assumptions used in estimating the risk score. It should be noted that the estimated potential risk score is a conservative estimate representing the highest potential risk level for each receptor evaluated.

Overall MEC Risk Score	A	B	C	D	E
	Lowest	Low	Medium	High	Highest

B.1.4 MEC Risk Assessment Results

This section describes the results of the current (post-removal) risk estimated for each identified receptor.

B.1.4.1 Current or Post-Removal Risks

A summary of the input factors and MEC current or post-removal risks for each receptor is presented in Table B.13. For each receptor, the risk posed by each MEC hazard type is scored separately, and the highest of the three scores is used as the overall score for the receptor. The post-removal MEC RA results for each receptor are presented in Tables B.14 through B.18. The tables present the results and a brief description of the inputs used to generate the resultant score. The post-removal result for each receptor identified for MRS-34 is an A, or lowest risk.

Although the risk is scored as an A for all receptors based on the risk protocol, it should be noted that the detection efficiency of the geophysical equipment is not assumed to be 100 percent, and that while not expected, based on the uncertainty analysis presented in Section B.1.5, it is possible that potential MEC may remain below the surface at the site.

B.1.5 Uncertainty

This section addresses the uncertainties in the RA related to data used in the RA, input scores, and assumptions about the uses of the land by future receptors.

B.1.5.1 Data

The data used in performance of the RA went through a thorough QC/QA process, as outlined in Section 3.5 of the RI, and the removal actions met the objectives outlined in the Removal Action Work Plans (USA, 2000; UXB, 1994*)*. The objectives of the work plans were met, all detected MEC was removed, and the data were considered usable for performing the RA. If problems with the data quality are discovered in the future, the results of the RA may need to be re-evaluated.

B.1.5.2 Input Scores

The following paragraphs address uncertainties related to some of the input scores, including the Migration/Erosion Potential, the Level of Intrusion, the Frequency of Entry, and the Intensity of Contact with Soil. Most of the uncertainties are similar to those identified in the Del Rey Oaks (MACTEC, 2007) and Parker Flats (Malcolm Pirnie, 2005) RAs.

MEC Depth Below Ground Surface

Scores of "1" for all receptors were used in performing the post-remediation RA, as specified in the Protocol, which states that the score of 1 is technically appropriate where "100 percent of detected MEC was removed considering the data quality for the site". Data quality is further

defined as having detection and removal procedures meeting the data quality criteria for the site based on clearly identified investigation objectives. The removal actions within MRS-34 did meet the investigation objectives as described in Section B.1.1. However, meeting the investigation objectives does not eliminate the possibility that MEC could still be present below the surface, because the detection efficiencies of the geophysical instruments have not been shown to be 100 percent. In general, all MEC items that were detected and removed from MRS-34 were found at depths less than 4 feet below ground surface. The maximum depth for MEC and MD removed during the 1994 UXB removal action was three feet. As stated in the UXB Final OE Removal Action Report: "Excavation to a depth of three feet was required to identify or confirm the presence of OE. If the anomaly could not be uncovered within three feet of the surface the onsite CEHND safety specialist was asked to determine if deeper excavation was required." (UXB, 1995). However, depth data for each MEC and MD item removed was not documented during this removal action, and therefore is not available. Though the matrix used for this category includes risk scores for MEC at depths up to 5 feet, the score of "1" is technically appropriate where 100 percent of detected MEC was removed considering the data quality for the site.

Migration/Erosion Potential

The same Erosion Potential Score was used for this RA as was used for the Del Rey Oaks (MACTEC, 2007) and the Parker Flats MRA RAs (Malcolm Pirnie, 2005) based on similar soil, vegetation cover, and topographic conditions through most of the site. Erosion could be higher in areas where soil is disturbed, such as in excavation areas and along roads and trails. Erosion is expected to be low in well-vegetated areas and areas that are paved or otherwise covered (structures built) in the future. Use of the lowest input factor could result in an underestimation of the overall risk; however, based on review of topographical data and because the site will be developed, the score of "1" for erosion potential best represents the current and anticipated site conditions.

Level of Intrusion

The level of intrusion score is based on an assumed depth of soil intrusion by the receptor based on expected behavior. If receptors intrude to depths less than the assumed depths, the risk would be overestimated, and if receptors intrude to depths greater than the assumed depths, the risk would be underestimated.

MEC Density

MEC density scores of "1" for all receptors were used in performing the post-remediation RA, as specified in the Protocol, which states that the score of 1 is technically appropriate where "100 percent of detected MEC was removed considering the data quality for the site." Data quality is further defined as having detection and removal procedures meeting the data quality criteria for the site based on clearly identified investigation objectives including reuse and the detection of designated MEC. The removal actions within MRS-34 did meet the investigation objectives, as

described in Section B.1.1; however, meeting the investigation objectives does not eliminate the possibility that MEC could still be present below the surface, because the detection efficiencies have not been shown to be 100 percent.

Frequency of Entry and Contact with Soil

The frequency of entry factor depends on assumptions about the behavior of receptors that access the site. The Frequency of Entry factor is a measure of the number of times per year that a receptor (one or more persons) will be in the area. If people were to visit the site more times per year than is assumed in the risk assessment, then the overall risk estimated for that receptor would underestimate the actual risk. The opposite is also true: if people were to visit the site fewer times than is assumed in the risk assessment, then the overall risk would be overestimated.

Intensity of Contact with Soil

The intensity of contact with soil factor is a measure of the length of time the receptor will have contact with the exposure medium (in this case, soil). It is difficult to evaluate the activities that will occur in the future, and what the intensity of contact with the soil will be. As with the Frequency of Entry uncertainties, if the receptor spends more time in contact with the soil than assumed, the overall risk for the receptor would be underestimated, and if the receptor were to spend less time in contact with the soil, the overall risk score could be overestimated.

B.1.5.3 Removal Uncertainties

Review of the previous investigation reports shows that all of the identified 2.36 inch rockets have been removed from MRS-34, and that the potential for undetected 2.36 inch M6 rockets remaining at the site is low. It should be noted that during the 1994 UXB removal action, a conservative approach was taken with the disposal and documentation of the 2.36 inch rockets found at MRS-34. As stated in the USA After Action Report: “Because at the time all suspected UXO were destroyed by detonation, it is unknown whether the 2.36 inch rockets found during this operation and reported as “live” were actually high explosive antitank rockets which should be classified as UXO or if they were practice rockets which would have been classified as ordnance scrap” (USA, 2000). Based on the results of the two removal efforts at the site and the conclusions presented in 1995 UXB and 2000 USA reports from those efforts, investigation activities were sufficient such that there is a high confidence level that there are no MEC remaining at MRS-34. This statement is contingent upon the assumption that the clearance work was effective and thorough. While it is impossible to make a definitive statement that any remediated MMRP site is completely free of MEC, our review of the work that was carried out at the site and the QC/QA that accompanied it supports the validity of the statement. However, the slight potential for MEC to remain below ground surface, even though a score of “1” is used, results in uncertainty in the “A” score. A score of “1” was assigned to all receptors included in the post-remediation RA, as specified in the Protocol, which states that the score of 1 is technically appropriate where 100 percent of detected MEC was removed considering the data quality for the site.

B.1.6 Human Health and Ecological Risk Assessment for Chemical Hazards

The potential for risk to human and ecological receptors from exposure to chemicals within MRS-34 was addressed as part of the *Final Comprehensive Basewide Range Assessment Report, Former Fort Ord, California, Revision 2* (BRA) (Shaw/MACTEC, 2012). The BRA concluded that based on the limited number of MEC items found, chemical contamination was unlikely and no further action was needed.

B.2 Conclusions

The following conclusions can be made based on the results of the RA.

- The post-removal risks (current) for all receptors are lowest risk (A). Although the investigation/removal data supports the risk scores of "A" or the lowest level of potential risk, it should be noted that the instrument detection efficiencies are not expected to be 100 percent.
- During the initial removal action, recovered MEC items were only suspected to be MEC, but a conservative approach was taken and the items were classified as MEC - 2.36 inch rockets (M6); it is also likely that these items could have been 2.36 inch practice rockets (M7).
- Two removal actions were performed at MRS-34 (UXB in 1994 and USA in 1999).

Based on the conclusions of the reports cited above, and the results of this risk assessment, it is highly unlikely that MEC remains at MRS-34. Therefore, no further action should be considered for the site.

B.3 References

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_____, 1995. *Final Report for Ordnance and Explosives Removal Action, Fort Ord, California. Fritzsche Army Airfield (FAAF),* Contract DACA87-93-D-0002, November 1. [OE-0106]

APPENDIX B

TABLES

Table B.1 Description of Receptors Evaluated in the MRS-34 Remedial Investigation (RI)

Receptor	Description	Level of Intrusion	Frequency of Entry	Intensity of Contact with Soil
Recreational User	Expected recreational uses of the property include walking on established paths, golfing, and bicycling on established paths and roads.	A recreational user is not expected to intrude below the surface.	A recreational receptor is expected to enter the area frequently.	A recreational user is expected to spend up to six hours per day in contact with the soil.
Indoor Worker	An indoor worker would include an office worker, retail worker, indoor maintenance worker, and janitorial worker.	An indoor worker is not expected to intrude below the surface.	Indoor worker receptors are expected to enter the area frequently.	An Indoor worker is expected to spend less than 0.5 hours per day in contact with the soil.
Outdoor Maintenance Worker	An outdoor maintenance worker is assumed to be responsible for landscape and gardening activities in the area. The activities may range from golf course maintenance to planting associated with retail and hotel landscaping.	An outdoor maintenance worker is expected to intrude below the surface up to a depth of 3 feet.	An outdoor maintenance worker is expected to enter the area frequently.	An outdoor maintenance worker is expected to spend up to 8 hours per day in contact with the soil.
Construction Worker	Construction workers are expected to perform excavations for foundations and utilities and to construct structures in the area. Construction workers would also perform earth moving associated with building roads and recreational facilities such as golf courses, using power equipment.	A construction worker is expected to intrude below the surface up to a depth of 5 feet.	A construction worker is expected to enter the area frequently.	A construction worker is expected to spend 8 hours per day in contact with the soil.
Adult/Child Resident	A resident is a likely receptor based on the proposed reuse. Potential development in the area could include single and multifamily developments as well as senior housing. An adult resident is expected to perform lawn maintenance and gardening in the yard. The child resident is expected to spend time playing in the yard and possibly digging.	An adult/child resident is expected to intrude below the surface to a depth of up to 4 feet.	An adult/child resident is expected to frequently enter the area.	An adult/child resident is expected to spend 2 hours per day in contact with the soil.

Table B.2 Depth Below Ground Surface	
Score	**Description (a)(b)(c)(d)**
1	100% of detected MEC was removed considering the data quality for the site.
2	MEC > 5 feet bgs
3	MEC ≥ 4 feet bgs
4	MEC ≥ 3 feet bgs
5	MEC ≥ 2 feet bgs
6	MEC ≥ 1 feet bgs
7	No MEC on the surface and MEC below surface
8	Any MEC on surface

Notes:
(a) The shallowest MEC item found determines the depth below ground surface for the sector.
(b) If significant uncertainty exists about the depth of the MEC item, it may be appropriate to assign the next highest score.
(c) Depth should be based on actual field measurements of MEC items found.
(d) Detection and removal procedures meeting the DQOs for the sector based on clearly defined investigational objectives including reuse and the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be approved by the BCT to score a "1".

