FORMER FORT ORD, MONTEREY, CALIFORNIA
ORDNANCE AND EXPLOSIVES (OE) CLEANUP

FINAL

RANGES 43–48
SITE-SPECIFIC WORK PLAN

August 2003

prepared for

U.S. Army Corps of Engineers
Sacramento District

prepared by

PARSONS

Contract No. DACA05-00-D-0003

Ranges 43–48
Site-Specific Work Plan

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ACRONYMS AND ABBREVIATIONS

AAR	after-action report
APC	armored personnel carrier
AP-T	antipersonnel tracer
AT	antitank
ATV	all-terrain vehicle
BAT	Best available technology
BCT	Base Closure Team
BE	base ejection
BGS	below ground surface
BIP	blow in place
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
CEHNC	U.S. Army Engineering and Support Center, Huntsville Division
CESPK	U.S. Army Corps of Engineers, Sacramento District
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
CSHP	Corporate Safety and Health Plan
CSP	Community Safety Plan
DENR	Directorate of Environmental and Natural Resources
DID	Data Item Description
DoD	Department of Defense
DOT	Department of Transportation
DTSC	Department of Toxic Substances and Control
EE/CA	engineering evaluation/cost analysis
EM	electromagnetic
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
FFA	Federal Facilities Agreement
FVF	field variance form
GEOQC	Quality Control Geophysicist
GIP	Geophysical Investigation Plan
GPS	global positioning system
GIS	geographic information system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis b virus
HC	hexachloroethane
HE	high explosive
HEAT	high-explosive antitank
HMP	Installation-wide Multispecies Habitat Management Plan
IA	Interim Action
IAW	in accordance with
ID	identification
IDLH	immediately dangerous to life and health
KO	Contracting Officer
LAW	light antitank weapon
LDSPA3	Land Disposal Site Plan Amendment 3

ACRONYMS AND ABBREVIATIONS (contd)

LE	low explosive
MAT	most appropriate technology
MOFB	miniature open front barricade
MPM	most probable munition
MRA	multi-range area
mV	millivolt
NCR	nonconformance and corrective action report
nT	nanotesla
ODDS	Ordnance Detection and Discrimination Study
OE	ordnance and explosives
OEFOM	OE Field Operations Manager
OESS	OE Safety Specialist
OESAP	OE Sampling and Analysis Plan
OSHA	Occupational Safety and Health Administration
PDA	personal digital assistant
PEL	permissible exposure limits
PM	Program Manager
PPE	personal protective equipment
PSL	personnel safety limits
PWP	Programmatic Work Plan
QA	quality assurance
QC	quality control
QCM	Quality Control Manager
RD/RAWP	Remedial Design/Remedial Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROC	receiver operating characteristic
ROD	Record of Decision
RPM	Remedial Project Manager
RTK	real-time kinematic
SCBA	Self Contained Breathing Apparatus
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
SUXOS	Senior UXO Supervisor
SWP	safe work practice
TCRA	time-critical removal action
TDMD	time-domain metal detector
TEU	Technical Escort Unit
TLV	threshold limit value
TP	target practice
TPA	transistor power amplifier
TSD	team separation distance
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
UXOSO	UXO Safety Officer
UXOQCS	UXO Quality Control Specialist
WP	white phosphorous

PREFACE

As the lead agency, the Army has determined that an Interim Action (IA) is appropriate to protect human health from the imminent threat posed by ordnance and explosives (OE) at three sites—Ranges 43–48, Range 30A and Site OE-16—while an ongoing comprehensive study of OE cleanup needs at former Fort Ord is conducted under the Basewide OE Remedial Investigation/Feasibility Study (RI/FS) [Ref. 1].

The Army's Proposed Plan [Ref. 2] identified prescribed burning as the preferred alternative to clear vegetation, a surface and subsurface OE removal as the preferred OE remedial action alternative, and detonation with engineering controls as the preferred OE detonation alternative for the three IA sites. The public comment period for the Proposed Plan ended 13 May 2002. The final selection of the vegetation clearance method, OE remedial action, and OE detonation method to be used at the IA sites was made in the IA Record of Decision (ROD) [Ref. 3], which was completed in September 2002.

The Army has developed a site-specific IA Remedial Design/Remedial Action Work Plan (RD/RAWP) for Ranges 43–48 because it has the highest priority of the three IA sites. The Ranges 43–48 IA RD/RAWP is comprised of this Site-Specific Work Plan (SSWP) and three other separately prepared plans that detail task-specific interrelated work activities for implementing the IA remedial activities. The three other IA RD/RAWP documents for the Ranges 43–48 IA site are:

(1) Ranges 43–48 Prescribed Burn Plan [Ref. 4]
(2) Voluntary Relocation Plan [Ref. 5]
(3) Prescribed Burn Air Sampling and Analysis Plan [Ref. 6]

All four Ranges 43–48 IA RD/RAWP documents are briefly described below:

- **Ranges 43–48 Prescribed Burn Plan**

The Ranges 43–48 Prescribed Burn Plan describes the burn area; the objectives of the prescribed burn; the range of environmental conditions under which the burn will be conducted; the manpower and equipment resources required to ignite, manage, and contain the burn; a smoke management plan and establishment of communication procedures for the fire crew, the public, and other affected agencies. Procedures for conducting the burn within the window of environmental conditions established in the burn prescription are also discussed in this plan.

- **Voluntary Relocation Plan**

The Voluntary Relocation Plan describes the Army’s actions that will be implemented for those Monterey County residents who wish to temporarily relocate during the Ranges 43–48 prescribed burn. This plan describes the roles and responsibilities of the various Army organizations and contractors, local government and community organizations, prior to, during, and after prescribed burns. It also describes the responsibilities of those people who wish to relocate.

- **Prescribed Burn Air Sampling and Analysis Plan**

The Prescribed Burn Air Sampling and Analysis Plan outlines procedures for the collection and analysis of air samples during a prescribed burn. The primary purpose of collecting and analyzing air samples during the prescribed burn is to confirm or refine the conclusions of the *Technical Memorandum, Air Emissions from Incidental Ordnance Detonation During a Prescribed Burn on Ranges 43 through 48, Former Fort Ord, California* [Ref. 7] that ground-level concentrations of ordnance-related air pollutants downwind of the prescribed burn will be well below human health-protective regulatory screening levels. While the air sampling program is focused on detection and quantification of ordnance-related emissions, data from the air sampling program will also be used to assess the adequacy of the burn prescription and to assess downwind concentrations of selected vegetation-related emissions.

- **Ranges 43–48 SSWP**

This SSWP describes the procedures, methods, and resources that Parsons and its subcontractors will use while performing a surface and subsurface OE removal and detonating OE with engineering controls. The surface and subsurface OE removal consists of identification (visual search and operation of OE detection equipment) and remediation (combined with follow-on detonation) of any OE found/detected on the ground surface and in the subsurface. OE detonation with engineering controls consists of applying additional detonating charges to single or consolidated OE items, and applying engineering controls (covering the OE with dirt, sandbags, contained water, or other materials) prior to detonation to reduce the blast and any associated fragmentation, emissions, and noise.

An appendix to this SSWP addresses site preparation activities to be performed prior to the prescribed burn to reduce smoke emissions during the prescribed burn, ensure the prescribed burn is contained within the site boundaries, and plan the subsequent digital mapping of the site. Site preparation activities include removing tires; prepping structures; removing or prepping (with foam) utility poles; clearing brush and pruning/removing trees; and installing a sprinkler system and/or spraying foam around the site's perimeter. Fire prevention work will also be performed near the Fitch Park housing area; this work includes the clearing of 37 acres of vegetation to widen the area's surrounding fuel break by an additional 150 ft. A meandering path digital geophysical walk-through will also be performed under this preparatory action.

