

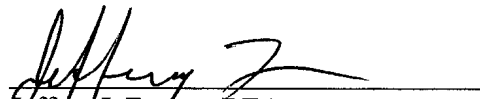
**Draft Final  
RCRA Closure Plan  
Range 36A  
(Solid Waste Management Unit FTO-016)  
Former Fort Ord, California  
Revision 0**

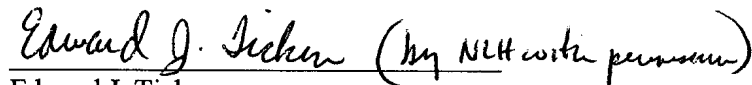
**VOLUME I**

Prepared for


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May 20, 2005

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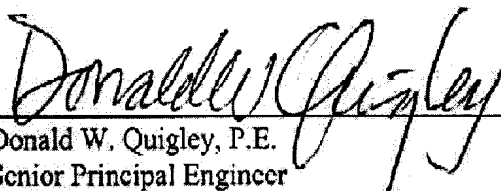
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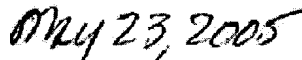
This document was prepared by MACTEC Engineering and Consulting, Inc. (MACTEC), at the direction of the U.S. Army Corps of Engineers (USACE) for the sole use of the USACE and the signatories of the Federal Facilities Agreement, including the Army, U.S. Environmental Protection Agency (EPA), Department of Toxic Substances Control (DTSC; formerly the Toxic Substances Control Program of the Department of Health Services), and Regional Water Quality Control Board, Central Coast Region (RWQCB), the only intended beneficiaries of this work. No other party should rely on the information contained herein without prior written consent of the USACE and Army. This report and the interpretations, conclusions, and recommendations contained within are based, in part, on information presented in other documents that are cited in the text and listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

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**CERTIFICATION**

I certify under penalty of law that this document and all attachments, with the exception of Volume II, were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

  
Donald W. Quigley, P.E.  
Senior Principal Engineer

  
Date

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## CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

---

Thomas E. Lederle  
Director, Hampton Field Office  
Army BRAC

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Date

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## VOLUME II MUNITIONS RESPONSE WORK PLAN

## ACRONYMS AND ABBREVIATIONS

AEHA	United States Army Environmental Hygiene Agency
bgs	Below ground surface
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
BS/BSD	Blank spike/blank spike duplicate
CDQMP	Chemical Data Quality Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
COC	Chain of custody
DQO	Data quality objective
DRMO	Defense Reutilization and Marketing Office
DTSC	Department of Toxic Substances Control
EOD	Explosive Ordnance disposal
EPA	U.S. Environmental Protection Agency
FAAF	Fritzsche Army Airfield
FFA	Federal Facility Agreement
Harding ESE	Harding ESE, Inc. (former name of MACTEC)
HLA	Harding Lawson Associates (former name of MACTEC)
HMX	Octahydro-1357-tetranitro-1357-tetrazocine
HSWA	Hazardous and Solid Waste Amendment
IA	Interim action
JMM	James M. Montgomery Consulting Engineers
LCS	Laboratory control samples
lbs	Pounds
lbs/yr	Pounds per year
MACTEC	MACTEC Engineering and Consulting, Inc.
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
MRS	Munitions Response Site
MRWPCA	Monterey Regional Water Pollution Control Agency
MS/MSD	Matrix spike/matrix spike duplicate

Revision 0

MB61205\_RCRA Rev0 DF Revised by USACE-FO

MACTEC Engineering and Consulting, Inc.