Table B.3 Level of Intrusion	
Score	**Description (a)(b)**
1	Non-Intrusive: Activity on the ground surface, none below the surface.
2	Minor Intrusions: Activity on ground surface and ground disturbances to a depth of one foot bgs.
3	Moderate Intrusions: Ground disturbances to a depth of two feet bgs.
4	Significant Intrusions: Ground disturbances to a depth of four feet bgs.
5	Highly Intrusive: Ground disturbances greater than four feet bgs.

Notes:
(a) The deepest intrusion level expected for a given reuse determines the Level of Intrusion for activities for the sector.
(b) If significant uncertainty exists about the depth of intrusion, it may be appropriate to assign the next highest score.

Table B.4 Migration/Erosion Potential	
Score	**Description (a)**
1	Very Stable: MEC will not migrate. Annual erosion is equal to or less than the site-wide average of 3/100 inch.
2	Minor Migration: Recurring and extreme natural events may cause MEC to migrate upward, potentially reaching the intrusion level, over a period of time (more than two five-year reviews). Annual erosion is greater then the average site-wide condition but less than one inch **(b)**.
3	Significant Migration: Recurring and extreme natural events will bring MEC to the surface within the first recurring review. Annual erosion is more than one inch **(c).**

Notes:
(a) The Migration/Erosion factor should consider the potential for changes in the depth of MEC due to erosion. The presence of human activities, streams, gullies, or steep slopes in an area may require a more thorough investigation of the potential for erosion.
(b) Average annual site-wide erosion potential is 3/100 inch.
(c) Significant erosion at Fort Ord is likely limited to areas disturbed by human activity, such as roads or firebreaks.

Table B.5 Accessibility Factor Scoring Matrix				
		Migration/Erosion Potential		
Depth Below Ground Surface	**Level of Intrusion**	**1. Very Stable**	**2. Minor Migration**	**3. Significant Migration**
1. 100% of detected MEC removed considering data quality for the area.	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (<1 foot bgs)	1	1	1
	3. Moderate Intrusion (<2 feet bgs)	1	1	1
	4. Significant Intrusion (<4 feet bgs)	1	1	1
	5. Highly Intrusive (>4 feet bgs)	1	1	1
2. MEC > 5 feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (<1 foot bgs)	1	1	1
	3. Moderate Intrusion (<2 feet bgs)	1	1	1
	4. Significant Intrusion (<4 feet bgs)	1	2	3
	5. Highly Intrusive (>4 feet bgs)	3	3	4
3. MEC > 4 feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (<1 foot bgs)	1	1	1
	3. Moderate Intrusion (<2 feet bgs)	1	1	2
	4. Significant Intrusion (<4 feet bgs)	3	3	4
	5. Highly Intrusive (>4 feet bgs)	5	5	5
4. MEC > 3 feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (<1 foot bgs)	1	1	2
	3. Moderate Intrusion (<2 feet bgs)	1	2	3
	4. Significant Intrusion (<4 feet bgs)	5	5	5
	5. Highly Intrusive (>4 feet bgs)	5	5	5
5. MEC > 2 feet bgs	1. Non-Intrusive (surface only)	1	2	3
	2. Minor Intrusion (<1 foot bgs)	3	3	4
	3. Moderate Intrusion (<2 feet bgs)	5	5	5
	4. Significant Intrusion (<4 feet bgs)	5	5	5
	5. Highly Intrusive (>4 feet bgs)	5	5	5
6. MEC > 1 feet bgs	1. Non-Intrusive (surface only)	4	5	5
	2. Minor Intrusion (<1 foot bgs)	5	5	5
	3. Moderate Intrusion (<2 feet bgs)	5	5	5
	4. Significant Intrusion (<4 feet bgs)	5	5	5
	5. Highly Intrusive (>4 feet bgs)	5	5	5
7. No MEC on the surface and MEC below surface	1. Non-Intrusive (surface only)	4	5	5
	2. Minor Intrusion (<1 foot bgs)	5	5	5
	3. Moderate Intrusion (<2 feet bgs)	5	5	5
	4. Significant Intrusion (<4 feet bgs)	5	5	5
	5. Highly Intrusive (>4 feet bgs)	5	5	5
8. Any MEC on the surface	1. Non-Intrusive (surface only)	5	5	5
	2. Minor Intrusion (<1 foot bgs)	5	5	5
	3. Moderate Intrusion (<2 feet bgs)	5	5	5
	4. Significant Intrusion (<4 feet bgs)	5	5	5
	5. Highly Intrusive (>4 feet bgs)	5	5	5

Accessibility Factor scores are defined as:
1. Least Potential for Accessibility.
2. Not Likely to be Accessible.
3. May be Accessible.
4. Likely to be Accessible.
5. Greatest Potential for Accessibility.

Table B.6 MEC Density	
Score	**Description***
1	100% of detected MEC removed to level of intrusion
2	Low MEC density (<0.1 items per acre)
3	Medium MEC Density (0.1 to 1 item per acre)
4	High MEC Density (>1 item per acre)

*Detection and removal procedures meeting the DQOs for the site based on clearly defined investigational objectives including reuse and the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be approved by the BCT to score a "1".

Table B.7 MEC Density (Following Removal)									
	Number of Items			**Density**			**MEC Input Factor Score***		
	MEC Hazard Type			**MEC Hazard Type**			**MEC Hazard Type**		
Depth (feet)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
All	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	1	1	1

*The MEC Input Factor Score of "1" for all hazard types is based on post-removal conditions (all detected MEC items removed)
** N/A – Not applicable,

Table B.8 Intensity of Contact with Soil	
Score	**Description**
1	Very Low: <1 hour/day
2	Low: <3 hours/day
3	Moderate: <6 hours/day
4	High: <9 hours/day
5	Very High: ≥9 hours/day

Notes:
Direct contact with soil can range from simply walking on the ground to digging in the soil.

Table B.9 Frequency of Entry	
Score	**Description**
1	Rare: Not likely to occur (once per year or less)
2	Infrequent: Will seldom occur (less than once per season to once per month)
3	Occasional: Will likely occur from time to time (more than once per month)
4	Frequent: Will occur frequently (once a week or more)

Note:
UXO-trained professionals and others covered by MEC-specific health and safety plans are not considered in the Frequency of Entry scoring.

Table B.10 Exposure Factor Scoring Matrix (a)

		Intensity of Contact with Soil				
Frequency of Entry	**MEC density**	1. Very Low: ≤1 hour/day	2. Low: ≤3 hours/day	3. Moderate: ≤6 hours/day	4: High: ≤9 hours/day	5. Very High: >9 hours/day
1. Rare	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC Density	1	2	2	3	3
	3. Medium MEC Density	2	3	3	3	3
	4. High MEC Density	3	3	3	4	4
2. Infrequent	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC Density	1	2	2	3	3
	3. Medium MEC Density	2	3	3	4	4
	4. High MEC Density	3	3	4	4	4
3. Occasional	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC Density	2	2	3	3	3
	3. Medium MEC Density	3	3	4	4	4
	4. High MEC Density	3	4	5	5	5
4. Frequent	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC Density	2	2	3	4	4
	3. Medium MEC Density	3	4	4	5	5
	4. High MEC Density	4	5	5	5	5

(a) Exposure Factor scores are defined as:
1. Least Potential for Exposure.
2. Not Likely to be Exposed.
3. May be Exposed.
4. Likely to be Exposed.
5. Greatest Potential for Exposure.

Table B.11 MEC Hazard Classification

Score	**Description (a)**
0	Inert MEC; will cause no injury **(b)**
1	MEC that will cause an injury, or in extreme cases could cause major injury or death to an individual if functioned by an individual's activities **(c)**
2	MEC that will cause major injury, or in extreme cases could cause death to an individual if functioned by an individual's activities **(d)**
3	MEC that will kill an individual if detonated by an individual's activities

(a) MEC type must only be determined by UXO-trained personnel.
(b) Inert describes the condition of a munition or component that contains no explosive, pyrotechnic, or chemical agent.
(c) An injury is defined as a flesh wound or minor burn.
(d) A major injury is defined as the loss of sight, hearing or limbs, or major burn.

Table B.12 Overall MEC Risk Scoring Matrix (a)

		Exposure				
MEC Type	**Accessibility**	1. Least Potential for Exposure	2. Not Likely to be Exposed	3. May be Exposed	4. Likely to be Exposed	5. Greatest Potential for Exposure
0. Inert MEC	1. Least potential for Accessibility	A	A	A	A	A
	2. Not Likely to be Accessible	A	A	A	A	A
	3. May be Accessible	A	A	A	A	A
	4. Likely to be Accessible	A	A	A	A	A
	5. Greatest Potential for Accessibility	A	A	A	A	A
1. MEC that will cause injury	1. Least potential for Accessibility	A	A	A	B	B
	2. Not Likely to be Accessible	A	B	B	B	B
	3. May be Accessible	A	B	B	C	C
	4. Likely to be Accessible	B	B	C	D	D
	5. Greatest Potential for Accessibility	B	C	D	D	D
2. MEC that will cause major injury	1. Least potential for Accessibility	A	A	B	B	B
	2. Not Likely to be Accessible	A	B	B	C	C
	3. May be Accessible	A	B	C	D	D
	4. Likely to be Accessible	B	C	D	D	E
	5. Greatest Potential for Accessibility	B	C	D	E	E
3. MEC that will kill	1. Least potential for Accessibility	A	B	B	C	C
	2. Not Likely to be Accessible	B	B	C	D	D
	3. May be Accessible	B	C	D	E	E
	4. Likely to be Accessible	C	C	D	E	E
	5. Greatest Potential for Accessibility	C	D	E	E	E

Notes: (a) The Overall MEC Risk scores are defined as:
- A. Lowest risk
- B. Low risk
- C. Medium risk
- D. High risk
- E. Highest risk

Table B.13 MRS-34 MEC Risk Assessment Analysis Results
Baseline Risk Analysis (Following Removal Action)

Receptor	MEC Hazard Type	MEC Depth Below Ground Surface	Migration/Erosion Potential	Level of Intrusion	Accessibility Factor Score	MEC Density	Frequency of Entry	Intensity of Contact with Soil	Exposure Factor Score	*Overall MEC Risk Score
Recreational User	1	1	1	1	1	1	4	3	1	A
	2	1	1	1	1	1	4	3	1	A
	3	1	1	1	1	1	4	3	1	A
Indoor Worker	1	1	1	1	1	1	4	1	1	A
	2	1	1	1	1	1	4	1	1	A
	3	1	1	1	1	1	4	1	1	A
Outdoor Maintenance Worker	1	1	1	4	1	1	4	4	1	A
	2	1	1	4	1	1	4	4	1	A
	3	1	1	4	1	1	4	4	1	A
Construction Worker	1	1	1	5	1	1	4	4	1	A
	2	1	1	5	1	1	4	4	1	A
	3	1	1	5	1	1	4	4	1	A
Adult/Child Resident	1	1	1	1	1	1	4	2	1	A
	2	1	1	1	1	1	4	2	1	A
	3	1	1	1	1	1	4	2	1	A

*Overall MEC Risk Score chart:

Overall MEC Risk Score	A	B	C	D	E
	Lowest	Low	Medium	High	Highest

Table B.14 MEC Baseline Risk Analysis for a Recreational User (Following Removal Action)			
Sector	**MRS-34, Fritzsche Army Airfield**		
Proposed Property Reuse	**Mixed Use Development**		
Receptor Type	**Recreational User**		
Analysis	**Post-Removal**		
MEC Risk Score	**A**	Accessibility 1	• MEC items in MRS-34 are not accessible because a removal to depth has been completed and all detected MEC items have been removed; the work was completed according to a BCT-approved work plan; and the recreational user is not expected to intrude below the surface. • The area is on gently sloping terrain and is not expected to be affected significantly by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping, which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a recreational user is frequent and the Intensity of Contact with Soil is moderate: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT-approved work plan; therefore, the Exposure is low.
		MEC Type **3**	The types of MEC discovered in MRS-34 include 2.36-inch high explosive, antitank, M6 rockets. This item is considered a Type 3 item. One Type 2 item was identified (charge, demo, TNT, 0.5 lb.). All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline Risk Analysis was collected according to the BCT-approved work plan and is considered usable for performing the risk assessment.