The prescribed burn at Ranges 43–48 could not be conducted in 2002, as scheduled, because required meteorological and other conditions for implementing the burn did not occur. The Army plans to conduct the prescribed burn and begin the OE clearance in the latter part of 2003. The Ranges 43–48 work plans developed in 2002 will be updated to incorporate some minor changes and will be placed in the Administrative Record.

CHAPTER 1
INTRODUCTION

1.1 PURPOSE

A surface and subsurface removal was selected in the IA ROD [Ref. 3] as the OE remedial action to be performed on the Ranges 43–48 IA site. This work plan describes the procedures, methods and resources that Parsons and its subcontractors will use while performing the surface and subsurface OE removal and related activities (e.g., preparatory action, brushcutting, and range target removal). This SSWP only includes the work that will be performed in the Ranges 43–48 IA site; the work in Range 30A and Site OE-16 will be completed in the future under separate SSWPs. The work performed under this work plan will be evaluated in the Basewide OE RI/FS [Ref. 1].

1.2 SCOPE

This work plan is an adjunct to the Programmatic Work Plan (PWP) [Ref. 8], and it is intended to describe the surface and subsurface OE removal (and related activities) to be performed in the Ranges 43–48 IA site. All site operations will be executed in accordance with (IAW) the PWP [Ref. 8] as supplemented by this SSWP and amended by applicable field variance forms (FVFs) (Appendix F). FVFs from other ongoing projects (OE-15SEA.1–4) applicable to this IA will also be followed.

Any deviation from either the PWP [Ref. 8] or this SSWP will require the submission of an FVF by Parsons. Parsons will prepare Draft FVFs and distribute them to the U.S. Army Corps of Engineers (USACE) for review and approval. After USACE approves the FVFs, Parsons will implement the FVF-based changes in the field and electronically distribute the approved FVFs to the Directorate of Environmental and Natural Resources (DENR), the Environmental Protection Agency (EPA), and the Department of Toxic Substances Control (DTSC) for a review period of three working days. The FVF-based change will continue to be adhered to unless feedback from the agencies dictates otherwise. A no response from the regulatory agencies will constitute concurrence with the FVF.

1.3 SITE LOCATION

The Ranges 43–48 IA site occupies the northern portion of the multi-range area (MRA), which is located in the south-central section of the former Fort Ord. The site is in close proximity to residential communities (city of Seaside and Fitch Park, Marshall, and Stillwell Housing areas), schools (Fitch Middle School, Marshall Elementary School, and Cypress Grove Charter High School [at Stillwell Elementary School location]), and recreational facilities (Bureau of Land Management [BLM] lands). Figure 1-1 displays where the Ranges 43–48 IA site is located relative to the MRA and the former Fort Ord, and it shows the close proximity of the site to the aforementioned residential communities, schools, and recreational lands.

1.4 SITE DESCRIPTION

The IA OE RI/FS [Ref. 9] originally defined Ranges 43–48 as a 483-acre IA site consisting of a 472-acre area designated for habitat reserve and an 11-acre portion of OE-15MOCO.2 designated for future development. This Ranges 43–48 IA site excluded 72 acres of land (the remaining 47-acre portion of OE-15MOCO.2 and the 25-acre eastern portion of OE-15SEA.4) contained within the original 555-acre Ranges 43–48 boundaries that were used during previous

OE investigations. Figure 1-2 shows the boundaries of the following: the 483 acre Ranges 43–48 IA site defined by the IA OE RI/FS; the habitat reserve and future development areas contained within the IA site; and the original 555-acre Ranges 43–48 area.

Minor adjustments were recently made to the boundaries of the habitat and future development areas; as a result, the acreage and the boundaries of the IA site have changed. Based on these changes, the Ranges 43–48 area is now defined as a 498-acre IA site consisting of a 473-acre habitat reserve and a 25-acre future development area. Figure 1-3 shows the new boundaries and acreages of the IA site, the habitat reserve area, and the future development area.

The Ranges 43–48 IA site is surrounded by fuel breaks: Eucalyptus Road, Evolution Road (formerly Maverick Road), Broadway Avenue (formerly the east-to-west section of Pipeline Road), and Orion Road (formerly the north-to-south section of Pipeline Road) border the site to the north, west, south, and east, respectively (Figures 1-2–1-4).

The Ranges 43–48 IA site is mostly covered by maritime chaparral with patches of annual grassland habitats along the site's western and southern boundaries. The majority of the site's terrain is rolling hills with elevations ranging from 375–550 ft. Figure 1-4 shows the site's terrain and vegetation.

1.5 REMOVAL PROCESS SELECTED FOR SITE

1.5.1 PROCESS UPDATE

A surface and subsurface removal was selected by the IA ROD [Ref. 3] as the OE remedial action to be performed on the Ranges 43–48 IA site. Since the release of the Draft Final version of this SSWP, the process for performing the subsurface removal work has been modified.

The subsurface OE removal process previously entailed performing a Schonstedt-assisted surface removal; conducting a subsurface OE removal to depth (investigating all anomalies detected until their sources are removed or resolved) using the best available technology (BAT), whether analog or digital; and conducting quality control (QC)/quality assurance (QA) inspections.

Based on the completed OE-15DRO.1–2 and the ongoing OE-15SEA.1–4 projects, the most appropriate technology (MAT) for completing the subsurface OE removal is (1) detecting and removing subsurface OE to depth with Schonstedt GA-52/Cx magnetometers (analog); (2) digitally mapping the post-removal conditions with an EM61-MK2 metal detector or a G-858 magnetometer, as well as investigating and resolving any remaining items detected during the mapping process; (3) conducting a QC inspection on the removal work with the Schonstedt magnetometers; and (4) conducting QA inspections. Portions of the site where this approach cannot be implemented will be delineated as special-case areas and addressed in the future. A visual surface removal remains the approach for removing surface OE (section 2.3.5).

1.5.2 BASIS FOR SELECTED REMOVAL PROCESS

The updated removal process is an efficient field implementation of the IA ROD-selected subsurface OE removal. This approach is expected to remove the greatest hazard of OE at Ranges 43–48 to the maximum extent practicable. Additionally, this approach supports the anticipated future reuse of the area, and it is consistent with the Land Disposal Site Plan Amendment 3 (LDSPA3) [Ref. 10], which was approved by the Department of Defense Explosives Safety Board (DDESB). The following facts support using this updated removal process:

(1) OE items at the former Fort Ord are typically encountered at depths less than their calculated maximum penetration depths (based on Fort Ord-specific OE penetration data).

(2) Approximately 97% of the items recovered at the former Fort Ord have been found within the top 2 ft below ground surface (bgs).

(3) During previous investigations and studies at the former Fort Ord, the Schonstedt GA-52/Cx magnetometer has proven to be capable of detecting the OE items aniticipated to be encountered at this site at their expected recovery depths (Table 5-1, page 5-2).

1.5.3 CONTINGENCY

In the event that performing this subsurface removal to depth adversely impacts the habitat or the operation's schedule (the operation needs to be completed before the maritime chaparral regrows and makes the surface inaccessible for geophysical surveys), the OE Base Closure Team (BCT) will be consulted. If it is determined that changes to the operation's procedures are required, the approval of those changes by the regulatory agencies will be expedited.

CHAPTER 2
TECHNICAL MANAGEMENT PLAN

This plan outlines the procedures that Parsons and its subcontractors will use to perform the surface and subsurface OE removal (and related activities) in the Ranges 43–48 IA site. The topics that remain unchanged from the PWP are not repeated in this SSWP. The appropriate sections of the PWP are referenced throughout the SSWP.