NA	Not analyzed, not applicable, or not available
ND	Not detected
ng/kg	nanograms per kilogram
NPL	National Priorities List
OE	Ordnance and explosive
OB/OD	Open burning/open detonation
OU	Operable unit
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PE	Professional Engineer
POTW	Publicly owned treatment works
ppm	Parts per million
PRG	Preliminary remediation goal
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine
REA	Registered Environmental Assessor
RI/FS	Remedial investigation/feasibility study
RPD	Relative percent difference
RWQCB	California Regional Water Quality Control Board
SB	Soil boring
SDG	Sample delivery group
Shaw	Shaw Environmental, Inc.
SHERP	Safety, Health and Emergency Response Plan
SWMU	Solid Waste Management Unit
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCL	Target cleanup level
TEFs	Toxic equivalency factors
TSD	Transfer, storage, and disposal
USACE	U.S. Army Corps of Engineers
UXO	Unexploded ordnance

## 1.0 INTRODUCTION

On behalf of the U.S. Army Corps of Engineers (USACE), Sacramento District, MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this Closure Plan describing procedures conducted for closing Range 36A at the former Fort Ord, Monterey County, California. Plate 1 shows the location of the former Fort Ord and the area in which Range 36A is located. Plate 2 is a site map showing the layout of Range 36A. Range 36A was used by the Army from the 1940s until October 1992 to dispose of military ordnance and ammunition and commercial explosives. Disposal occurred by open burning and open detonation (OB/OD) with detonations limited to 25 pounds per event. Disposal activities ceased when Fort Ord's explosive ordnance disposal (EOD) unit was deactivated as part of the closure of Fort Ord (HLA, 1993). Range 36A was reactivated for a short period in 1994 and used on a limited basis by the Fort Ord unexploded ordnance (UXO) removal contractor in support of Fort Ord's Time Critical Removal Action Program for disposal of ordnance found outside the Inland Ranges. These activities ceased in January 1995.

Report preparation and site characterization activities were conducted in accordance with the *Draft Closure Plan, Range 36A, Former Fort Ord, California*, dated February 8, 1997 (HLA, 1997), and the *Draft Final Work Plan, Soil Confirmation Sampling, Range 36A, Former Fort Ord, California*, dated July 2, 2003 (Harding ESE, 2003).

### 1.1 Objective and Approach

The principal objective of this closure plan is to document the clean closure of Range 36A at the former Fort Ord. Clean closure is intended to leave only residual chemical constituents of concern (i.e., residual levels that are less than closure performance standards [cleanup goals]) and stem concerns about human health and future land uses. Clean closure also enables the greatest latitude for future reuse of areas previously affected by historical operations at the site.

Additionally, Volume II of this closure plan includes a work plan for munitions response to locate and remove munitions and explosives of concern (MEC) that may remain at Range 36A. The munitions response will consist of a geophysical sweep and sub-surface investigation.

The approach used herein to certify clean closure (i.e., absence of contamination above cleanup goals) is to document conformance of site characterization activities with the activities described in the Draft Final Work Plan (*Harding ESE, 2003*) and to compare analytical results for the characterization samples with closure performance standards as discussed in Section 3.0. These performance standards were developed on a site-specific basis and are summarized in this report.

Physical risk associated with the potential presence of MEC at the former Fort Ord is being addressed under the Fort Ord Military Munitions Response Program. The plan describing how the Army will address physical risk in areas surrounding Range 36A will be presented in the Operable Unit (OU) Habitat Remedial Investigation/Feasibility Study (RI/FS) Technical Memorandum. The current Federal Facility Agreement (FFA) schedule for the OU Habitat investigation is as follows:

- Final OU Habitat RI/FS Technical Memorandum - July 2005
- Final OU Habitat RI/FS - April 2006
- Final OU Habitat Proposed Plan - July 2006
- Final OU Habitat Record of Decision - December 2006

The schedule for remedial design and remedial action for OU Habitat will be determined based on the remedy selected in the OU Habitat Record of Decision. Updates to the OU Habitat FFA schedule may be found at the Former Fort Ord Environmental Cleanup website ([www.fortordcleanup.com](http://www.fortordcleanup.com)).

## 1.2 Report Organization

Section 2.0 of this report provides a summary of the background information and previous reports for Range 36A. The performance standards used to determine attainment of clean closure are described in Section 3.0. The site characterization activities and a summary of the results are described in Section 4.0. Section 5.0 presents the summary and conclusions, and Section 6.0 presents the references cited in the text. Appendices to this report include supporting information.