Table B.15 MEC Baseline Risk Analysis for an Indoor Worker (Following Removal Action)			
Sector	**MRS-34, Fritzsche Army Airfield**		
Proposed Property Reuse	**Mixed Use Development**		
Receptor Type	**Indoor Worker**		
Analysis	**Baseline**		
MEC Risk Score	**A**	Accessibility 1	• MEC items in MRS-34 are not accessible because a removal to depth has been completed and all detected MEC items have been removed, the work was completed according to a BCT-approved work plan, and the indoor worker is not expected to intrude below the surface. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping, which would also limit erosion.
		Exposure 1	• The Frequency of Entry for an indoor worker is frequent and the Intensity of Contact with Soil is moderate: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT-approved work plan; therefore, the Exposure is low.
		MEC Type **3**	The types of MEC discovered in MRS-34 include 2.36-inch high explosive, antitank, M6 rockets. This item is considered a type 3 item. One type 2 item was identified (charge, demo, TNT, 0.5 lb.). All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline Risk Assessment was collected according to the BCT-approved work plan and is considered usable for performing the risk assessment.

Table B.16 MEC Baseline Risk Analysis for a Outdoor Maintenance Worker (Following Removal Action)			
Sector	**MRS-34, Fritzsche Army Airfield**		
Proposed Property Reuse	**Mixed Use Development**		
Receptor Type	**Outdoor Maintenance Worker**		
Analysis	**Baseline**		
MEC Risk Score	**A**	Accessibility 1	• MEC items in MRS-34 are not accessible because a removal to depth has been completed and all detected MEC items have been removed and the work was completed according to a BCT-approved work plan. The outdoor maintenance worker is expected to intrude below the surface, but no MEC items are expected to remain. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping, which would also limit erosion.
		Exposure 1	• The Frequency of Entry for an outdoor maintenance worker is frequent and the Intensity of Contact with Soil is high: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT-approved work plan; therefore, the Exposure is low.
		MEC Type **3**	The types of MEC discovered in MRS-34 include 2.36-inch high explosive, antitank, M6 rockets. This item is considered a type 3 item. One type 2 item was identified (charge, demo, TNT, 0.5 lb.). All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline Risk Assessment was collected according to the BCT-approved work plan and is considered usable for performing the risk assessment.

Table B.17 MEC Baseline Risk Analysis for a Construction Worker (Following Removal Action)			
Sector	**MRS-34, Fritzsche Army Airfield**		
Proposed Property Reuse	**Mixed Use Development**		
Receptor Type	**Construction Worker**		
Analysis	**Baseline**		
MEC Risk Score	**A**	Accessibility 1	• MEC items in MRS-34 are not accessible because a removal to depth has been completed and all detected MEC items have been removed and the work was completed according to a BCT approved work plan. The construction worker is expected to intrude below the surface, but no MEC is expected to remain. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping, which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a construction worker is frequent and the Intensity of Contact with Soil is high: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT-approved work plan; therefore, the Exposure is low.
		MEC Type 3	The types of MEC discovered in MRS-34 include 2.36-inch high explosive, antitank, M6 rockets. This item is considered a type 3 item. One type 2 item was identified (charge, demo, TNT, 0.5 lb.). All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline Risk Assessment was collected according to the BCT-approved work plan and is considered usable for performing the risk assessment.

Table B.18 MEC Baseline Risk Analysis for an Adult/Child Resident (Following Removal Action)			
Sector	**MRS-34, Fritzsche Army Airfield**		
Proposed Property Reuse	**Mixed Use Development**		
Receptor Type	**Adult/Child Resident**		
Analysis	**Baseline**		
MEC Risk Score	**A**	Accessibility 1	• MEC items in MRS-34 are not accessible because a removal to depth has been completed; all detected MEC items have been removed and the work was completed according to an approved work plan. The adult/child resident is expected to intrude to a depth of 1 foot; however, because the removal to depth has been completed according to a BCT approved work plan, the MEC depth score is low. • The area is on flat to gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for an adult/child resident is frequent and the Intensity of Contact with Soil is low. Although the frequency of entry is high for the resident the potential exposure is low because a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT approved work plan.
		MEC Type **3**	The types of MEC removed from MRS-34 include the 2.36 inch antitank rocket (M6). One type 2 item was identified (charge, demo, TNT, 0.5 lb.). All items at Fort Ord are assumed to be fuzed (if not inert) and portable
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved project work plan and is considered useable for performing the risk assessment.