The recently performed and currently scheduled work at Ranges 43–48 includes the following operations:

(1) A time-critical removal action (TCRA) to remove unexploded ordnance (UXO), OE-scrap, and non-OE-scrap items from the surface of the site's open and accessible areas that was completed in winter 2001. The Ranges 43–48 Final Surface Removal Technical Information Paper [Ref. 11] details the procedures and the results of the surface removal TCRA.

(2) A preparatory action in the site's accessible areas that began summer 2002 and will be completed prior to the prescribed burn to reduce materials that would contribute to smoke generation during the prescribed burn, ensure that the prescribed burn can be contained within the original site boundaries, and help plan the geophysical work that will be performed after the prescribed burn. Appendix A contains a technical letter that explains the completed and to-be-performed preparatory activities in and around the Ranges 43–48 IA site.

(3) A prescribed burn covering the site to clear vegetation [Ref. 4] scheduled between July 1 and December 31, 2003. This prescribed burn will be performed to facilitate the OE cleanup operations described by this SSWP.

2.1 OE HISTORY OF RANGES 43–48

The Ranges 43–48 site was previously used for a variety of military training activities. The OE information in this SSWP is based on the IA OE RI/FS [Ref. 9], historical documents [Refs. 12-14], and the previous OE sampling and removal activities performed in the site. Table 2-1 lists the prior use of the ranges in the site and the items found or used in each range; Table 2-2 summarizes the previous OE removal and sampling activities performed in Ranges 43–48; and Appendixes B and C display and list the locations of the OE items that were encountered during these previous OE removal and sampling activities. All anomalies that were detected during these previous investigations were excavated and/or removed.

Table 2-1-Previous Use of Ranges 43–48

Range	Prior Range Use	Items Found or Used on Range[a]
43	Platoon live-fire course, mortar training	1. Grenades: hand, fragmentation 2. Mortars: 4.2-in., high explosive (HE), white phosphorous (WP); 60mm, target practice (TP), illumination; 81mm HE, WP, TP, illumination 3. Projectiles: 37mm, low explosive (LE); 40mm grenade launcher, smoke, practice; 57mm, HE; 75mm, HE, shrapnel; 105mm smoke, HE; 155mm smoke 4. Rockets: 66mm, light antitank weapon (LAW) 5. Small arms
44	Antitank weapons	1. Mines: antipersonnel, practice 2. Missiles (Dragon-guided): practice and high-explosive antitank (HEAT) 3. Projectiles: 37mm antitank (AT), 40mm, grenade, HE, practice; 84mm, HEAT; 90mm, recoilless rifle rounds, HEAT 4. Rockets: 35mm, LAW, subcaliber; 66mm, LAW, HEAT; 66mm incendiary
45	Grenade launcher	1. Grenades: hand, illumination, smoke, practice 2. Mortars: 60mm, HE, practice 3. Mines: antipersonnel, practice 4. Projectiles: 14.5 mm subcaliber ; 22mm subcaliber; 40mm grenade, practice, HE, smoke, illumination 5. Rockets: 35mm subcaliber; 66mm LAW (HEAT from Range 44); 66mm incendiary
46	Small arms	1. Small arms (pistols and rifles)
47	40mm grenades	1. Grenades: 40mm, HE
48	Weapons familiarization, sniper, mortar, machine gun	1. Grenades: hand, fragmentation; rifle, practice 2. Mines: antitank, practice; antipersonnel, practice 3. Missiles: Dragon-guided, HEAT 4. Mortars: 4.2-in.,HE; 60mm, HE, TP, illumination; 81mm, HE, WP, TP, illumination; 5. Projectiles: 22mm subcaliber; 40mm grenade launcher, HE; 57mm, HE; 75mm, HE; 84mm, practice, HEAT; 105mm HE, smoke, illuminating; 155mm, smoke 6. Rockets: 2.36-in., practice; 3.5-in., practice; 35mm subclaiber, practice; 66mm LAW HEAT; 66mm incendiary 7. Signal: illumination 8. Small arms

[a]Information based on IA OE RI/FS [Ref. 9] and historical documents [Refs. 12–14].

Table 2-2-Previous Ranges 43–48 Investigation Activities

Date of Activities	Grids/ Partial Grids	Grid Size	Description of Activities
April 1997	11[a]	15-ft by 100-ft[a]	Grid sampling to 4-ft depth on 15-ft-wide trail in Range 44 to allow safe access for soil characterization activities and equipment
April 1997	2	100-ft by 100-ft	4-ft removal on Range 44 grids performed to establish duration and cost for a removal action in ranges[b]
August 1997	1	100-ft by 100-ft	Sampling performed on grid that contained a target in Range 44
October 1997	6	100-ft by 200-ft	Grid sampling to 4-ft depth as part of MRA sampling
November 1997–January 1998	53	15-ft by 100-ft	OE removal performed to 4-ft depth for road clearance on Maverick Road
May–June 1998	65	30-ft by 110-ft	OE removal performed to 4-ft depth on Blue Line fuel break
April–June 1999	36	100-ft by 100-ft	4-ft removal (previously referred to as 100% grid sampling) performed in OE-15MOCO.2 and OE-15SEA.4 to determine amount of OE present and scope for future removal actions.
April–August 1999	25	100-ft by 100-ft	OE clearance to 4-ft depth in Range 46 during site preparation to support remediation of lead-contaminated soil and spent small arms ammunition
May/October 1999	11[c]	100-ft by 100-ft	Surface OE removal performed over 11.5-acre portion of Range 45 as an immediate safety action
February 2001	89	15-ft by 100-ft	Surface removal performed to establish fuel break along southern side of Eucalyptus Road
May 2001	62	45-ft by 100-ft	Pipeline Road fuel break (now Broadway Avenue and Orion Road) established; 4-ft removal on 15-ft-wide central road and surface removal on 15-ft-wide sides
August 2001	52	50-ft by 100-ft	Fuel break established along Maverick Road (now Evolution Road); 4-ft removal on 20-ft-wide central road and surface removal on 15-ft sides
August–December 2001	37	1,000-ft by 1,000-ft	TCRA to remove surface OE from open, visible areas performed over entire site
August–October 2002	N/A	N/A	Preparatory action to (1) remove or prep items (e.g., tires, structures, utility poles, brush) that could contribute to smoke generation during a prescribed burn; (2) enhance site's fire containment features; and (3) plan subsequent geophysical work.

[a]Range 44 trail was comprised of approximately 11 contiguous 100-ft sections.
[b]Items were only encountered on the surface during this operation.
[c]Of the 11.5 acres covered by this action, the 11 grids covered only approximately 2 acres.

2.2 FIELD OPERATIONS AND REMOVAL AREAS

Appendix B contains a map of the Ranges 43–48 IA site that shows the locations of the range fans, grids, and previously sampled or cleared grids, roads, and fuel breaks. The grid designations and the Fort Ord Master Grid system designations are displayed on this map.

2.3 SITE OPERATIONS

The following subsections describe the Ranges 43–48 IA site operations in sequential order; Figure 2-3 (page 2-14) demonstrates the process flow of the surface and subsurface OE removal. It should be noted that many of these various operations will be performed concurrently within different areas of the site. Because it is expected that the maritime chaparral in the site will regrow within approximately 15 months, the habitat-designated areas containing maritime chaparral will be considered first priority for the surface and subsurface removal, followed by the grassland areas. In maritime chaparral areas, the staging of work will be determined by the vegetation regrowth patterns.

2.3.1 PREPARATORY INSPECTION

A preparatory inspection of the site was performed before the 2002 pre-burn preparatory activities, and preparatory inspections will be performed before the prescribed burn and before OE removal work begins. The formal preparatory meetings for the prescribed burn and the OE cleanup work will be scheduled no less than 3 days and no more than 7 days before work begins.

2.3.2 FENCE REMOVAL/PREPARATORY ACTION

The original concertina wire 10 to 15 ft inside the site was removed as part of site preparation activities for the Ranges 43–48 IA. The barbed-wire fence supported by concertina wire along Eucalyptus Road will not be removed.