As described in the Draft Closure Plan (*HLA, 1997*), this closure plan contains the following:

- Certification by the Army and a registered Professional Engineer (pages iii and iv) excluding the Munitions Response Work Plan (Volume II)
- Certification of the Munitions Response Work Plan (Volume II) by the Army and a registered Professional Geophysicist
- Description of supervisory personnel involved in physical closure of the unit
- Summary of site characterization (Section 4.2)
- Discussion and interpretation of analytical results (Sections 4.0 and 5.0)
- Field engineer observation reports (Appendix A)
- Photographs of the closed and surrounding area (Appendix B)
- Sampling and analytical data (Tables 2 and 3 and Appendix E)
- Munitions Response Work Plan (Volume II)
- Modifications to the approved closure plan (if applicable).

No waste manifests were necessary because no waste was generated during closure activities related to the investigation of chemical contamination in soil.

This closure plan has been prepared by MACTEC, for the USACE under Contract DACA 05-86-C-0241, Modifications P00245 and P00262, in accordance with the scope of work dated August 9, 1994.

## 2.0 FACILITY IDENTIFICATION AND BACKGROUND

This section contains identifying information about Range 36A, following California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) format (*DTSC, 1994*).

### 2.1 Facility Name

U.S. Department of the Army - Former Fort Ord

#### 2.1.1 EPA Identification Number

CA7210020676

#### 2.1.2 Facility Address

Former Fort Ord  
Monterey, California 93944-5004

#### 2.1.3 Mailing Address

Department of the Army  
Fort Ord Base Realignment and Closure (BRAC) Office  
Attn: Gail Youngblood  
BRAC Environmental Coordinator  
P.O. Box 5004  
Monterey, California 93944-5004  
(831) 242-7924/7918

#### 2.1.4 Contact Person

U.S. Army Representative  
Contact: Gail Youngblood  
(831) 242-7924/7918  
Hours: 8:00 a.m. to 5:00 p.m.

#### 2.1.5 Facility Operator

U.S. Department of the Army  
Presidio of Monterey

#### 2.1.6 Owner

##### 2.1.6.1 Facility Owner

U.S. Department of the Army

##### 2.1.6.2 Landowner

U.S. Department of the Army

### 2.1.7 Facility Description

After it opened in 1917, Fort Ord primarily served as a training and staging facility for infantry troops. No permanent improvements were made until the late 1930s, when administrative buildings, barracks, mess halls, tent pads, and a sewage treatment plant were constructed. From 1947 to 1975, Fort Ord was a basic training center. After 1975, the Seventh Infantry Division (Light), which included over 20,000 military and civilian personnel, occupied Fort Ord. Light infantry troops are those that perform their duties without heavy tanks or armor. The former Fort Ord was selected for decommissioning in 1991, and placed on the Defense Base Realignment and Closure Act (BRAC) 1991 list, but troop reallocation was not completed until 1993. The installation officially closed September 30, 1994.

The three major developed areas within the former Fort Ord are the Main Garrison, Fritzsche Army Airfield (FAAF) (now the Marina Municipal Airport), and the East Garrison. The remaining undeveloped property was used for training activities.

As stated in Section 1.0, Range 36A was used for disposal of various types of commercial explosives, military ordnance and ammunition. Disposal occurred by open burning and open detonation.

### 2.1.8 Preparer of Closure Plan

MACTEC Engineering and Consulting  
Project Manager - Ed Ticken  
5341 Old Redwood Highway, Suite 300  
Petaluma, California 94954  
(707) 793-3882

### 2.1.9 Environmental Permits

No environmental permits are presently associated with, or were obtained during, the closure of Range 36A. Range 36A is being closed as an interim status unit pursuant to the State hazardous waste management program.

## 2.2 Background

This section summarizes background information, including the site description, site usage, and previous investigations performed. More detailed background information regarding specific technical issues is provided in other referenced technical documents that have been submitted previously to the DTSC.

These references are provided in Section 6.0.