APPENDIX C

DATABASE LIST OF MEC/MD ITEMS FOUND AT MRS-34

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_07 K	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752364.75	2144193.63	**UXO**	**1**	10/17/1994
MRS-34	MRS-34_13 K	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751929.50	2143807.38	**UXO**	**3**	10/17/1994
MRS-34	MRS-34_13 F	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751518.25	2144126.13	**UXO**	**1**	10/6/1994
MRS-34	MRS-34_13 C	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751285.00	2144309.88	**UXO**	**1**	11/16/1994
MRS-34	MRS-34_13 C	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751285.00	2144309.88	**UXO**	**1**	11/17/1994
MRS-34	MRS-34_12 E	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751517.75	2144253.50	**UXO**	**1**	11/7/1994
MRS-34	MRS-34_13 C	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751285.00	2144309.88	**UXO**	**1**	9/1/1994
MRS-34	MRS-34_06 H	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752205.50	2144453.13	**UXO**	**1**	9/12/1994
MRS-34	MRS-34_06 I	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752286.50	2144386.50	**UXO**	**1**	9/12/1994
MRS-34	MRS-34_11 E	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751593.50	2144319.25	**UXO**	**1**	9/12/1994
MRS-34	MRS-34_04 G	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752273.50	2144649.25	**UXO**	**1**	9/6/1994
MRS-34	MRS-34_10 H	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751906.00	2144188.63	**UXO**	**1**	9/7/1994
MRS-34	MRS-34_03 B	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751966.50	2145034.88	**UXO**	**1**	9/8/1994
MRS-34	MRS-34_10 A	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751359.25	2144642.25	**UXO**	**2**	9/8/1994
MRS-34	MRS-34_11 I	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5751914.50	2144052.50	**UXO**	**1**	9/8/1994
MRS-34	MRS-34_11 K	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752065.75	2143926.75	**UXO**	**1**	9/8/1994
MRS-34	MRS-34_11 L	Rocket, 2.36inch, high explosive antitank, M6	**3**	0	5752141.00	2143864.13	**UXO**	**1**	9/8/1994
MRS-34	LC3-ME02-SF09	Signal, illumination, ground, M125 series	2	5	5747330.48	2126584.50	MD	1	3/18/1999
MRS-34	LC3-ME02-SF09	Signal, illumination, ground, M125 series	2	2	5747380.48	2126574.50	MD	1	3/18/1999
MRS-34	MRS-34_13 C	Charge, 0.5lbs, demolition, TNT	2	0	5751283.96	2144309.40	ISD	1	9/1/1994
MRS-34	MRS-34_07 M	Rocket motor, 2.36inch	1	0	5752516.67	2144067.63	MD	2	10/11/1994
MRS-34	MRS-34_08 M	Rocket motor, 2.36inch	1	0	5752441.25	2144001.21	MD	3	10/11/1994
MRS-34	MRS-34_09 K	Fuze, grenade (model unknown)	1	0	5752215.50	2144060.38	MD	1	10/11/1994
MRS-34	MRS-34_09 K	Rocket motor, 2.36inch	1	0	5752215.50	2144060.38	MD	2	10/11/1994
MRS-34	MRS-34_13 C	Rocket motor, 2.36inch	1	0	5751283.96	2144309.40	MD	7	10/11/1994
MRS-34	MRS-34_07 N	Rocket motor, 2.36inch	1	0	5752592.75	2144004.46	MD	2	10/12/1994
MRS-34	MRS-34_10 J	Rocket motor, 2.36inch	1	0	5752065.00	2144057.25	MD	1	10/12/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_10 K	Rocket motor, 2.36inch	1	0	5752141.17	2143994.08	MD	1	10/12/1994
MRS-34	MRS-34_11 K	Rocket motor, 2.36inch	1	0	5752065.67	2143926.71	MD	1	10/12/1994
MRS-34	MRS-34_12 C	Rocket motor, 2.36inch	1	0	5751365.50	2144380.33	MD	1	10/12/1994
MRS-34	MRS-34_13 G	Rocket motor, 2.36inch	1	0	5751597.87	2144064.04	MD	3	10/13/1994
MRS-34	MRS-34_07 L	Rocket motor, 2.36inch	1	0	5752441.17	2144130.34	MD	2	10/14/1994
MRS-34	MRS-34_08 C	Rocket motor, 2.36inch	1	0	5751668.42	2144642.71	MD	1	10/14/1994
MRS-34	MRS-34_09 C	Rocket motor, 2.36inch	1	0	5751592.75	2144577.21	MD	2	10/14/1994
MRS-34	MRS-34_12 K	Rocket motor, 2.36inch	1	0	5751991.00	2143859.96	MD	1	10/14/1994
MRS-34	MRS-34_13 H	Rocket motor, 2.36inch	1	0	5751685.75	2143995.89	MD	1	10/14/1994
MRS-34	MRS-34_07 D	Rocket motor, 2.36inch	1	0	5751820.83	2144644.66	MD	1	10/17/1994
MRS-34	MRS-34_08 K	Rocket motor, 2.36inch	1	0	5752290.00	2144126.88	MD	1	10/17/1994
MRS-34	MRS-34_13 K	Rocket motor, 2.36inch	1	0	5751930.05	2143806.75	MD	4	10/17/1994
MRS-34	MRS-34_08 D	Rocket motor, 2.36inch	1	0	5751745.08	2144578.96	MD	1	10/18/1994
MRS-34	MRS-34_08 L	Rocket motor, 2.36inch	1	0	5752366.17	2144063.71	MD	2	10/18/1994
MRS-34	MRS-34_04 G	Rocket motor, 2.36inch	1	0	5752273.42	2144649.25	MD	1	10/19/1994
MRS-34	MRS-34_10 L	Fuze, grenade (model unknown)	1	0	5752216.75	2143931.33	MD	1	10/19/1994
MRS-34	MRS-34_11 L	Fuze, grenade (model unknown)	1	0	5752140.92	2143864.13	MD	1	10/19/1994
MRS-34	MRS-34_09 L	Fuze, grenade (model unknown)	1	0	5752291.42	2143997.42	MD	2	10/20/1994
MRS-34	MRS-34_09 L	Rocket motor, 2.36inch	1	0	5752291.42	2143997.42	MD	1	10/20/1994
MRS-34	MRS-34_12 G	Rocket motor, 2.36inch	1	0	5751670.67	2144126.33	MD	1	10/20/1994
MRS-34	MRS-34_08 E	Rocket motor, 2.36inch	1	0	5751820.42	2144516.58	MD	1	10/24/1994
MRS-34	MRS-34_12 G	Rocket motor, 2.36inch	1	0	5751670.67	2144126.33	MD	1	10/25/1994
MRS-34	MRS-34_05 N	Rocket motor, 2.36inch	1	0	5752740.00	2144133.79	MD	1	10/26/1994
MRS-34	MRS-34_08 H	Rocket motor, 2.36inch	1	0	5752055.77	2144320.97	MD	2	10/27/1994
MRS-34	MRS-34_11 A	Rocket motor, 2.36inch	1	0	5751283.76	2144576.96	MD	1	10/3/1994
MRS-34	MRS-34_12 M	Rocket motor, 2.36inch	1	0	5752140.00	2143735.96	MD	1	10/3/1994
MRS-34	MRS-34_13 M	Rocket motor, 2.36inch	1	0	5752083.64	2143687.79	MD	1	10/3/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_01 G	Rocket motor, 2.36inch	1	0	5752500.75	2144846.46	MD	1	10/31/1994
MRS-34	MRS-34_07 B	Rocket motor, 2.36inch	1	0	5751666.00	2144773.00	MD	1	10/4/1994
MRS-34	MRS-34_10 O	Rocket motor, 2.36inch	1	0	5752438.85	2143747.22	MD	1	10/4/1994
MRS-34	MRS-34_12 J	Rocket motor, 2.36inch	1	0	5751915.25	2143922.96	MD	1	10/4/1994
MRS-34	MRS-34_13 J	Rocket motor, 2.36inch	1	0	5751851.89	2143867.23	MD	3	10/4/1994
MRS-34	MRS-34_06 H	Rocket motor, 2.36inch	1	0	5752205.76	2144453.30	MD	1	10/5/1994
MRS-34	MRS-34_09 B	Rocket motor, 2.36inch	1	0	5751515.17	2144641.58	MD	1	10/5/1994
MRS-34	MRS-34_11 M	Rocket motor, 2.36inch	1	0	5752215.42	2143802.25	MD	2	10/5/1994
MRS-34	MRS-34_11 N	Rocket motor, 2.36inch	1	0	5752290.67	2143739.63	MD	1	10/5/1994
MRS-34	MRS-34_06 I	Rocket motor, 2.36inch	1	0	5752286.50	2144386.50	MD	1	10/6/1994
MRS-34	MRS-34_07 J	Rocket motor, 2.36inch	1	0	5752288.42	2144257.00	MD	1	10/6/1994
MRS-34	MRS-34_08 I	Rocket motor, 2.36inch	1	0	5752138.00	2144253.08	MD	1	10/6/1994
MRS-34	MRS-34_08 N	Rocket motor, 2.36inch	1	0	5752517.17	2143938.13	MD	2	10/6/1994
MRS-34	MRS-34_09 M	Rocket motor, 2.36inch	1	0	5752366.25	2143935.13	MD	2	10/6/1994
MRS-34	MRS-34_09 O	Rocket motor, 2.36inch	1	0	5752514.51	2143812.18	MD	1	10/6/1994
MRS-34	MRS-34_10 G	Rocket motor, 2.36inch	1	0	5751822.75	2144258.25	MD	1	11/10/1994
MRS-34	MRS-34_13 C	Rocket motor, 2.36inch	1	0	5751283.96	2144309.40	MD	4	11/16/1994
MRS-34	MRS-34_10 F	Rocket motor, 2.36inch	1	0	5751746.00	2144321.96	MD	1	11/21/1994
MRS-34	MRS-34_11 F	Rocket motor, 2.36inch	1	0	5751669.92	2144255.79	MD	1	11/23/1994
MRS-34	MRS-34_12 E	Rocket motor, 2.36inch	1	0	5751517.75	2144253.50	MD	1	11/7/1994
MRS-34	MRS-34_10 E	Rocket motor, 2.36inch	1	0	5751669.50	2144385.46	MD	1	11/8/1994
MRS-34	MRS-34_12 E	Rocket motor, 2.36inch	1	0	5751517.75	2144253.50	MD	1	11/8/1994
MRS-34	MRS-34_10 Q	Rocket motor, 2.36inch	1	0	5752587.25	2143624.00	MD	1	11/9/1994
MRS-34	LC3-ME02-SF09	Signal, ground, rifle, parachute, M17 series	1	7	5747355.48	2126559.50	MD	1	3/18/1999
MRS-34	MRS-34_05 B	Rocket motor, 2.36inch	1	0	5751816.25	2144903.92	MD	1	8/30/1994
MRS-34	MRS-34_05 E	Rocket motor, 2.36inch	1	0	5752045.75	2144712.58	MD	1	8/30/1994
MRS-34	MRS-34_09 D	Rocket motor, 2.36inch	1	0	5751669.50	2144513.42	MD	1	8/30/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_01 E	Rocket motor, 2.36inch	1	0	5752347.33	2144975.16	MD	1	8/31/1994
MRS-34	MRS-34_05 J	Rocket motor, 2.36inch	1	0	5752434.75	2144388.17	MD	1	8/31/1994
MRS-34	MRS-34_05 N	Rocket motor, 2.36inch	1	0	5752740.00	2144133.79	MD	1	8/31/1994
MRS-34	MRS-34_12 H	Rocket motor, 2.36inch	1	0	5751755.27	2144055.81	MD	4	8/31/1994
MRS-34	MRS-34_12 I	Rocket motor, 2.36inch	1	0	5751839.83	2143985.62	MD	1	8/31/1994
MRS-34	MRS-34_12 J	Rocket motor, 2.36inch	1	0	5751915.25	2143922.96	MD	1	8/31/1994
MRS-34	MRS-34_12 K	Rocket motor, 2.36inch	1	0	5751991.00	2143859.96	MD	4	8/31/1994
MRS-34	MRS-34_12 L	Rocket motor, 2.36inch	1	0	5752065.92	2143797.67	MD	7	8/31/1994
MRS-34	MRS-34_12 M	Rocket motor, 2.36inch	1	0	5752140.00	2143735.96	MD	3	8/31/1994
MRS-34	MRS-34_12 N	Rocket motor, 2.36inch	1	0	5752215.08	2143673.46	MD	3	8/31/1994
MRS-34	MRS-34_14 A	Rocket motor, 2.36inch	1	0	5751058.36	2144380.92	MD	11	8/31/1994
MRS-34	MRS-34_04 K	Rocket motor, 2.36inch	1	0	5752583.75	2144389.13	MD	1	9/1/1994
MRS-34	MRS-34_08 O	Rocket motor, 2.36inch	1	0	5752590.51	2143877.43	MD	1	9/1/1994
MRS-34	MRS-34_12 F	Rocket motor, 2.36inch	1	0	5751594.08	2144189.96	MD	6	9/1/1994
MRS-34	MRS-34_12 G	Rocket motor, 2.36inch	1	0	5751670.67	2144126.33	MD	2	9/1/1994
MRS-34	MRS-34_08 P	Rocket motor, 2.36inch	1	0	5752663.33	2143816.71	MD	1	9/12/1994
MRS-34	MRS-34_08 Q	Rocket motor, 2.36inch	1	0	5752739.50	2143753.58	MD	2	9/12/1994
MRS-34	MRS-34_10 P	Rocket motor, 2.36inch	1	0	5752510.75	2143687.42	MD	3	9/12/1994
MRS-34	MRS-34_11 E	Rocket motor, 2.36inch	1	0	5751593.50	2144319.29	MD	4	9/12/1994
MRS-34	MRS-34_11 F	Rocket motor, 2.36inch	1	0	5751669.92	2144255.79	MD	1	9/12/1994
MRS-34	MRS-34_11 G	Rocket motor, 2.36inch	1	0	5751746.50	2144192.13	MD	2	9/12/1994
MRS-34	MRS-34_11 H	Rocket motor, 2.36inch	1	0	5751830.52	2144122.09	MD	2	9/12/1994
MRS-34	MRS-34_12 Q	Rocket motor, 2.36inch	1	0	5752432.16	2143492.25	MD	1	9/12/1994
MRS-34	MRS-34_14 I	Rocket motor, 2.36inch	1	0	5751713.68	2143872.15	MD	1	9/22/1994
MRS-34	MRS-34_14 J	Rocket motor, 2.36inch	1	0	5751792.86	2143813.17	MD	1	9/26/1994
MRS-34	MRS-34_15 K	Rocket motor, 2.36inch	1	0	5751799.92	2143689.75	MD	1	9/26/1994
MRS-34	MRS-34_16 C	Rocket motor, 2.36inch	1	0	5751065.82	2144118.96	MD	2	9/26/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_14 O	Rocket motor, 2.36inch	1	0	5752164.37	2143534.46	MD	1	9/27/1994
MRS-34	MRS-34_15 D	Rocket motor, 2.36inch	1	0	5751226.83	2144129.79	MD	1	9/27/1994
MRS-34	MRS-34_15 E	Rocket motor, 2.36inch	1	0	5751305.92	2144069.13	MD	1	9/27/1994
MRS-34	MRS-34_13 A	Rocket motor, 2.36inch	1	0	5751133.29	2144444.93	MD	1	9/28/1994
MRS-34	MRS-34_16 K	Rocket motor, 2.36inch	1	0	5751719.60	2143618.55	MD	1	9/28/1994
MRS-34	MRS-34_13 B	Rocket motor, 2.36inch	1	0	5751210.35	2144375.05	MD	1	9/29/1994
MRS-34	MRS-34_02 I	Rocket motor, 2.36inch	1	0	5752580.75	2144650.46	MD	1	9/6/1994
MRS-34	MRS-34_04 F	Rocket motor, 2.36inch	1	0	5752196.75	2144713.38	MD	1	9/6/1994
MRS-34	MRS-34_08 G	Rocket motor, 2.36inch	1	0	5751973.75	2144389.21	MD	7	9/6/1994
MRS-34	MRS-34_12 E	Rocket motor, 2.36inch	1	0	5751517.75	2144253.50	MD	34	9/6/1994
MRS-34	MRS-34_13 O	Rocket motor, 2.36inch	1	0	5752228.24	2143578.24	MD	1	9/6/1994
MRS-34	MRS-34_02 E	Rocket motor, 2.36inch	1	0	5752271.25	2144908.83	MD	2	9/7/1994
MRS-34	MRS-34_03 F	Rocket motor, 2.36inch	1	0	5752272.67	2144779.38	MD	1	9/7/1994
MRS-34	MRS-34_07 A	Rocket motor, 2.36inch	1	0	5751585.34	2144839.79	MD	2	9/7/1994
MRS-34	MRS-34_11 O	Rocket motor, 2.36inch	1	0	5752361.52	2143680.86	MD	1	9/7/1994
MRS-34	MRS-34_06 C	Rocket motor, 2.36inch	1	0	5751819.50	2144773.71	MD	1	9/8/1994
MRS-34	MRS-34_06 N	Rocket motor, 2.36inch	1	0	5752667.75	2144070.33	MD	2	9/8/1994
MRS-34	MRS-34_11 J	Rocket motor, 2.36inch	1	0	5751989.75	2143989.79	MD	1	9/8/1994
MRS-34	MRS-34_11 K	Rocket motor, 2.36inch	1	0	5752065.67	2143926.71	MD	1	9/8/1994
MRS-34	MRS-34_11 L	Rocket motor, 2.36inch	1	0	5752140.92	2143864.13	MD	1	9/8/1994
MRS-34	MRS-34_11 M	Rocket motor, 2.36inch	1	0	5752215.42	2143802.25	MD	1	9/8/1994
MRS-34	MRS-34_12 E	Rocket motor, 2.36inch	1	0	5751517.75	2144253.50	MD	48	9/8/1994
MRS-34	MRS-34_07 C	Rocket motor, 2.36inch	1	0	5751744.17	2144708.33	MD	1	
MRS-34	MRS-34_07 O	Rocket motor, 2.36inch	1	0	5752667.01	2143943.05	MD	3	
MRS-34	MRS-34_11 L	Grenade, hand, smoke, M18 series	1	0	5752140.92	2143864.13	MD	1	
MRS-34	MRS-34_12 P	Rocket motor, 2.36inch	1	0	5752355.67	2143556.00	MD	1	
MRS-34	MRS-34_14 C	Rocket motor, 2.36inch	1	0	5751211.81	2144248.12	MD	2	