As part of the 2002 pre-burn preparatory activities in the site's accessible areas, Parsons and its subcontractors removed the tire piles from the site; removed the inactive utility poles extending into Ranges 43, 44, 45 and 47; cleared brush and pruned/removed trees; and conducted a meandering path digital geophysical survey. Fire prevention work was also completed around the Fitch Park housing area, including the clearance of 37 acres of vegetation to widen the fuel break surrounding the housing area by an additional 150 ft. Preparatory work still to be performed before the 2003 prescribed burn includes installing a sprinkler system around the site's perimeter and/or spraying foam/retardant on structures, the active and inactive utility poles along Eucalyptus Road, and around the site's perimeter.

The purpose of this preparatory action work is to reduce the materials that could contribute to smoke generation during the prescribed burn and ensure that the prescribed burn can be contained within the original Ranges 43–48 site boundaries. Appendix A details the quantities and locations of the items subject to this preparatory action, and it describes the procedures for addressing them. The maps in Appendix A display the locations of the areas and items subject to this preparatory action.

2.3.3 VEGETATION CLEARANCE-BURN

A majority of the site's vegetation will be cleared through the prescribed burn. This prescribed burn was the vegetation clearance method selected in the IA ROD to make the site safe for performing the surface and subsurface OE removal. The post-burn vegetation clearance operations that will be performed are addressed in section 2.3.6.

2.3.4 GRID AND BORDER SURVEY

A subcontractor will survey and install 100-ft by 100-ft grids in the Ranges 43–48 IA site. Wooden stakes will be used to mark the corners of each grid. The grid corners will be placed on, or nearly even with, state plane coordinates. Each grid will be identified by its southwestern corner stake and connected to the Fort Ord Master Grid System.

The majority of the Ranges 43–48 IA site border was previously surveyed through the surface removal TCRA [Ref. 11] and the establishment of the Blue Line fuel break [Ref. 15]. However, it is likely that many of the wooden stakes that currently mark the site's borders will need to be replaced after the prescribed burn. In addition, the northern IA site border from the eastern boundary of OE-15SEA.4 to the Blue Line/Eucalyptus Road intersection and the borders of the habitat and development areas will need to be surveyed and staked. A UXO specialist will accompany the surveyor subcontractor to ensure that their route is clear of OE and will check areas where stakes are to be placed with a Schonstedt GA-52/Cx magnetometer.

2.3.5 VISUAL SURFACE REMOVAL

After the prescribed burn, a visual surface removal will be performed to make the site safer for brushcutting operations. UXO technicians will visually locate UXO, UXO-like, OE-scrap, or non-OE-scrap items. This surface removal will be performed IAW section 2.3.6.2 of the PWP [Ref. 8], which defines visual surface removal procedures. A Schonstedt GA-52/Cx magnetometer will be used over the areas where the surface is obscured by brush, as determined by the Senior UXO Supervisor (SUXOS).

2.3.5.1 Procedures

UXO teams will use handheld global positioning systems (GPSs) loaded with the site map to ensure maximum coverage. When a suspected item (OE or to-be-determined UXO) is encountered, the item's coordinates will be identified either by estimating the distance [northing and easting] from the southwest grid corner stake) or, if the grids in that area have not yet been installed, using a handheld GPS. The UXO teams will remove or destroy any UXO item encountered IAW the procedures listed in Appendix G of the PWP [Ref. 8]. The UXO teams will remove any OE-like item and record the item by weight per grid. In addition, UXO teams will remove or stage (for future removal) the debris and metal scrap that can be hand-carried to reduce the amount of these items that need to be removed during the analog OE removal (section 2.3.8).

2.3.6 VEGETATION CLEARANCE-BRUSHCUTTING

Although one of the goals of the prescribed burn is to clear as much vegetation as possible in order to reduce the need to cut vegetation, there may be some unburned brush and leftover standing burnt stems and branches from the maritime chaparral that will need to be cleared so ordnance detection instrument operators can access the ground.

The extent of the maritime chaparral cutting will be limited to 50 acres; however, if there are more than 50 acres of unburned chaparral, DENR will get an approval from the U.S. Fish and Wildlife Service (USFWS) to clear the remaining unburned chaparral. The leftover dead wood from burned shrubs may be cut using mechanical equipment (e.g., TAZ® [or equivalent]) and/or manual equipment (e.g., chainsaws, loppers and weed whackers), as necessary.

Environmental impacts and the safety of personnel will be considered for selecting the feasible cutting method(s) for clearing the unburned maritime chaparral and leftover deadwood in a given area. Depending on the amount of unburned brush in an area, Parsons may seek guidance from DENR to determine the appropriate cutting method for that area.

The dead wood that is cut will be removed from the site and chipped in another location. The location of chipping will depend upon the volume of dead wood in given areas and whether it is feasible to haul the dead wood offsite.

The 160 metal t-posts that currently identify the habitat-monitoring transects within the site will be temporarily removed to allow the brushcutting to be performed. The t-posts will then be immediately replaced in the same spot to avoid losing transect locations and data accuracy.

2.3.7 GEOPHYSICAL WALK-THROUGH

To prepare for the ensuing digital geophysical survey (section 2.3.9.1), representatives from Parsons, its subcontractors, and USACE will perform a walk-through of the Ranges 43–48 IA site to determine which digital instrument to use for various areas within the site. The representatives will determine where the digital geophysical survey will be performed with either an EM61-MK2 metal detector a G-858 magnetometer using the process described in section 5.3 of ODDS [Ref. 16]. The major factors that determine which digital instrument is selected for a given area include terrain, vegetation, and the suspected types of OE (and their fuzing) in that area. Figure 2-1 shows the process for determining the appropriate geophysical instrument. After this geophysical walk-through, a map showing the digital instrument selected for each area within the site will be delivered to USACE, DTSC, and EPA within 14 days.

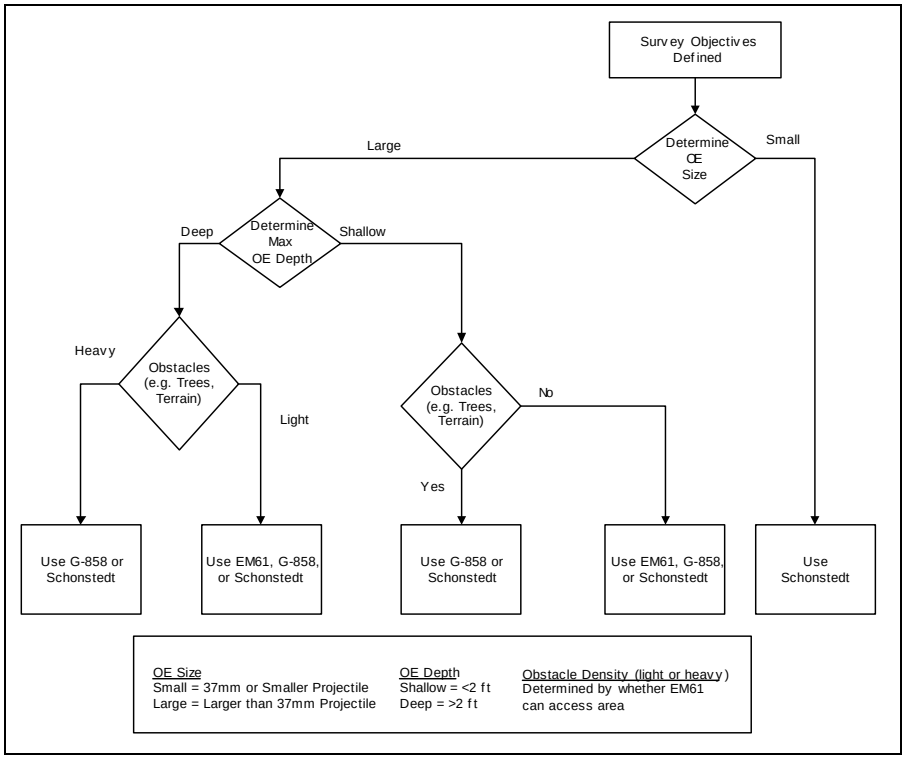


Figure 2-1—Digital Instrument Selection Process

2.3.8 ANALOG OE REMOVAL

An analog OE removal will be performed over the entire Ranges 43–48 IA site. The analog OE removal will consist of two major work elements: (1) the detection and removal of surface OE and subsurface OE to depth with Schonstedt GA-52/Cx magnetometers; (2) the identification of range targets and special-case areas (areas identified as being saturated with such large amounts of metallic clutter that they would interfere with a geophysical survey).