In 1980, Fort Ord submitted a Resource Conservation and Recovery Act (RCRA) Part A permit application to both U.S. EPA Region IX (EPA) and the California Department of Health Services. That application declared Fort Ord's intent to operate as a transfer, storage, and disposal (TSD) facility under RCRA by storing hazardous wastes onsite for more than 90 days in a permanent storage area. The Part A permit application identified two RCRA TSD units and a treatment unit (Range 36A). The units were granted interim status pending submittal of the RCRA Part B Permit Application. The Part A Application was updated and resubmitted to both agencies in 1984, 1986, 1987, 1990, 1991, 1994, and 2002.

In 1984, the EPA amended the RCRA regulations to include the Hazardous and Solid Waste Amendments (HSWA). In part, these regulations required any interim status facility that intended to continue operation by formal permit to complete an assessment of all solid waste management units (SWMUs), regardless of the date waste was handled or disposed of at these units, and to include this assessment in the Part B permit application. It was EPA's intent with this regulation to require that facilities complete corrective action at these units as a condition of the facility's permit.

In February 1990, Fort Ord was added to the National Priorities List (NPL, or Superfund), and in July 1990, a Federal Facility Agreement (FFA) was signed by representatives of the U.S. Army, the EPA, the California Department of Health Services (now Cal/EPA, DTSC), and the California Regional Water Quality Control Board, Central Coast Region (RWQCB).

In 1991, Fort Ord was included on the BRAC 1991 list, and was scheduled to be closed and transferred for public use. As part of the closure process, and because the base had been listed on the National Priorities List, investigations of the base were begun under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In response to a letter (dated July 3, 1991) from the EPA, Fort Ord submitted various portions of the RCRA Part B Permit Application to both EPA Region IX and the State of California over the period of 1991 to 1993.

In 1995, in anticipation of the facility's closure under BRAC, the Army requested voluntary withdrawal of its Part B Application and announced its intent to close all RCRA TSD interim status units and cease operating as a TSD facility.

### 2.2.1 Site Description and Usage

Range 36A is an approximately 200-foot by 400-foot area within the Inland Ranges (RI/FS Site 39) in Impossible Canyon (Plates 1 and 2). The range was operated by the 49<sup>th</sup> Ordnance Detachment FORSCOM Field Operating Activity for disposing of commercial explosives and military ordnance and ammunition between sometime in the 1940s (*AEHA, 1988*) and October 1992.

The area was investigated by James M. Montgomery Consulting Engineers (*JMM, 1990*) and by HLA (now known as MACTEC) in 1992 (*HLA, 1993*). Several explosive compounds were detected in shallow soil samples at low concentrations; lead and beryllium were also detected in shallow soil and appear to be site-related.

The range was reactivated in January 1994 for disposing of UXO identified by Fort Ord's Time Critical Removal Action Program for UXO and ordnance and explosive waste found outside the Inland Ranges (*HLA, 1995*). The site was inactive during HLA's 1995 site visit and no disposal activities are known to

have occurred at Range 36A since January 1995. The area is currently managed by the U.S. Bureau of Land Management.

This unit was investigated under the RI/FS program as NPL Site 5 (*HLA, 1995*). Because a final RCRA permit decision was not issued for Range 36A, this unit was to be closed as an interim status unit pursuant to state and federal hazardous waste management programs.

According to the 1980 RCRA Part A permit application, Range 36A was a treatment unit for the disposal of “Explosives (duds, etc.) detonated in impact areas, 25 lb limit per detonation, about 1500 lb/yr (*USEPA, 1980*).”

### 2.2.2 Previous Investigations and Remediation

In support of Fort Ord’s RCRA Part B permit application, the United States Army Environmental Hygiene Agency (AEHA) conducted an assessment of Fort Ord’s SWMUs in 1988. AEHA was the branch of the Army responsible for technical support and enforcement of environmental programs. AEHA inspected Fort Ord and identified 58 SWMUs, numbering them FTO-001 through FTO-058 (*AEHA, 1988*). The AEHA identified Range 36A as SWMU FTO-016, the “Open Detonation Area.” As part of the inspection, AEHA described and evaluated unit and waste characteristics, potential migration pathways, evidence of release, and exposure potential. The AEHA also made recommendations based on the evaluation. The inspection of Range 36A determined that the area was used infrequently and only for small-scale open detonations. No other wastes were disposed of at the site. After detonations were completed, all debris was to be collected and taken from the site for disposal. Very little detonation-related debris was present at the time of the AEHA inspection. AEHA made no recommendations regarding future disposal activities at Range 36A.