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_14 D	Rocket motor, 2.36inch	1	0	5751292.51	2144186.29	MD	1	
MRS-34	MRS-34_14 E	Rocket motor, 2.36inch	1	0	5751372.49	2144126.64	MD	2	
MRS-34	MRS-34_14 F	Rocket motor, 2.36inch	1	0	5751452.73	2144066.77	MD	2	
MRS-34	MRS-34_14 G	Rocket motor, 2.36inch	1	0	5751533.14	2144006.77	MD	1	
MRS-34	MRS-34_14 H	Rocket motor, 2.36inch	1	0	5751623.69	2143939.16	MD	1	
MRS-34	MRS-34_14 L	Rocket motor, 2.36inch	1	0	5751951.09	2143695.64	MD	1	
MRS-34	MRS-34_14 N	Rocket motor, 2.36inch	1	0	5752107.84	2143578.98	MD	4	
MRS-34	MRS-34_15 C	Rocket motor, 2.36inch	1	0	5751147.17	2144191.09	MD	2	
MRS-34	MRS-34_15 M	Rocket motor, 2.36inch	1	0	5751953.58	2143571.75	MD	1	
MRS-34	MRS-34_16 B	Grenade, hand, smoke, M18 series	1	0	5750987.77	2144182.39	MD	2	
MRS-34	MRS-34_16 M	Rocket motor, 2.36inch	1	0	5751874.84	2143502.60	MD	1	
MRS-34	MRS-34_16 N	Rocket motor, 2.36inch	1	0	5751953.50	2143443.94	MD	1	
MRS-34	MRS-34_08 M	Rocket, 2.36inch, practice, M7	0	0	5752441.25	2144001.21	MD	1	10/11/1994
MRS-34	MRS-34_07 N	Rocket, 2.36inch, practice, M7	0	0	5752592.75	2144004.46	MD	1	10/12/1994
MRS-34	MRS-34_13 G	Rocket, 2.36inch, practice, M7	0	0	5751597.87	2144064.04	MD	1	10/13/1994
MRS-34	MRS-34_07 K	Rocket, 2.36inch, practice, M7	0	0	5752364.75	2144193.63	MD	1	10/17/1994
MRS-34	MRS-34_13 I	Rocket, 2.36inch, practice, M7	0	0	5751774.08	2143927.54	MD	2	10/3/1994
MRS-34	MRS-34_13 J	Rocket, 2.36inch, practice, M7	0	0	5751851.89	2143867.23	MD	2	10/4/1994
MRS-34	MRS-34_13 C	Rocket, 2.36inch, practice, M7	0	0	5751283.96	2144309.40	MD	1	11/16/1994
MRS-34	MRS-34_13 D	Rocket, 2.36inch, practice, M7	0	0	5751361.70	2144247.39	MD	1	11/16/1994
MRS-34	MRS-34_10 G	Rocket, 2.36inch, practice, M7	0	0	5751822.75	2144258.25	MD	1	11/8/1994
MRS-34	MRS-34_10 Q	Rocket, 2.36inch, practice, M7	0	0	5752587.25	2143624.00	MD	1	11/9/1994
MRS-34	MRS-34	Rocket, 2.36inch, practice, M7	0	0	5752134.00	2144150.00	MD	4	8/24/1994
MRS-34	MRS-34	Rocket, 2.36inch, practice, M7	0	0	5752134.00	2144150.00	MD	1	8/24/1994
MRS-34	MRS-34	Rocket, 2.36inch, practice, M7	0	0	5752134.00	2144150.00	MD	11	8/24/1994
MRS-34	MRS-34	Rocket, 2.36inch, practice, M7	0	0	5752134.00	2144150.00	MD	6	8/24/1994
MRS-34	MRS-34_05 G	Rocket, 2.36inch, practice, M7	0	0	5752199.08	2144584.79	MD	1	8/31/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_12 M	Rocket, 2.36inch, practice, M7	0	0	5752140.00	2143735.96	MD	1	8/31/1994
MRS-34	MRS-34_14 A	Rocket, 2.36inch, practice, M7	0	0	5751058.36	2144380.92	MD	6	8/31/1994
MRS-34	MRS-34_12 F	Grenade, rifle, antitank, practice, M11 series	0	0	5751594.08	2144189.96	MD	6	9/1/1994
MRS-34	MRS-34_12 F	Rocket, 2.36inch, practice, M7	0	0	5751594.08	2144189.96	MD	1	9/1/1994
MRS-34	MRS-34_06 H	Rocket, 2.36inch, practice, M7	0	0	5752205.76	2144453.30	MD	1	9/12/1994
MRS-34	MRS-34_09 R	Rocket, 2.36inch, practice, M7	0	0	5752739.83	2143625.00	MD	1	9/12/1994
MRS-34	MRS-34_10 P	Rocket, 2.36inch, practice, M7	0	0	5752510.75	2143687.42	MD	1	9/12/1994
MRS-34	MRS-34_11 G	Rocket, 2.36inch, practice, M7	0	0	5751746.50	2144192.13	MD	1	9/12/1994
MRS-34	MRS-34_11 H	Rocket, 2.36inch, practice, M7	0	0	5751830.52	2144122.09	MD	1	9/12/1994
MRS-34	MRS-34_11 H	Rocket, 2.36inch, practice, M7	0	0	5751830.52	2144122.09	MD	1	9/12/1994
MRS-34	MRS-34_11 R	Rocket, 2.36inch, practice, M7	0	0	5752586.00	2143493.79	MD	3	9/12/1994
MRS-34	MRS-34_09 T	Rocket, 2.36inch, practice, M7	0	0	5752894.33	2143496.67	MD	1	9/13/1994
MRS-34	MRS-34_07 Q	Rocket, 2.36inch, practice, M7	0	0	5752816.25	2143818.88	MD	1	9/15/1994
MRS-34	MRS-34_12 B	Rocket, 2.36inch, practice, M7	0	0	5751288.75	2144444.21	MD	1	9/28/1994
MRS-34	MRS-34_04 F	Rocket, 2.36inch, practice, M7	0	0	5752196.75	2144713.38	MD	1	9/6/1994
MRS-34	MRS-34_08 I	Rocket, 2.36inch, practice, M7	0	0	5752138.00	2144253.08	MD	1	9/6/1994
MRS-34	MRS-34_03 B	Rocket, 2.36inch, practice, M7	0	0	5751966.50	2145034.92	MD	1	9/8/1994
MRS-34	MRS-34_10 A	Rocket, 2.36inch, practice, M7	0	0	5751359.51	2144642.47	MD	2	9/8/1994
MRS-34	MRS-34_14 C	Rocket, 2.36inch, practice, M7	0	0	5751211.81	2144248.12	MD	1	
MRS-34	MRS-34_14 F	Rocket, 2.36inch, practice, M7	0	0	5751452.73	2144066.77	MD	1	
MRS-34	MRS-34_14 H	Rocket, 2.36inch, practice, M7	0	0	5751623.69	2143939.16	MD	2	
MRS-34	MRS-34_15 C	Rocket, 2.36inch, practice, M7	0	0	5751147.17	2144191.09	MD	2	
MRS-34	MRS-34_15 F	Rocket, 2.36inch, practice, M7	0	0	5751385.00	2144008.38	MD	1	
MRS-34	MRS-34_15 J	Rocket, 2.36inch, practice, M7	0	0	5751721.67	2143749.84	MD	1	
MRS-34	MRS-34_16 B	Grenade, rifle, antitank, practice, M11 series	0	0	5750987.77	2144182.39	MD	1	
MRS-34	MRS-34_09 D	* 2.36 INCH ROCKET MOTOR PIECES (OE Scrap)		0	5751669.50	2144513.42	MD	1	10/18/1994
MRS-34	MRS-34_04 G	* NOSE CONE (OE Scrap)		0	5752273.42	2144649.25	MD	1	10/19/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	MRS-34_08 E	* PRACTICE RIFLE GRENADE (Model Unknown)		0	5751820.42	2144516.58	MD	1	10/24/1994
MRS-34	MRS-34_06 A	* 2.36 INCH W/H (Model Unknown)		0	5751661.19	2144904.64	MD	1	10/3/1994
MRS-34	MRS-34_01 D	* ROCKET MOTOR (Model Unknown)		0	5752273.67	2145037.20	MD	1	10/31/1994
MRS-34	MRS-34_09 B	* 2.36 INCH ROCKET MOTOR PIECES (OE Scrap)		0	5751515.17	2144641.58	MD	1	10/5/1994
MRS-34	MRS-34_10 M	* SMOKE GRENADE (Model Unknown)		0	5752291.50	2143869.33	MD	1	10/5/1994
MRS-34	MRS-34_05 B	* 2.36 INCH ROCKET FUZE (Model Unknown)		0	5751816.25	2144903.92	MD	1	10/6/1994
MRS-34	MRS-34_13 C	* 2.36 INCH WARHEAD W/OUT FUZE (Model Unknown)		0	5751285.00	2144309.88	UXO	1	10/6/1994
MRS-34	MRS-34_11 F	* 2.36 INCH FIN ASSEMBLY (OE Scrap)		0	5751669.92	2144255.79	MD	1	11/23/1994
MRS-34	MRS-34_12 E	* RIFLE GRENADE (Model Unknown)		0	5751517.75	2144253.50	MD	2	11/7/1994
MRS-34	MRS-34_12 E	* 2.36 INCH WARHEAD (Model Unknown)		0	5751517.75	2144253.50	MD	2	11/7/1994
MRS-34	MRS-34_12 E	* 2.36 INCH NOSE CONE (OE Scrap)		0	5751517.75	2144253.50	MD	1	11/8/1994
MRS-34	MRS-34_12 E	* 2.36 CONE (OE Scrap)		0	5751517.75	2144253.50	MD	1	11/8/1994
MRS-34	LE3-MB06-SJ07	* Fragment, Unknown, 0.5" x 1		1	5751159.41	2143982.84	MD	1	3/18/1999
MRS-34	LE3-MB07-SG06	* Rocket, 2.36", Practice, M7		30	5752101.44	2144504.08	MD	1	3/18/1999
MRS-34	LE3-MB07-SH01	* Rocket, 2.36", Nose Cone		10	5751537.49	2143779.45	MD	1	3/18/1999
MRS-34	LE3-MB07-SI02	* Fragment of 2.36" Rocket, Practice		2	55751638.05	2143834.40	MD	1	3/18/1999
MRS-34	LE3-MB07-SJ06	* Fragment, Unknown, 1" x 3		12	5752028.92	2143950.21	MD	1	3/18/1999
MRS-34	LE3-MB08-SH01	* Fragment, Uknown		8	5752587.77	2143728.62	MD	1	3/18/1999
MRS-34	LE3-MB08-SI09	* Fragment, Uknown		6	5753331.98	2143878.18	MD	1	3/18/1999
MRS-34	LE3-MB08-SJ07	* Grenade, Smoke, Scrap		2	5753140.01	2143910.61	MD	1	3/18/1999
MRS-34	LE3-MC06-SB08	* Fragment of 2.36" Rocket, Practice		6	5751223.05	2144185.12	MD	1	3/18/1999
MRS-34	LE3-MC06-SD07	* Rocket, 2.36" (Motor)		6	5751172.39	2144330.21	MD	1	3/18/1999
MRS-34	LE3-MC06-SD08	* Rocket, 2.36" (Motor)		12	5751237.42	2144367.93	MD	1	3/18/1999
MRS-34	LE3-MC06-SD08	* Rocket, 2.36" (Motor)		12	5751209.71	2144320.21	MD	1	3/18/1999
MRS-34	LE3-MC06-SE07	* Rocket, 2.36" (Venturi)		9	5751197.77	2144415.31	MD	1	3/18/1999
MRS-34	LE3-MC07-SA07	* 155mm Shipping plugs, 3 each		12	5752171.49	2144040.58	MD	1	3/18/1999
MRS-34	LE3-MC07-SF07	* Rocket, 2.36", Practice		20	5752129.02	2144552.73	MD	1	3/18/1999