Based on previous investigations and studies at the former Fort Ord, the Schonstedt GA-52/Cx magnetometer should be able to detect the OE items anticipated to be encountered on the Ranges 43–48 IA site at their expected recovery depths (Table 5-1, page 5-2).

During previous investigations at the former Fort Ord, approximately 97% of the items recovered were found within the top 2 ft bgs. During investigations at ODDS field-trial sites that were located in or adjacent to the MRA, approximately 99% of the items were recovered within 2 ft bgs—and the Schonstedt GA-52/Cx magnetometer had the highest detection rate among all of the geophysical instruments used. The types of items recovered at the ODDS field-trail sites included the same types of items generally expected at Ranges 43–48 such as 60mm, 81mm, and 4.2-in. mortars; 37mm, 40mm, 57mm, 75mm, and 155mm (nose only) projectiles; 2.36-in. and 3.5-in. rockets; pyrotechnics; rifle grenades; and various fuzes. These types of items have been recovered in Ranges 43–48 at depths that are, on average, within the detection capability of the Schonstedt GA-52/Cx magnetometer.

To address items deeper than the Schonstedt's detection capability, the data processing and anomaly selections that will be performed during the subsequent digital geophysical work will focus on those deeper items.

2.3.8.1 OE Removal Procedures

The UXO teams will lay ropes out to form 100-ft by 3-ft search lanes. To locate anomalies, UXO technicians will use Schonstedt GA-52/Cx magnetometers in a back-and-forth motion that covers the entire width of the established lanes, per section 2.3.8.2 of the PWP [Ref. 8].

When an anomaly is detected, it will be excavated per sections 2.3.8.3–2.3.8.7 of the PWP [Ref. 8]. All anomalies will be excavated to depth, which means that the digging of an anomaly continues until its source is removed.

When a suspected item (OE or to-be-determined UXO) is encountered, the UXO teams will record the item's description, location (identified by estimating the distance [northing and easting] from the southwest grid corner stake), and depth in a personal digital assistant (PDA). The UXO teams will remove or destroy all suspected OE items encountered IAW the procedures listed in Appendix G of the PWP [Ref. 8].

UXO teams will remove all detectable ferrous and all visible, nonferrous items that are 2 in. in any dimension (or larger) from the grid and record them by weight per grid. The description of any OE-scrap item or fragments will be recorded in a PDA if (1) the OE type associated with the item or fragments is easily identifiable and (2) the OE type was not expected to be encountered in or is unusual for the Ranges 43–48 IA site.

During excavations, the top 3 to 4 inches of soil will be replaced at the surface after backfilling holes, where feasible, to preserve the seed bank of rare annual plants. The feasibility of replacing the topsoil will be determined by the type of soil and whether rare plant species are

present. All OE removal activities will be monitored to minimize impacts to species listed by the Installation-Wide Multi-species Habitat Management Plan for Former Fort Ord (HMP) [Ref. 17] to the greatest extent feasible.

2.3.8.2 Identifying Range Targets and Special-Case Areas

There are approximately 100 identified range targets scattered throughout the Ranges 43–48 IA site and more are expected to become visible after the prescribed burn. The range targets already identified or expected to be identified include the following types: 6-ft-tall metal silhouettes, 55-gallon drums, armored personnel carriers (APCs), cement-filled targets, dumpsters, tanks, and wheeled vehicles. Figure 2-2 displays the locations of the range targets already identified in the Ranges 43–48 IA site. The range targets will be removed/relocated per the range target removal/ relocation process described in section 2.3.12.

The areas surrounding the range targets and parts of Ranges 44, 45, 47 and 48, as a result of being heavily fired upon, may be saturated with large amounts of metallic clutter that preclude a geophysical survey from being conducted over them. Therefore, during the analog OE removal, range target areas and parts of the aforementioned ranges may be identified as being saturated with metallic clutter and delineated as special-case areas. Because the procedures for special-case areas listed in section 5.6.4.2 of the PWP [Ref. 8] might significantly impact the habitat, Parsons will recommend appropriate cleanup solutions based on the amount of OE and the potential impacts to the habitat to USACE. The Army and USACE will then consult with the regulatory agencies regarding those recommendations. The recommended cleanup solutions may include investigating the special-case area (section 2.3.13) or marking the area for a future action. The results of the work in the special-case areas will be included in the after-action report (AAR).

The range target removal/relocation may be performed before the burn (on the accessible targets already identified), concurrently with other site activities, or deferred until after the digital geophysical work has been completed (to maximize the amount of OE that can be detected and removed before vegetation regrowth makes the surface inaccessible to the digital geophysical operations). Special-case area investigations (if required) may be performed concurrently with other site activities or deferred until after the digital geophysical work has been completed.

2.3.9 DIGITAL MAPPING

2.3.9.1 Digital Geophysical Survey

After the analog OE removal, a digital geophysical survey will be conducted over each grid investigated by the analog OE removal to document and map post-removal site conditions. During this digital geophysical survey, any anomaly recorded will subsequently be investigated and then resolved. The digital geophysical survey will also identify any additional special-case areas and further define those special-case areas delineated during the analog OE removal. A map that displays where each digital geophysical instrument was used will be developed. A detailed description of the digital geophysical surveys that will be performed in the Ranges 43–48 IA site is included in section 5.16 of this SSWP.

2.3.9.2 Reacquisition of Anomalies

Field reacquisition teams will verify suspected anomaly locations as excavation sites. A description of the geophysical reacquisition process is located in section 5.21 of this SSWP.

2.3.9.3 Excavation of Anomalies

A removal to depth will be performed on all successfully reacquired anomalies and 10% of the unsuccessfully reacquired anomalies in the Ranges 43–48 IA site.

If an anomaly is not detected where a flag was placed to mark the anomaly location, per FVF PWP 002, teams will search a 3-ft radius around that flag with a Schonstedt GA-52/Cx magnetometer and an EM61-MK2 (where possible).

PDAs will be used to record the results of the digital excavations. The information recorded for a given anomaly will depend on the results of its excavation:

- If a suspected item (OE or to-be-determined UXO) is encountered, the UXO teams will record the item's description; distance and direction from the flag; depth; weight; and initial condition and disposition. Teams will also record the action taken and whether the item requires demolition.
- If an identifiable OE-scrap item is encountered, the UXO teams will record the item's description; distance and direction from the flag; depth; weight; and initial disposition.
- Per FVF SEA010, if an anomaly produces a non-OE item, or pieces or fragments (of an OE item) that are not intact, the UXO teams will record the approximate weight of the total associated with the anomaly and the depth; however, the associated OE type, distance and direction away from the flag, and inclination and declination will not be recorded. One exception to this FVF will be that the description of any fragments will be recorded in a PDA if (1) the OE type associated with those fragments is easily identifiable and (2) the OE type was not expected to be encountered in or is unusual for the Ranges 43–48 IA site.