Previous investigations of Range 36A include an investigation by James M. Montgomery Consulting Engineers (JMM) in 1990 and an investigation by HLA in 1993 (*JMM, 1991* and *HLA, 1993*). The

distribution of explosive compounds detected at Range 36A is shown on Plate 2. During JMM's investigation, cyclotrimethylenetrinitramine (RDX) was detected in four surface soil samples at concentrations ranging from 0.94 to 11.88 mg/kg and in one deep sample (15 feet bgs) at 0.34 mg/kg, just above the detection limit. Octahydro-1357-tetranitro-1357-tetrazocine (HMX) was detected in both halves of a split surface soil sample at concentrations of 0.71 and 1.35 mg/kg. During HLA's investigation, RDX and HMX were detected only in surface soil samples. RDX was detected in nine surface soil samples at concentrations ranging from 0.31 to 16.5 mg/kg. Three of the samples (including the split) exceeded the RDX preliminary remediation goal (PRG) of 4.4 mg/kg (*USEPA, 2002*). HMX was detected in five surface samples at concentrations ranging from 0.41 to 1.84 mg/kg; all below the HMX PRG of 3,100 mg/kg (*USEPA, 2002*). No other explosive compounds that were included in the analyses were detected in the 69 soil samples collected at the site.

Samples at the site were also analyzed for metals during the JMM and HLA investigations. Multiple metals were detected above their maximum shallow or deep background concentrations. However, with the exception of lead and beryllium detected in two shallow soil samples, the other metals detected above their background concentrations appeared to be related to possible variations in naturally-occurring soil chemistry rather than to site-related activities. Beryllium also exceeded the PRG developed for Fort Ord of 0.39 mg/kg in multiple samples (*HLA, 1994*). However, the Fort Ord PRG for beryllium is no longer applicable; Region IX EPA PRGs are now being utilized at the former Fort Ord.

A total of ninety-three soil samples were collected and analyzed for lead in the previous investigations conducted at this site. The concentration of lead in only one of these samples exceeded the maximum Fort Ord background concentration for lead in shallow soil of 51.8 mg/kg. However, this concentration was below the lead PRG developed for Fort Ord of 240 mg/kg (*HLA, 1994*). The current applicable PRG for lead (Region IX EPA PRG) is 400 mg/kg.

Based on the results of the investigations discussed above, Range 36A was identified for closure as a former hazardous waste management unit under the jurisdiction of the RCRA. Because a final RCRA permit decision was not issued for Range 36A, this unit is being closed as an interim status unit pursuant to state and federal hazardous waste management programs. Therefore, a Draft Closure Plan (*HLA, 1997*) was prepared to allow Range 36A to undergo clean closure, meaning that no hazardous waste will be present and contamination will be removed to the extent necessary for protection of human health and the environment. The Draft Closure Plan (*HLA, 1997*) recommended removal of soil where RDX and beryllium concentrations in onsite soil exceeded PRGs. The EPA PRG for beryllium is 150 mg/kg; this concentration was not exceeded in any samples at the site.

The analytical results of samples collected at Range 36A in 1990 and 1993 indicated that only a limited number of beryllium and lead concentrations exceeded Fort Ord background levels; however, all metals were below EPA PRGs. Because the sampling and analysis in 1990 and 1993 was performed after 40 years of munitions disposal by the military at Range 36A and beryllium and lead concentrations remained below EPA PRGs, additional analysis of soil samples for those metals is not warranted related to the reactivation and use of Range 36A from 1994 to 1995.

### 3.0 CLOSURE PERFORMANCE STANDARDS (CLEANUP LEVELS)

This section summarizes the closure performance standards (cleanup levels) and criteria for determining the extent of decontamination necessary to demonstrate the closure performance standards have been met for MEC and chemical contamination. Range 36A (SWMU FTO-016) will be closed in a manner that:

- Minimizes the need for further maintenance
- Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to the ground or surface waters or to the atmosphere.