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
MRS-34	LE3-MC07-SJ07	* Rocket, 2.36", Practice, Nose		3	5752161.83	2144984.52	MD	1	3/18/1999
MRS-34	LE3-MC08-SC05	* Fragment, 3 each		0	5752990.68	2144295.71	MD	1	3/18/1999
MRS-34	MRS_34_G 03 B	* Ballast Counterweight for M7 Practice 2.36" rocket		4	5751552.77	2144065.63	MD	1	4/15/1999
MRS-34	MRS_34_G 07	* Rocket, Practice, 2.36" M7		30	5752102.44	2144504.48	MD	1	4/21/1999
MRS-34	MRS-34	* SMOKE GRENADES (Model Unknown)		0	5752134.00	2144150.00	MD	4	8/22/1994
MRS-34	MRS-34	* RIFLE GRENADE TAIL (Model Unknown)		0	5752134.00	2144150.00	MD	1	8/22/1994
MRS-34	MRS-34	* SMOKE GRENADES (Model Unknown)		0	5752134.00	2144150.00	MD	2	8/22/1994
MRS-34	MRS-34_14 A	* SMOKE GRENADES (Model Unknown)		0	5751058.36	2144380.92	MD	2	8/25/1994
MRS-34	MRS-34_12 I	* 2.36 INCH ROUND (Model Unknown)		0	5751839.83	2143985.62	MD	1	8/31/1994
MRS-34	MRS-34_14 A	* EMPTY RIFLE GRENADE (OE Scrap)		0	5751058.36	2144380.92	MD	1	8/31/1994
MRS-34	MRS-34_14 A	* 2.36 INCH COUNTER WEIGHT (OE Scrap)		0	5751058.36	2144380.92	MD	10	8/31/1994
MRS-34	MRS-34_12 G	* 2.36 INCH WARHEAD (Model Unknown)		0	5751670.67	2144126.33	MD	1	9/1/1994
MRS-34	MRS-34_11 E	* 2.36 INCH NOSE CONE (OE Scrap)		0	5751593.50	2144319.29	MD	1	9/12/1994
MRS-34	MRS-34_11 F	* 2.36 INCH ROCKET WARHEADS (Model Unknown)		0	5751669.92	2144255.79	MD	3	9/12/1994
MRS-34	MRS-34_11 F	* RIFLE GRENADE PRACTICE (Model Unknown)		0	5751669.92	2144255.79	MD	1	9/12/1994
MRS-34	MRS-34_11 G	* RIFLE GRENADE PRACTICE WARHEAD (Model Unknown)		0	5751746.50	2144192.13	MD	1	9/12/1994
MRS-34	MRS-34_11 H	* 2.36 INCH COUNTER WEIGHT (OE Scrap)		0	5751830.52	2144122.09	MD	3	9/12/1994
MRS-34	MRS-34_11 H	* 2.36 INCH FRAGMENTS (OE Scrap)		0	5751830.52	2144122.09	MD	1	9/12/1994
MRS-34	MRS-34_08 S	* 2.36 INCH NOSE SHIELD (OE Scrap)		0	5752893.00	2143626.00	MD	1	9/13/1994
MRS-34	MRS-34_08 T	* 2.36 INCH SHAPE CHARGE CONE (OE Scrap)		0	5752970.50	2143561.63	MD	1	9/13/1994
MRS-34	MRS-34_14 I	* 2.36 INCH COUNTER WEIGHT (OE Scrap)		0	5751713.68	2143872.15	MD	2	9/22/1994
MRS-34	MRS-34_13 B	* 2.36 INCH NOSE CONE (OE Scrap)		0	5751210.35	2144375.05	MD	2	9/29/1994
MRS-34	MRS-34_04 G	* 2.36 INCH PRACTICE BAZOOKA HEAD (OE Scrap)		0	5752273.42	2144649.25	MD	1	9/6/1994
MRS-34	MRS-34_12 E	* 2.36 INCH WARHEAD (Model Unknown)		0	5751517.75	2144253.50	MD	12	9/6/1994
MRS-34	MRS-34_06 N	* GRENADE (Model Unknown)		0	5752667.75	2144070.33	MD	1	9/8/1994
MRS-34	MRS-34_12 E	* 2.36 INCH WARHEAD (Model Unknown)		0	5751517.75	2144253.50	MD	9	9/8/1994

Database List of MEC/MD Items Found

Site	Grid	MM Items	Risk Code	Depth (in)[1]	Easting (ft)	Northing (ft)	MM Type	Quantity	Date
NOTES:									
1) The"0" depth value shown in the MMRP database for the items with 1994 dates (1994 UXB removal action) does not reflect the actual depth of the item. Depths were not recorded during that removal action and therefore are unknown.									
2) The asterisk * in MM Item description field means there is no equivalent Master Pick List nomenclature for the item, the nomenclature from the original grid sheet was used.									
3) Data Source: MMRP database, downloaded on March 8, 2012.									

APPENDIX D

CITY OF MARINA MUNICIPAL CODE, ORDINANCE 98-04

MARINA MUNICIPAL CODE

Chapter 15.56

Ordinance 98-04: DIGGING AND EXCAVATION ON THE FORMER FORT ORD

Sections:

15.56.010 Purpose and intent.
15.56.020 General.
15.56.030 Designation and applicability.
15.56.040 Excavation and digging restrictions.
15.56.050 Permit requirements.
15.56.060 Permit procedure.
15.56.070 Term of permit.
15.56.080 Exceptions to permit conditions.
15.56.090 Performance bond.
15.56.100 Amendment to permits. 15.56.110 Appeals.
15.56.120 Notification to property owners and other land users.
15.56.130 Revision of chapter.

15.56.010 Purpose and intent.

The United States Army (Army) is in the process of transferring various parcels of the former Fort Ord military installation (Fort Ord) to the city or to other entities within the city's land use jurisdiction. Some parcels of the former Fort Ord were contaminated with unexploded ordnance and explosives (UXO), which is a hazardous waste. The Army will not transfer those parcels until it has completed response actions for UXO as required by law. Even following the Army's completion of UXO response actions, it is possible that some UXO materials may remain on those parcels. The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has statutory responsibility to oversee cleanup of releases of hazardous substances, which includes hazardous waste. DTSC cannot certify that all UXO has been cleared and has considered requiring land use restrictions that will be recorded with the Monterey County recorder. The city believes that recorded land use restrictions would burden the title of those parcels and present economic disincentives to develop them. The city and DTSC desire that sufficient controls and restrictions be placed on these parcels to protect the public health, safety and in a manner equivalent to that resulting from recordation of land use restrictions. (Ord. 98-4 § 1 (part), 1998)

15.56.020 General.

The city council finds and determines that those properties formerly included within the Fort Ord military installation which are suspected of containing UXO require special standards and procedures for digging and excavation in addition to those contained in the building code, to ensure that:

A. Neither digging or excavation nor development of such properties occurs until ordnance or explosive remediation thereon is completed;

B. Potential purchasers or developers of UXO sites and those persons whose work at UXO sites includes disturbing soil, are aware of the potential that UXO may be located on these properties and are aware of the requirements for UXO remediation prior to any digging, excavation or ground disturbance thereon; and

C. DTSC should be continuously involved in the establishment of controls for those properties because it has statutory oversight responsibility with respect to hazardous substance response actions. (Ord. 98-4 § 1 (part), 1998)

15.56.030 Designation and applicability.

A. The city council shall by resolution, and with the concurrence of DTSC, designate all real property within the

city's land use jurisdiction which was formerly part of Fort Ord and which have been identified in the Revised Archives Search Report, Former Fort Ord, dated 1997, or are otherwise identified, as the possible location of unexploded ordnance or explosives as an ordnance remediation district. All such districts shall be depicted on a grading district map by an "ORD" suffix to indicate the existence of ordnance remediation obligations on such property and, upon receipt of notification by the Army of specific requirements or restrictions on such districts, a notation thereof. The city shall notify DTSC of any change in the permitted land uses in any district within thirty days after it adopts any change.

B. The regulations in this chapter shall apply in all "ORD" districts and shall be in addition and subject to all provisions of the municipal code including Title 17 and the building code. (Ord. 98-4 § 1 (part), 1998)

15.56.040 Excavation and digging restrictions.

It is unlawful for any person, including utilities, to engage in any of the following activities on any property located within a district unless that person is acting pursuant to a valid permit issued pursuant to this chapter: excavation, digging, development or ground disturbance of any type (A) involving the displacement of ten cubic feet or more of soil; or (B) in violation of requirements or restrictions placed on such property by the Army and as noted on the grading district map. (Ord. 98-4 § 1 (part), 1998)

15.56.050 Permit requirements.

An owner or user of real property located within a district who desires to conduct the activities described in Section 15.56.040 shall apply to the director of public works (director) for a permit. The application shall be on a form approved by the city, shall be signed by the permit applicant, and shall contain the following information:

A. A description of any previous UXO excavation or removal activity conducted on the property whose soil is proposed to be excavated, moved or graded;

B. A description of the property whose soil is proposed to be excavated, moved or graded. The description shall include a drawing with dimensions to a scale which sets forth the size and details of all proposed excavation activity, including any proposed cut and fill, trenching, well drilling, mineral excavation, post hole drilling, or other activity of any sort whenever the applicant proposes to (1) disturb ten cubic feet or more of soil; or
(2) disturb soil in a manner inconsistent with restrictions placed on the property by the Army and as noted on the grading district map;

C. A statement that the person submitting the application acknowledges liability for removing all detected unexploded ordnance and explosives in accordance with this chapter and the permit;

D. A statement by the person submitting the application that s/he has, within the preceding twelve months, delivered a copy of the notice to everyone whose work at the property described in subsection B above includes disturbing soil;

E. Any other information which the director may require as pertinent to the determination of the adequacy of the proposed plan;

F. Payment of the permit fee, as established by the city council, at the time of filing the application for the permit. (Ord. 98-4 § 1 (part), 1998)

15.56.060 Permit procedure.

The director shall review the permit application and shall approve the permit unless evidence is available which indicates that the proposed grading or excavation will create an undue risk to the health and safety of the public at large. Prior to acting on any such application, the director, in his/her sole discretion, may set and conduct a public hearing for the purpose of receiving comments on the proposed grading and excavation. Except as otherwise indicated in Section 15.56.080, any permit issued hereunder shall be subject to the following conditions:

A. All excavation and grading shall be performed solely in accordance with the permit approved by the city and in accordance with the permit as issued by the city.