After an anomaly has been excavated, the UXO dig teams will use a Schonstedt GA-52/Cx magnetometer and an EM61-MK2 to recheck the excavation. Teams will check a minimum of a 3-ft radius around the flag marking the initially recorded anomaly location to verify that there are no other anomalies remaining around the excavated area. If it appears that the anomaly source has not been removed, the excavated area will be reinvestigated.

During excavations, the top 3 to 4 inches of soil will be replaced at the surface after backfilling holes, where feasible, to preserve the seed bank of rare annual plants. The feasibility of replacing the topsoil will be determined by the type of soil and whether rare plant species are present. All OE removal activities will be monitored to minimize impacts to HMP-listed species to the greatest extent feasible.

2.3.10 QC-3: ANALOG 10% QC

After the analog OE removal and digital mapping processes have been completed, Parsons' UXO QC Specialist (UXOQCS) will use a Schonstedt GA-52/Cx magnetometer to inspect 10% of each grid investigated. Per FVF SEA028, any grid failure or other QC issue will be addressed by a nonconformance and corrective action report (NCR) that describes the nonconformance, lists the cause, recommends a corrective action, and outlines the reinspection process.

Per FVF SEA030, which standardized the QC/QA grid failure criteria for OE removal sites at the former Fort Ord, a grid failure during QC/QA surveys in the Ranges 43–48 IA site will be constituted by the discovery of either a UXO or UXO-like item sufficient in size to represent a 37mm projectile (or larger) or five non-selected anomalies that should have been selected during the initial survey.

2.3.11 QA

2.3.11.1 Digital QA

The USACE geophysicist will conduct QA of the digital geophysical aspects of operations, which are listed in section 11.4.1 and detailed in Appendix G of this SSWP.

2.3.11.2 Analog QA

The government will conduct a QA inspection with a Schonstedt GA-52/Cx magnetometer over a minimum of 10% of each grid in the Ranges 43–48 IA site.

2.3.12 RANGE TARGET REMOVAL/RELOCATION

Parsons subcontractors (overseen by UXO escorts) will relocate or remove range targets from the site. Many of these items can be easily accessed from fuel breaks and established dirt roads and then hauled away. Some items, however, may be a short distance from the existing roads. To access these items, the UXO escorts will determine the safest route from the existing road to the range target. If that route has not already been cleared of OE, an analog OE removal will be conducted over the route. Once a route has been cleared, removal crews may then drive over it to reach the item. The areas around those range targets that would require major road construction to facilitate the targets' removal will be marked as special-case areas.

After reaching the range target, the UXO escort will inspect inside the range target for OE. The range target will then be lifted by heavy equipment, and the UXO escort will inspect underneath the range target for OE. If an OE item is dropped from the range target, range target removal operations will stop until the situation is evaluated and the appropriate action to remove the OE item is performed.

After it is determined that the range target can be moved safely, it will be hauled over the same access route to return to the existing road. This "one-time-in/one-time-out" procedure will be performed in a manner that minimizes impacts to the habitat. For multiple targets that are in

close proximity to each other, the same access route may be used again if doing so would reduce the impact on the environment.

The range targets that are removed will be recycled by a Parsons subcontractor IAW the standard operating procedure (SOP) for range residue removal [Ref. 18]. Some relocated range targets may remain in the Ranges 43–48 IA site for historical display.

Table 6-1 (Chapter 6) lists the hazards involved with the removal of the range targets and the safety precautions to be implemented.

2.3.13 INVESTIGATION OF SPECIAL-CASE AREAS

Parsons will make recommendations to USACE for the cleanup of special-case areas based on the amount of OE and the potential impacts to the habitat. USACE will then consult with the regulatory agencies regarding those recommendations. The recommendations may include marking the area for a future action or investigating it. Tentatively, investigations will be conducted per section 5.6.4.2 of the PWP as amended by any applicable FVFs.

2.3.14 SITE RESTORATION

Parsons subcontractors will perform restoration activities under the guidance of the Parsons OE Field Operations Manager (OEFOM) and the Parsons biologist. The majority of the site restoration will consist of erosion control measures in barren areas, where erosion may occur due to runoff in the rainy season. Erosion control will mostly consist of the application of a weed-free straw to control runoff. Parsons estimates that up to 5% of the site and the surrounding roads will require erosion control measures (this estimate excludes the approximately 20.5 acres of special-case areas shown in Figure 2-2 that may require excavations and sifting). In special-case areas, active planting may be required to restore the chaparral vegetation because cleanup solutions that may be performed such as scraping could severely impact the chaparral vegetation. If restoration activities are required for special-case areas, the selected restoration activities will be documented in the Ranges 43–48 IA site AAR.

2.3.15 AAR

An AAR that covers the Ranges 43–48 IA site will be prepared, and it will summarize previous site activities and describe the IA-related OE removal activities completed, including the preparatory action, range target removal, special-case area investigations, and the surface and subsurface OE removal. The AAR will include geophysical data; maps displaying where items were found; comprehensive lists of the types, quantities, depths, and locations of items found; and a summary of lessons learned that can be applied to the current and future operations. This future AAR will not replace any AARs from previous operations, but it will reference those AARs.