Because Range 36A was used for explosive ordnance demolition, samples collected during these site characterization activities were analyzed for RDX. Soil samples collected during a prior investigation contained RDX at concentrations exceeding the EPA Region IX PRG of 4.4 milligrams per kilogram (mg/kg; [USEPA, 2002]). Because RDX naturally degrades in sunlight and concentrations exceeding the PRG were only present in soil samples collected at the surface, RDX concentrations identified in the previous investigation could have decreased below the PRG subsequent to the previous sampling. At the request of the DTSC, analysis for dioxins and perchlorate was also included. The PRGs for dioxins and perchlorate are 3.9E-06 mg/kg and 7.8 mg/kg, respectively (USEPA, 2002). For dioxins, the PRG for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) was used as explained in Section 4.5.

Because Range 36A was used for explosive ordnance demolition, a munitions response will be conducted to address the possible presence of MEC. Unlike the chemical contaminants discussed above, which have PRGs, MEC does not have numeric criteria for determining the closure performance standard; therefore, it is not anticipated the site will meet the standard for unrestricted use. Regardless, the

munitions response will include identification and surface removal of MEC and munitions debris and resolution of all detected anomalies by excavation, as described in the munitions response work plan (prepared by Shaw Environmental Inc.) provided in Volume II of this closure plan. This approach, with appropriate restrictions on the property, will meet the criteria listed above.

The Army currently owns the property and restricts access to it through the various institutional and engineering controls described in the Army's Munitions Response Site (MRS) Security Program, which was implemented in 1997. The MRS Security Program includes the following measures to protect the community from explosive hazards:

Conducting MEC removal actions, which will occur at Range 36A as described in the munitions response work plan

- A 4-strand barbed wire fence and concertina wire around the Impact Area, which includes Range 36A
- Locked chain-link gates at access points to the Impact Area
- Posting warning signs and "no trespassing" signs on the barbed wire fence
- Security patrols
- Public education.

Details on the MRS Security Program are provided in the Munitions Response Site Security Program, Former Fort Ord, California (*Mactec, 2005*).

When the property is transferred to the Department of the Interior, Bureau of Land Management (BLM), appropriate restrictions will be included to continue to meet the above listed criteria. The BLM currently restricts use on former Fort Ord property it has already received.

## 4.0 SITE CHARACTERIZATION ACTIVITIES AND RESULTS

This section describes the site characterization activities conducted at Range 36A.

### 4.1 Personnel

Personnel who performed activities associated with the closure of Range 36A include the following:

<b>Organization/Personnel</b>	<b>Responsibility</b>
<b>Shaw Environmental, Inc., Marina, California</b>	<b>Sample Collection/Laboratory Coordination and Munitions Response Program</b>
Tom Ghigliotto – Sample Coordinator/QC	Collection of soil samples and QC
Charles Luckie – Sampler	Collection of soil samples and HSO
Bruce Tincknell – UXO Specialist	MEC avoidance during sampling
Eric Schmidt – Project Chemist	Coordination with laboratory and sample documentation
Peter Kelsall - Project Manager	Field Program oversight
<b>Munitions Response</b>	
Marty Miele, RG – Project Geophysicist	Implementation, certification and quality control of Munitions Response Work Plan
Tim Mathisen – Senior UXO Supervisor	Supervision of field munitions response
Peter Kelsall – Project Manager	Oversight of the munitions response program
<b>MACTEC Engineering &amp; Consulting, Inc., Petaluma, California</b>	<b>Report Preparation</b>
Jeffery Fenton, REA – Task Manager	Coordination and implementation of field program and closure plan
Donald Quigley, P.E. – Project Engineer	Closure plan certification and quality control reviewer
Ed Ticken – Project Manager	Oversight of field program and closure plan
<b>U.S. Department of the Army, Sacramento District Corps of Engineers</b>	<b>Implementing Agency</b>
Marc Edwards – USACE Engineers Clinton Huckins	Onsite USACE representatives
David Eisen – USACE Project Manager	Oversight of overall program management
Juan Koponen – USACE Project Manager	Oversight of Munitions Response Program
Derek Lieberman, P.E. – U.S. Army	Onsite Army representative

## 4.2 Summary of Site Characterization Activities

The following site characterization activities were performed at Range 36A:

- Collection of two surface soil samples from each of the two locations where RDX previously exceeded PRGs
- Collection of one surface soil sample from each of the two locations identified by USACE representatives
- Collection of three samples from a depth of 5 feet bgs at three of the four surface sample locations.