B. Prior to movement of any soil on any property located within a district, the permittee or designee shall personally deliver to each person who intends to work on the property described in the permit the notice and safety

plan which is attached hereto as Exhibit A, and explain to each such person the information set forth in that notice.

C. The permittee may not move or disturb soil in a manner inconsistent with restrictions placed on the property by the Army and as noted on the grading district map unless there is a Department of Defense certified, or equivalent, explosive ordnance disposal technician acceptable to the director who is on site and visually supervises any such activity. Any excavation or soil disturbance inconsistent with restrictions placed on the property by the Army may be accomplished only after investigation using sweep lanes no wider than five feet throughout the excavation area and after using detection devices and visual identification to locate, identify and remove any unexploded ordnance discovered during such excavation activity.

D. The permittee shall cease soil disturbance activities and shall notify the Army and DTSC of any suspected unexploded ordnance discovered during any excavation or soil removal immediately upon discovery. The permittee shall coordinate appropriate response actions with the Army and DTSC.

E. No later than thirty days following the completion of the permitted soil disturbance activity, the permittee shall prepare and file with the director, the Army and DTSC an after action report that shall state whether and where UXO was detected and the extent and depth of UXO response actions undertaken and completed on the property that is the subject of the permit. The after action report shall include site maps to illustrate the information contained in the report. All after action reports prepared and filed in accordance with this chapter shall be deemed public records.

F. The permittee agrees as a condition of issuance of a permit to defend at its sole expense, indemnify and hold harmless from any liability the city, and reimburse the city for any expenses incurred resulting from or in connection with the approval of the project including any claim, suit or legal proceeding. The city may, at its sole discretion, participate in the defense of any such action, but such participation shall not relieve the permittee of its obligations under this subsection. (Ord. 98-4 § 1 (part), 1998)

15.56.070 Term of permit.

The permit shall be valid for one year from the date it is issued. (Ord. 98-4 § 1 (part), 1998)

15.56.080 Exceptions to permit conditions.

Following consultation with and approval by DTSC, the city council may, upon a finding that the requirements of Section 15.56.060C are no longer necessary, designate by resolution any district as a limited control district. The holder of any permit issued for any limited control district shall not be subject to section 15.56.060C. (Ord. 98-4 § 1 (part), 1998)

15.56.090 Performance bond.

Upon a finding by the director that a permit should issue for excavation or grading on the proposed site, a surety bond, lien or other security guarantee conditioned upon the faithful performance and completion of the permitted excavation activity shall be filed with the city. Such surety shall be executed in favor of the city and shall be maintained in an amount prescribed by the director sufficient to ensure the completion of the ordnance remediation and excavation of the site as prescribed in the approved permit. (Ord. 98-4 § 1 (part), 1998)

15.56.100 Amendment to permits.

Request for amendments to an approved excavation permit may be submitted to the director at any time, detailing proposed changes from the original permit. Deviations from the original permit shall not be undertaken until such amendment has been approved by the city in writing. Amendments to an approved permit shall be approved by the same procedure as prescribed for the approval of the original excavation permit. (Ord. 98-4 § 1 (part), 1998)

15.56.110 Appeals.

Any person aggrieved by any determination of the director in exercise of the authority granted in this chapter

shall have the right to appeal to the city council. Any appeal setting forth the contested decision and the reasons for contesting same must be filed within ten working days after the posting of the director's decision at the three places designated by the city council. The city council shall render its decision within sixty days following the filing of the notice of appeal. The council may affirm, reverse or modify the decision of the director. The council action shall be final upon issuance of its decision. (Ord. 98-4 § 1 (part), 1998)

15.56.120 Notification to property owners and other land users.

A. To the extent that the Army identifies those persons to whom it has conveyed property that is designated ordnance remediation districts, the city will notify those persons and those utilities known to be providing service within the city, of the requirements of this chapter and provide those persons with the notice and safety plan (notice), which is attached hereto as Exhibit A. The city shall annually notify the owners of such property as shown on the equalized tax rolls of the requirements of this chapter and provide those persons with a copy of the notice. Failure of any owner, occupant or user of such land to receive such notification shall not relieve that person from responsibility for compliance with this chapter.

B. All owners, occupants or users of land subject to this chapter, including utilities, shall notify any subsequent owners, assigns, lessees or users of such land of the requirements of this chapter. Notification shall be made prior to transfer of the property in question.

C. All persons identified in subsection A above shall deliver, at least annually, a copy of the notice to everyone whose work at UXO sites includes disturbing soil and shall explain the contents thereof to those persons. (Ord. 98-4 § 1 (part), 1998)

15.56.130 Revision of chapter.

This chapter shall not be revised without prior written notice to the DTSC and subject to the terms of that certain agreement between the city and DTSC dated April 21, 1998. (Ord. 98-4 § 1 (part), 1998)

APPENDIX E

RESPONSE TO COMMENTS

RESPONSES TO COMMENTS

Document:	Draft Track 2 Munitions Response, Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area, Former Fort Ord, California
Commenting Organization:	California Department of Toxic Substances Control
Name:	Ed Walker
Date of Comments:	June 20, 2012

General Comment 1:
The Department of Toxic Substances Control has reviewed the Draft Track 2 Munitions Response Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area, former Fort Ord, California, March 2012.

The Remedial Investigation documents two removal actions performed and the results of the Risk Assessment.

Both removal actions included 100 percent geophysical investigation and removal of all detected anomalies. The Risk Assessment identifies a potential presence of Munitions and Explosives of Concern (MEC) at the site below geophysical detection limits. Based on the site information, the potential that MEC will be encountered in the future is considered highly unlikely. To account for the minimal risk identified there are institutional controls and education plans in place. These include requirements for excavation permits and a community relations and an education plan.

Based on the results of the Remedial Investigation and documented institutional controls and community relations plan, the Department of Toxic Substances Control concurs that no actionable risk was identified regarding current conditions at the site, and concurs with the no further action recommendation.

Response to General Comment 1:

As outlined in the Remedial Investigation, the No Further Action recommendation is based on the previous completion of two MEC removals at the site. Although potential risk cannot be completely eliminated, MEC are not expected to be encountered and no further action is warranted.

Section 2.2.1 of the RI describes a number of basewide efforts that promote MEC safety because of Fort Ord's history as a military base. These efforts include MEC recognition and safety training available to anyone who requests it, and the City of Marina ordinance regarding construction activity that requires acquisition of permits that address appropriate precautionary measures and notifications. These two precautionary measures are particularly relevant to MRS-34, therefore Section 5.0 has been modified to make a note of them.

RESPONSES TO COMMENTS

Document:	Draft Track 2 Munitions Response, Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area, Former Fort Ord, California
Commenting Organization:	U.S. Environmental Protection Agency
Name:	Lewis Mitani
Date of Comments:	May 30, 2012

General Comment 1:

The definition of explosive soil found on pages viii and ix of the Glossary section of the Draft Track 2 Munitions Response Remedial Investigation, Munitions Response Site 34, Fritzsche Army Airfield Area (March 2012) (hereinafter referred to as the "Draft T2 MR RI MRS 34") cites the "Military Munitions Response Actions Engineer Manual (EM) 1110-1-4009, U.S. Army Corps of Engineers, June 15, 2007" as its source. While the definition provided is the correct definition found in the cited EM, the Department of Defense Ammunition and Explosives Safety Standards (DoDM 6055.09-M) contains an updated definition in Volume 7 (Criteria for Unexploded Ordnance, Munitions Response, Waste Military Munitions, and Material Potentially Presenting an Explosive Hazard), Section V7.E4.4.1 (Explosive Soil). While the cited concentrations of primary (initiating) explosives, nitrocellulose, nitroglycerin, and nitroguanidine will not likely be observed at the Former Fort Ord, the updated definition does provide additional information and should replace the obsolete definition provided from EM 1110-1-4009. Please make this change.

Response to General Comment 1:

The definition of explosive soil presented in the Glossary will be revised to include the updated definitions found in DoDM 6055.09-M, Volume 7, Section V7.E.4.1.

Specific Comment 1:

Table of Contents, Page i: The word "Fritzsche" is spelled "Fritzxche" in the header of this page. Please correct this.

Response to Specific Comment 1:

The typographical error will be corrected in subsequent versions of the document.

Specific Comment 2:

Section 3.3, History of MR Investigations, Page 18: The list of munitions provided in the second paragraph includes "eight M11 rifle-launched practice smoke grenades" as being

removed from the site. This item, as described here, does not appear to exist as a type classified military munition. A description of what is likely the correct nomenclature for this munition is found in Section 3.4.1, Training Practices, in the Rifle Grenade subsection on pages 20 and 21. There the item is described as the "M11 series anti-tank (AT) practice rifle grenade." Please review the noted nomenclature and correct it as needed.

Response to Specific Comment 2:

The description of the M11 in Section 3.3 will be revised to be consistent with the nomenclature used in Section 3.4.1 (anti-tank practice rifle grenade).

Specific Comment 3:

Section 3.5.2.3.1, Investigation Design and Methods, Pages 33 and 34: This section contains a table that has some entries that require further explanation. These are:

- TNT: It is unclear how a geophysical instrument is expected to detect the explosives TNT, which is not metallic. If this is intended to be a TNT demolition charge (which has metallic [tin plate or steel] end caps), this should be noted. Also, the size of the charge (i.e., ¼ pound, ½ pound, 1 pound) should be provided in the listing due to the different mass of metal in the end caps for the various sizes.

- Grenade: The term “grenade” includes over 30 munitions of various types and sizes. Some are constructed of non-metallic materials (fuzes excepted). The type(s) of grenades used or simulated should be noted.

Please revise the noted table to provide the requested information.

Response to Specific Comment 3:

The reference to “TNT” used in the table in Section 3.5.2.3.1 will be revised to “TNT simulation” and the table will include a corresponding footnote used in the USA report describing the simulation as a 4-inch by 1-inch wooden dowel with metal washers attached to the ends.

The reference to “Grenade” in the table in Section 3.5.2.3.1 will be revised to “Smoke Grenade” as cited in the USA report.