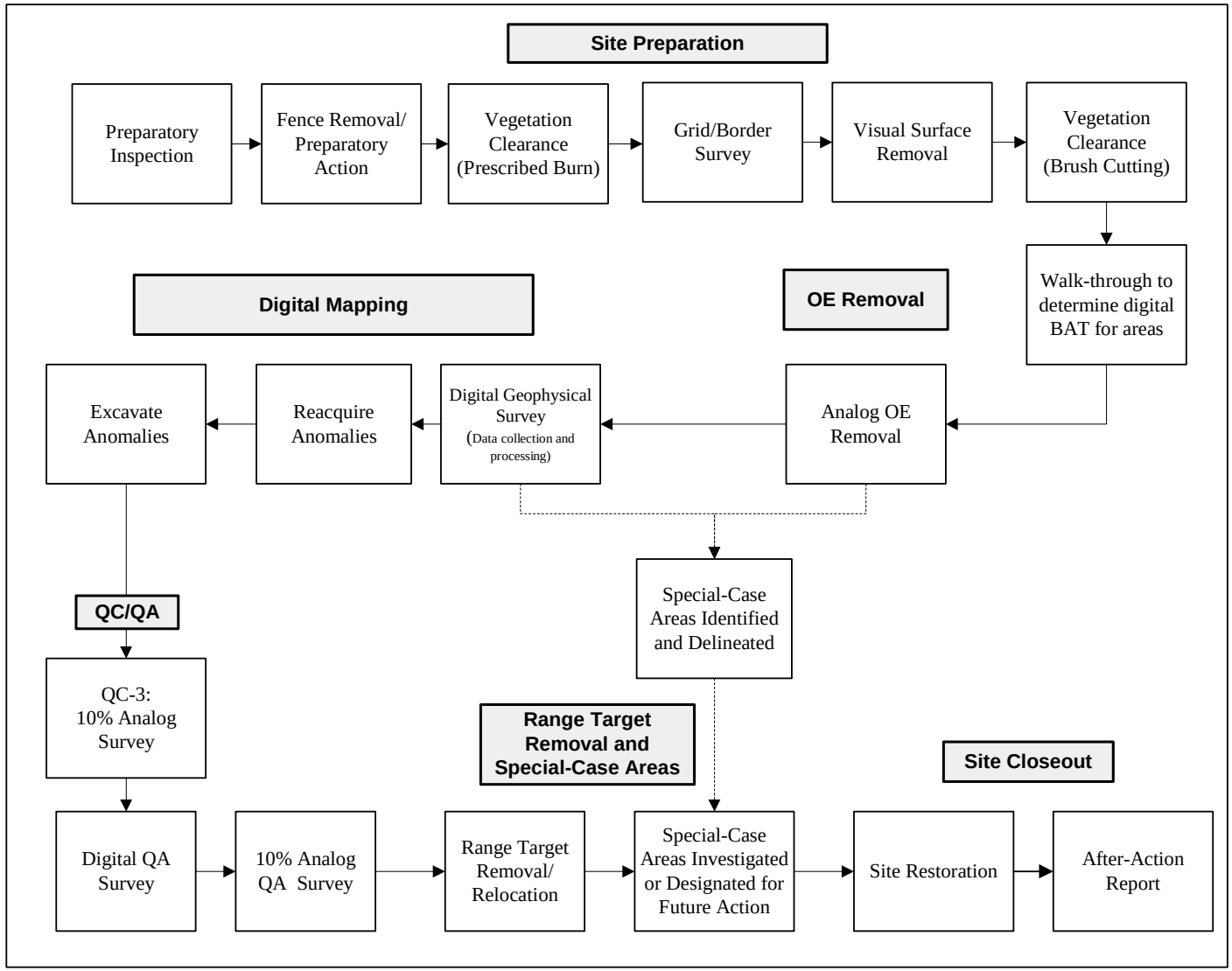


Figure 2-3—Ranges 43–48 IA Site Operations Process Flow

2.4 ORGANIZATION

Tables 2-3 and 2-4 list the estimated compositions of field teams and number of personnel by labor category. It should be noted that the numbers provided in these tables are estimates and may change due to actual field conditions encountered and/or the effect of vegetation regrowth.

Table 2-3—Estimated Field Team Composition[a]

Team	Teams	Team Members	Total Personnel	Team Composition
Survey	2	3	6	(1) Surveyor, (1) Surveyor's Aide, and (1) UXO Tech II
Mechanical Vegetation Clearance	1	2	2	(1) Heavy-Equipment Operator and (1) Safety Observer/UXO Tech II
Manual Vegetation Clearance	4	7	28	(1) Team Leader, (5) Laborers, and (1) UXO Tech II (includes restoration)
OE Removal (visual surface and analog to depth) and Digital Anomaly Excavations	8	6	48	(1) UXO Tech III and (5) UXO Tech IIs
Geophysical Survey, Reacquisition, and QC	6	4	24	(2) Equipment Operators, (1) Geophysical Assistant, and (1) data processor[b]
Total	21	—	108	—

[a]Number of teams and members per team are subject to availability of personnel
[b]Data processors are considered part of the field team although they are office personnel.
[c]UXOQCS and QC Manager (QCM) are present to observe teams.

Table 2-4—Estimated Number of Field Personnel by Labor Category[a]

Category	No.
Brush Clearance Team Leader	4
Geophysical Data Processor	6
Geophysical equipment operators	12
Geophysical Assistant	6
Geophysical Field Coordinator	1
Quality Control Geophysicist (GEO QC)	2
Heavy-Equipment Operator	1
Laborers	20
OE Field Operations Manager	1
QCM	1
Project Geophysicist	1
Survey personnel	4
SUXOS	1
UXOQC	1
UXO Safety Officer (UXOSO)	1
UXO Tech III	8
UXO Tech II	47
Total	117

[a]Number of teams and members per team are subject to availability of personnel.; includes all personnel required to support field operations.

CHAPTER 3
EXPLOSIVES MANAGEMENT PLAN

Chapter 3 of the PWP is the Explosives Management Plan for this surface and subsurface OE removal.

CHAPTER 4
EXPLOSIVES SITING PLAN

The most probable munition (MPM) with the greatest hazard for the Ranges 43–48 IA site is a 75mm HE M48 projectile (based on the 75mm HE M48 projectile found in grid B2I6 during the surface TCRA). A site's MPM is determined by the site's former land use and prior OE investigations in the site. After the MPM is established, a minimum separation distance of the MPM is determined. This is achieved by referring to a U.S. Army Engineering and Support Center, Huntsville Division (CEHNC) document that lists the maximum fragment ranges for munitions [Ref. 19]. This CEHNC document (Appendix D) shows that a 75mm HE M48 projectile has a minimum separation distance of 1,701 ft.

Based on the 1,701-ft minimum separation distance of the site's MPM, a 1,701-ft exclusion zone will be used during intrusive operations. During intrusive operations, only project personnel will be authorized to be inside the exclusion zone. IAW EM 1110-1-4009 [Ref. 20], a team separation distance (TSD) of 234 ft will be used to separate individual UXO and project teams performing surface and subsurface OE removal-related activities.

To restrict public access into areas near the site during this IA, Eucalyptus Road and Parker Flats Cut-Off will be closed to the public by Parsons' security subcontractor or the area between the Fitch Park housing area and the MRA will be fenced off. Engineering controls will be used during detonations and during the excavation of items identified as possible UXO in the area along the northern border of the Ranges 43–48 IA site between Range 48 and approximately 700 ft west of Range 46 (Figure 4-1). Using engineering controls reduces the exclusion zone to 200 ft because it mitigates the blast and the fragmentation from the unintentional detonation of an OE item. The reduced exclusion zone will prevent OE removal work from affecting residences in the southeast portion of the Fitch Park housing area that are within the 1,701-ft exclusion zone. This reduction is based on tests involving engineering controls that follow the guidelines described in CEHNC memorandums [Refs. 21–23]. Engineering controls include, but are not limited to, the following types:

(1) Miniature open front barricade (MOFB) during excavations
(2) Sandbags, soil and water tamping, or other forms of barricading during demolition operations

The locations of blow-in-place (BIP) and consolidated detonations will be identified using a GPS, recorded in a PDA, and entered into the project database. This data will be included in the AAR.

The sandbag filling locations and demolition locations (for movable and transportable OE items) will be coordinated with the Parsons biologist to ensure impacts to HMP-listed species are minimized.

CHAPTER 5
DIGITAL GEOPHYSICAL INVESTIGATION PLAN

Chapter 5 details the Geophysical Investigation Plan (GIP) for the digital mapping of the Ranges 43–48 IA site. This plan has been developed IAW the CESPK Data Item Description (DID) OT-FTO-05 (except for changes made through FVFs) and is intended to supplement the GIP presented in the PWP [Ref. 8].

5.1 OBJECTIVES

After the analog OE removal (section 2.3.8), digital geophysical surveys will be conducted to map and document the post-removal site conditions, as well as to establish and record the locations of anomalies that could be subsurface OE. The digital geophysical surveys will comply with the PWP [Ref. 8] as supplemented by this SSWP.

Anomalies will be selected from the recorded data for intrusive investigation. The smaller items at shallower depths in the removal area (e.g., 14.5 and 22mm subcaliber projectiles, and hand grenade fuzes) are best detected with Schonstedt GA-52/Cx magnetometers, which will have already been used over the site during the analog OE removal that will be performed before the digital geophysical survey. Because the response of the digital instruments from these smaller objects is likely to be within the instrument noise level, the data processing and anomaly selections will focus on finding the larger items, for which the digital instruments are best suited.

Any anomaly recorded will be investigated and then resolved. Per FVF SEA014, an anomaly will be considered resolved in one of three ways: it is interpreted as noise by the data processor (section 5.20); it is unsuccessfully reacquired (section 5.21); or its source is excavated (section 2.3.9.3).

5.2 SPECIFIC AREAS TO BE INVESTIGATED

The entire 498-acre Ranges 43–48 IA site will be subject to a digital geophysical survey under this SSWP. The appropriate cleanup solution for the special-case areas will be determined by evaluating the amount of OE in the area and the potential habitat impacts from cleanup solutions (i.e., scraping and sifting) that may be performed. The general sequence of the site activities that will be performed in the Ranges 43–48 IA site is shown in Figure 2-3 (page 2-13).