### 4.2.1 Soil Sampling

On October 28, 2003, representatives from Shaw Environmental, Inc. (Shaw) collected soil samples from six locations at Range 36A (Plate 3). Four surface soil samples were collected adjacent to two locations where samples collected by HLA in 1992 contained RDX exceeding the PRG. The remaining two locations were identified by the USACE (USACE #1 and USACE #2) and selected from an area where OE disposal occurred (detonations) following the 1992 sampling. One surface sample was collected from each of the two locations (two samples). Additionally, three of the six surface sample locations were randomly selected for the collection of 5-foot samples. Following the collection of the surface samples, the soil was excavated by hand to a depth of 5 feet and one sample collected using a drive sampler containing a stainless steel sample tube. The stainless steel sample tubes were capped with Teflon-lined plastic lids, labeled, and packaged for shipping using insulated containers packed with ice.

## 4.3 Sample Data and Analyses

All soil samples were analyzed for RDX using EPA Test method 8330, dioxins using EPA Test Method 8290, and perchlorate using EPA Test Method 314.0. Analyses were performed in accordance with procedures described in the former Fort Ord Chemical Data Quality Management Plan [CDQMP]

(IT, 2001) by Applied P & Ch Laboratories (APCL), Chino, California. APCL is a certified laboratory for the requested analysis.

Two quality control (QC) field samples were collected to evaluate the precision, accuracy, and integrity of field sampling and laboratory analytical procedures. One duplicate soil sample and one equipment rinsate sample were submitted with the primary soil samples.

Table 1 presents a summary of the analytical program for the soil samples collected from Range 36A. Appendix D presents the Data Quality Evaluation completed for the samples and Appendix E presents the Laboratory Analytical Reports.

#### 4.4 Modifications to Closure Plan

No modifications to the Draft Final Work Plan (*Harding ESE, 2003*) were made.

#### 4.5 Analytical Results, Soil Sampling

The soil sample results for the detected analytes are presented in Table 2. Appendix E, Laboratory Analytical Results, contains the complete analytical results including laboratory reporting limits for non-detected analytes. PRGs for chemicals detected in soil at Range 36A were used to assess the need for further action at the site. Perchlorate was not detected in any of the surface or 5-foot samples collected at Range 36A. With the exception of the surface soil sample collected at location SB-05-1, RDX was not detected in any of the surface or 5-foot samples collected. RDX was detected in the surface sample collected at location SB-05-1 at a concentration of 1,400 µg/kg, which is below the EPA PRG of 4.4 mg/kg. Comparison of the maximum RDX concentration detected in soil at Range 36A with the closure performance standard is shown in Table 3.

Dioxins were detected at low levels in all surface samples collected at Range 36A. To evaluate dioxins,

congener-specific concentrations were converted to TCDD-toxic equivalent (TCDD-TE) concentrations using the interim toxic equivalency factors (TEFs) developed by the EPA (*USEPA, 2000*). The TEFs were derived based on the toxic potential of each congener in relation to 2,3,7,8-TCDD, the congener for which toxic effects are the most thoroughly studied and documented. The following congener-specific TEFs (*USEPA, 2000*) were used and were applied only if the specific congener was detected in at least one sample:

- 1.0 for 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD);
- 0.1 for 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin (HxCDD);
- 0.1 for 1,2,3,7,8,9-HxCDD;
- 0.1 for 1,2,3,4,7,8-HxCDD;
- 0.01 for 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin (HpCDD); and
- 0.0001 for 1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin (OCDD).