Specific Comment 4:

Section 3.6.2, Recommendations, Page 40: This section states that, “Reviews of the available literature, removal results, and equipment performance results indicate that the MRS-34 geophysical investigation successfully detected, excavated, and recovered the desired MEC items and that the potential safety hazard has been removed.” This sentence is confusing. It is

unclear why the word "desired" is included in the sentence (i.e., were any “undesired” MEC left behind?). Also, this sentence states that, "...the potential safety hazard has been removed.” In contrast, this is followed by a sentence that states that, "However, it is possible, although unlikely, that MEC could remain at the site." This seems to contradict the assertion that the potential safety hazard has been removed.

Please review the noted verbiage and correct it as needed to reflect the fact that the hazard has been reduced significantly, but that it is unlikely that it has been completely eliminated.

Response to Specific Comment 4:

Sentence 1 of Section 3.6.2 will be revised to “…the MRS-34 geophysical investigation successfully detected, excavated, and recovered MEC items and that the potential safety hazard has been significantly reduced.”

Specific Comment 5:

Section 5.0, Conclusions, Page 43: This section states that, “...all detectable MEC/MD have already been removed..." This is not correct. This should be revised to state that, “... all detected MEC/MD have already been removed...” The MEC/MD that has been removed is that which was detectable by the instruments employed. It is not necessarily all that is detectable by other means, to include soil sifting. Please revise the cited statement as requested.

Response to Specific Comment 5:

Sentence 1 of Section 5.0, paragraph 2 will be revised as requested to “… all detected MEC/MD have already been removed…”

RESPONSES TO COMMENTS

Document:	Draft Track 2 Munitions Response Remedial Investigation Munitions Response Site 34, Former Fritzsche Army Airfield Area Former Fort Ord, CA, March 2012, Former Fort Ord, CA, April 2012
Commenting Organization:	Marina in Motion and Edson Ecosystems
Name:	Dan Amadeo and Jeff Edson
Date of Comments:	May 24, 2012

Marina in Motion – Dan Amadeo

Comment 1:
"Please accept the comments from Marina in Motion's Technical Assistant attached at enclosure.

This document provides sufficient background and summary data without requiring significant research of the administrative record."

Response to Comment 1:
No response required.

Question 1:
"Does the Army and/or regulatory agencies have responsibility for additional survey and remediation if additional MEC is subsequently found after the land is transferred to the appropriate jurisdiction?"

Response to Question 1:
The property has already been transferred to the City of Marina under a Finding of Suitability for Early Transfer (FOSET) as described in Section 1.0 and Section 2.1.3.3 of the RI. Deed notifications and restrictions specify subsequent site use criteria and reporting procedures in the unlikely event that MEC is discovered at the site, as described in Sections 2.1.3 and 2.2.1. Additionally, in the unlikely event of an incidental discovery of a munitions item outside of a former MRS or within an area where a previous removal action was conducted, the Army will develop a plan for an appropriate follow-on action in accordance with the Munitions Response Site Security Program, and any such action will be coordinated with the regulatory agencies.

Question 2:
"Does the Army and/or regulatory agencies have responsibility for ensuring and monitoring the Ordinance [sp.] Ordinance, local ordinances, and applicable institutional controls are followed after the land has been transferred?"

Response to Question 2:
Local ordinances are under the jurisdiction of the local government. The Army is not responsible for monitoring the City of Marina Ordinance 98-04 in relation to MRS-34. The ordinance was developed in accordance with an agreement between the City of Marina and DTSC, and cannot be modified or terminated without notice to DTSC, as discussed in Sections 2.1.3, 5.0, and Appendix B Section B.1.2.

Edson Ecosystems – Jeff Edson

Comment 1:
"Introduction: This report presents the results of a Remedial Investigation (RI) at the Munitions Response Site (MRS)-34. MRS-34 is a 70.5 acre site located in the northwestern portion of the former Fort Ord, in the vicinity of what was formerly the Fritzsche Army Airfield (FAAF) and is now the Marina Municipal Airport. The FAAF property, including MRS-34, the airfield, and associated structures, was transferred to the City of Marina in 2001. Fort Ord archives identifies a 1946 Fort Ord Master Plan map that pre-dated the presence of the airfield and showed a practice area for bazooka and rifle grenades north of the current airport runways in areas that now are open grasslands."

"This RI provides an evaluation of whether the previous investigation work performed has adequately mitigated potential risks to public safety from hazards associated with the potential presence of MEC from the historical practice range. Evaluations and conclusions in the report are based on reviews of data acquired during previous investigations. No new field data was acquired and no new investigation activities were performed for completion of this report."

Response to Comment 1:
No response necessary.

General Comment 1:
"This primary document is well written and provides MiM and the public sufficient historical/background information necessary to understand and form an educated opinion regarding the document's conclusions. Descriptions of historical investigations are detailed; information regarding investigation design, methods and equipment are adequately described. The need to independently research documents in the Administrative Record was minimal."

Response to General Comment 1:
No response necessary.

General Comment 2:
"Edson Ecosystems 'agrees' with the conclusions described in Section 5. The only concern with the Army's RI and recommendation is the omission of the MK23 practice bomb discovery located 15 feet outside the MRS-34 boundary. There was little discussion as to how the practice bomb became located in the area and what additional investigations were performed to verify that additional practice bombs (or other MEC) didn't exist outside the MRS-34 boundary. Because of the lack of historical records in this area, this discovery cannot be ignored."

"Finally, because the site poses a risk, although low, if this document is considered a Remedial Investigation/Feasibility Study (RI/FS), it should include a discussion of the Army's evaluation of remedial alternatives (see General Comment 3 below). As written, there is no discussion as to how the "no further action" alternative was evaluated against other remedial options. For example, does the Army consider Marina's city ordinance part of the final remedy; is the "no further action" alternative protective without the city's ordinance?"

Response to General Comment 2:
Item 1: The Army evaluated archived data regarding historical use of MK23 miniature practice bombs and reviewed information on reconnaissance that had been conducted at other historical military facilities in California where the MK23 was known to have been used, in order to evaluate whether similar site characteristics existed at MRS-34 and surrounding vicinity that could be indicative of historical MK23 target practice. The Army found no other evidence of bomb-related items at MRS-34 and no evidence that the area was used as a bombing target. In coordination with the agencies, the Army has concluded that the presence of the MK23 miniature practice bomb at the location found was a single anomalous occurrence unrelated to MRS-34 historical activities, that the area had not been used for any related practice activities, and that no further action was needed.

Item 2: This document does not include a feasibility study. The headers on some of the pages incorrectly include the phrase "Feasibility Study", which will be removed from subsequent versions of the document. As discussed in Section 5.0 of the RI, the No Further Action recommendation is based on the previous completion of two MEC removals at the site, which has already achieved the lowest level of risk as demonstrated by the RA, and all reasonable remedial criteria for the site have already been achieved. Although potential risk cannot be completely eliminated, MEC are not expected to be encountered and in the absence of actionable potential remaining risk no further action is warranted.

Section 2.2.1 of the RI describes a number of basewide efforts that promote MEC safety because of Fort Ord's history as a military base. These efforts include MEC recognition and safety training available to anyone who requests it. Some 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, and the City of Marina

has adopted an ordinance regarding construction activity that requires acquisition of permits that address appropriate precautionary measures and notifications.

General Comment 3:
"The header for this document states, 'Draft Track 2 Munitions Response Remedial Investigation/Feasibility Study Munitions Response Site 34 Former Fritzsche Army Airfield Area Former Fort Ord, California' (emphasis added). The intent of the report is confusing; is this report considered a Feasibility Study (FS) in addition to providing the results of the RI? Why does it state on page 5, 'Based on results of the RI and RA as presented in this document, completion of a FS is not required?' The header titles should correlate with the document title."

Response to General Comment 3:
As indicated in the response to Comment No. 2 above, this document does not include a feasibility study, and page headers will be corrected accordingly.

Specific Comment 1:
"Section 3.3 - History of MR Investigations - Were there follow-up investigations to the 1994 USB survey to verify MRS-34's boundaries? Because the 1999 resurvey discovered MD that was not identified in the 1994 clearance, is the 1994 survey reliable in defining the site's boundaries? This question is critical as Figure 3-1 identifies the discovery of MEC along the northwestern boundary, along with the discovery of a MK23 practice bomb located 15 feet outside the MRS-34's perimeter."

Response to Specific Comment 1:
Identification of the practice range that is now designated as MRS-34 was based on a systematic reconnaissance sweep of the larger area west, north, and east of the former Fritzsche Army Airfield airstrip as preparation for the 1994 removal action. The boundaries of the range were established based on the specific distribution of range associated debris as determined from the evaluation of the entire Fritzsche Army Airfield area. The identification of MEC within the northwestern portion of MRS-34 is consistent with the established boundary. The Army's evaluation of the data indicates that the presence of the single inert MK-23 miniature practice bomb found in the area was an isolated anomaly unrelated to historical range use at MRS-34 and unrelated to the location of the range or identified range boundaries, and the RI found no data that indicates any modification of the site boundary is needed.

Specific Comment 2:
"Section 3.4.4 - Potential Exposure Routes - This section states, 'It is expected that any remaining MEC would be similar to the types of MEC items that were found previously at the site.' The section goes on to state, 'Based on the proposed reuse, office workers and recreational users are not expected to encounter MEC because their activities are not expected to include subsurface intrusion.' With historical discoveries of non-

penetrating MEC, i.e., rifle and smoke grenades, why does the conceptual site model limit MEC exposure to the subsurface?"

Response to Specific Comment 2:
The site conceptual model includes surface and subsurface potential exposures. Two removal actions including surface and subsurface removal were performed at MRS-34, and no MEC was found during investigations performed after the initial 1994 removal action. However, uncertainties inherent with former use of the site as a practice range create potential risk for both surface and subsurface encounters. Although uncertainty exists regarding potential subsequent exposures from MEC remaining on the ground surface, subsequent site use is expected to include construction and associated development that would be more likely to encounter or expose MEC through disturbance of the ground surface. The quoted statement is intended to refer specifically to the greater exposure potential that exists for those individuals performing subsurface intrusive work and is not intended to indicate that potential surface exposure does not exist. However, office workers and recreational users would be less likely to encounter MECs subsequent to development, due to the presence of buildings, paving, and landscaping.

Specific Comment 3:
"Section 3.5.2.3.1 - Investigation Design and Methods - Were there follow-up MEC investigation adjacent to the discovery of a MK23 practice bomb located 15 feet outside the MRS-34's perimeter? What conclusions were derived from its discovery?"

"In addition, were any of the MD discovered inconsistent with MEC historically used and cleared from the site?"

Response to Specific Comment 3:
No additional bomb-related items or evidence of bombing activities were found at MRS-34 or adjacent areas. Please see response to General Comment 2.

Specific Comment 4:
"Section 3.6.1.1 - Site Use and Development - This section states, 'Site boundaries were identified during the 1994 removal action based on field observations and geophysical data regarding the relative density and distribution of MD at the site. Subsequent removal actions identified additional MD, but no additional field or historical data has been identified that indicates the historical area of use associated with MRS-34 extended outside the current site boundaries, or that any modification of site boundaries is needed.'"

"Why is the discovery of the MK23 practice bomb not considered in the site use and included in the conceptual site model? How confident is the Army that additional MK23 practice bombs don't exist outside of UXB's MRS-34 boundary?"

Response to Specific Comment 4:
There is no evidence indicating historical use at MRS-34 for bomb-related practice activities. Please see response to General Comment 2.