The congener 2,3,7,8-TCDD was not detected and no TEF was applied.

Table 4 shows the derivation of TCDD-TE concentrations for soil at Range 36A. For each sample, the concentrations for the dioxin congeners were multiplied by their respective TEFs, and the quotients were summed to result in a total TCDD-TE concentration. Thus, the calculated TCDD-TE concentration for each sample represents a weighted sum of all dioxin congeners detected in at least one sample. The TCDD-TE concentration for each sample was then compared with the PRG for 2,3,7,8-TCDD of  $3.9\text{E-}06$  mg/kg. All TCDD-TE concentrations were below the PRG.

#### 4.6 Data Quality Evaluation

Appendix D of this report presents a detailed Data Quality Evaluation for the sampling event. The following is a summary of the data evaluation.

Data generated during sampling and analysis was reconciled against the quality control requirements established in the CDQMP (*IT, 2001*) to determine if the data was of sufficient quality to achieve the project requirements. No formal data quality objectives were established for this project; work activities were outlined in the *Draft Final Work Plan, Soil Confirmation Sampling, Range 36A, Former Fort Ord, California (MACTEC, 2003)*.

As stated above, the soil samples were submitted to APCL in Chino, California for analysis. APCL reported the chemical data under sample delivery group (SDG) 35885. The subcontract laboratory was informed of the project requirements prior to project implementation in order to assure compliance with the CDQMP. Quality control samples were collected as defined in the CDQMP.

Data validation was performed on the SDG to confirm the integrity and reliability of field and laboratory data generated during the sampling event. Laboratory Data Consultants of Carlsbad, California performed data validation. One hundred percent of the data underwent a thorough review, Level IV evaluation of the QC summary forms as well as the raw data to confirm sample quantitation and identification following CDQMP guidance. Data validation shows that all results for confirmation samples collected associated with Range 36A are usable and that sufficient data exist for the purpose of demonstrating that the requirements of the *Draft Final Work Plan, Soil Confirmation Sampling, Range 36A, Former Fort Ord, California* dated July 2, 2003, were met.

## 5.0 SUMMARY AND CONCLUSIONS

PRGs for chemicals detected in soil at Range 36A were used to assess the need for further action at the former ordnance disposal area. Concentrations of RDX and perchlorate were compared to EPA PRGs. To evaluate dioxins, congener-specific concentrations were converted to TCDD-TE concentrations using the interim TEFs developed by the EPA and compared to the PRG for 2,3,7,8-TCDD. Ten soil samples were collected in accordance with the Draft Final Work Plan (*Harding ESE, 2003*). No perchlorate was detected in the 10 soil samples collected. RDX was detected in one sample, but at a concentration that was below the PRG. Dioxins were detected at low levels (below the 2,3,7,8-TCDD PRG) in each of the surface samples. One dioxin congener was detected at a depth of 5 feet, but also below the 2,3,7,8-TCDD PRG. Additionally, all calculated TCDD-TE concentrations for dioxins detected in soil at Range 36A were below the 2,3,7,8-TCDD PRG.

In summary, perchlorate was not detected in soil samples and RDX and dioxins were detected below their respective PRGs. On the basis of the site characterization conducted at Range 36A, it is the conclusion of this report that Range 36A (SWMU FTO-016) has met the criteria for clean closure regarding chemical contamination in soil. Therefore, the Army recommends no further action related to chemical contamination in soil at Range 36A.

The Army will conduct a munitions response to address the possibility that MEC may be present at Range 36A. The investigation will include a surface survey and sweep prior to vegetation removal; vegetation removal as necessary to identify surface MEC and permit a geophysical survey; surface removal of MEC and munitions debris; a geophysical sweep across the entire site to locate subsurface anomalies to the detection capabilities of the instruments (approximately four feet); resolve anomalies by excavation; and certification that munitions debris is free of explosive hazard. The work plan (prepared by Shaw Environmental Inc. [Shaw]) describing the munitions response to be conducted at Range 36A is provided in Volume II.

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MACTEC Engineering and Consulting, Inc.

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