5.3 ANTICIPATED OE TYPES AND PENETRATION DEPTHS

Table 5-1 lists the most common OE items potentially remaining in the Ranges 43–48 IA site. In addition, Table 5-1 lists the maximum and average recovery depths and maximum calculated penetration depth for the OE and OE-scrap items that were encountered during previous investigations in Ranges 43–48. It is anticipated that the recovery depths of the subsurface OE that is expected to be encountered during the subsurface OE removal will be similar to the recovery depths listed in Table 5-1. Appendix C lists the quantities and locations of the UXO and OE-scrap items that have been encountered during the previous site operations (grid sampling, 4-ft removals, establishment of fuel breaks, surface TCRA) in Ranges 43–48.

Table 5-1—Recovery and Penetration Depths of OE and OE-scrap Items Previously Encountered in Ranges 43–48[a]

OE Type	Qty		Maximum Recovery Depth		Average Recovery Depth		Maximum Calculated Penetration Depths [in sand][e] (in.-bgs)[b]
	OE/ UXO	OE Scrap	Depth (in.-bgs)[b]	Qty.[c]	Depth (in.-bgs)[b]	Qty.[d]	
Cartridge: 40mm, practice, M781	11	61	5	61	5	72	N/A
Fuze: grenade, various	79	31	8	2	1	110	N/A
Fuze: projectile, various	6	112	30	2	9	118	N/A
Grenade: hand, several types	9	21	13	1	5	30	N/A
Mine: antipersonnel, M18A1, claymore	1	1	3	1	2	2	N/A
Missile: Dragon-guided, HEAT (rocket motors)	27	2	0	9	0	29	10
Missile: Dragon-guided, practice	12	0	0	12	0	12	N/C
Projectile: 22mm, subcaliber, practice, M744	29	47	12	5	7	76	17
Projectile: 37mm, APC, M59	0	2	8	1	6	2	47
Projectile: 37mm, APT, M51 Series	0	4	6	2	5	4	47
Projectile: 37mm, TP, M63	3	4	8	1	3	7	47
Projectile: 40mm, HE (various)	62	528	0	590	0	590	2
Projectile: 40mm, practice (various)	64	0	27	1	1	64	2
Projectile: 40mm, HEDP	7	1,024	0	1,031	0	1,031	2
Projectile: 57mm, HE, M306	68	2	12	1	0	70	32
Projectile: 60mm, HE, M49 Series	141	1	18	1	1	141	13
Projectile: 60mm, mortar, illumination, M721	0	8	10	4	7	8	N/C
Projectile: 60mm, mortar, TP, M50A3	18	1	24	14	21	19	N/C
Projectile: 75mm, HE (various)	6	1	12	2	3	7	47
Projectile: 75mm, shrapnel, MK1	4	6	30	1	10	10	80
Projectile: 81mm, mortar, HE (various)	59	4	30	1	10	63	N/C
Projectile: 81mm, mortar, illumination, M301 series	2	1	12	1	4	3	N/C
Projectile: 81mm, mortar, TP, M43A1	137	14	30	1	13	151	32
Projectile: 84mm, HEAT, M136 series[e]	101	0	0	101	0	101	30
Projectile: 90mm, HEAT, M348 and M371[e]	14	1	0	15	0	15	24
Projectile: 4.2-in., mortar, HE, M3 series	2	19	17	1	3	21	49
Projectile: 105mm, HE, M1	1	0	0	1	0	1	N/C
Projectile: 105mm, illumination, M314	0	5	36	1	28	5	N/C
Projectile: 155mm, smoke, HC, M116A1	1	19	36	1	26	20	N/C
Rocket: 2.36-in., practice, M7 series	0	11	24	5	12	11	5
Rocket: 2.36-in., HEAT, M6	4	0	0	4	0	4	5

Table 5-1—(contd)

OE Type	Qty		Maximum Recovery Depth		Average Recovery Depth		Maximum Calculated Penetration Depths [in sand][e] (in.-bgs)[b]
	OE/ UXO	OE Scrap	Depth (in.-bgs)[b]	Qty.[c]	Depth (in.-bgs)[b]	Qty.[d]	
Rocket: 3.5-in., practice, M29 Series	1	141	12	2	3	142	10
Rocket: 35mm, practice, subcaliber, M73	2,055	24	30	1	1	2,079	6
Rocket: 66mm, HEAT, M72 series	215	1	3	1	0	216	11
Rocket: 66mm, incendiary, transistor power amplifier (TPA), M74	48	5	0	53	0	53	8
Signal illumination: ground, various	3	5	10	1	4	8	N/A

[a]Information is based on OE data compiled in the Fort Ord OE database from all previous investigations in Ranges 43–48. Parsons has performed QC on the OE data.
[b]Quantities are items found at listed maximum depth.
[c]Quantities are all items in the Fort Ord OE database within Ranges 43–48 with depths and quantities recorded.
[d]Source: Former Fort Ord Phase 2 Engineering Evaluation /Cost Analysis (EE/CA) [Ref. 24].
[e]Items have only been encountered on the surface of Ranges 43–48
N/A = not applicable (depth not calculated because item assumed to not penetrate on impact; these items can still be found in the subsurface because of burial due to erosion or in disposal pits).
N/C = Not calculated (ordnance item penetration depth not provided in Phase II EE/CA).

5.4 TOPOGRAPHY

The topography of the survey sites is rolling hills formed by Pleistocene-age dune deposits that may be up to 250 ft thick and cover most of the MRA. A majority of the slopes can be surveyed using digital instruments (provided they are not covered by unburned vegetation).

5.5 VEGETATION

The existing vegetation in the site, mostly maritime chaparral, will be cleared through the prescribed burn scheduled between July 1 and December 31, 2003. Unburned brush and leftover standing burnt stems and branches from the maritime chaparral will be cleared. Cutting of unburned maritime chaparral will be limited to 50 acres; if there are more than 50 acres of unburned maritime chaparral, DENR will get an approval from the USFWS to cut the leftover brush. Unburned vegetation that is not cleared may limit the accessibility of the surface to digital geophysical instruments.

5.6 GEOLOGIC CONDITIONS

Parsons' experience working in the subject sites suggests that there will be little effect on the EM61-MK2 from magnetic concretions common to the Santa Margarita Formation, but the G-858 magnetometer will likely have continued "ring-offs" from geologic materials.

5.7 SOIL CONDITIONS

Soil conditions at the survey site are predominantly sandy and provide a relatively good environment for electromagnetic (EM) and magnetic surveys.

5.8 GROUNDWATER CONDITIONS

Groundwater investigations associated with the basewide RI/FS [Ref. 25] included water-level measurements at several wells located near the survey sites in the western portion of the MRA. Based on water-level data from these wells, the vadose (unsaturated) zone in the uppermost aquifer varies in thickness from 60 to 180 ft. These groundwater conditions are not anticipated to have a detrimental effect on the geophysical survey.

5.9 GEOPHYSICAL CONDITIONS

The geophysical conditions in the survey areas are affected by both vegetation and terrain, which limit the access of certain instruments and positioning systems. Background geophysical signals/gradients are expected to be in the range of 1 to 3 millivolts (mV) for EM surveys and 1 to 3 nanoteslas (nT)/ft for magnetometer surveys.

5.10 SITE UTILITIES

To minimize the effects of interference from the site utilities (mostly the power lines located along or near Eucalyptus Road) on the digital geophysical survey, Parsons will perform a static test with the best available digital instrument to evaluate whether background noise will be above the acceptable criteria. If the interference from the site utilities is above the acceptable criteria while testing the selected digital geophysical instrument, the next best available digital instrument will be tested. The digital geophysical survey will only be performed with an instrument that meets the acceptable criteria. The final instrument selection will be documented. Currently, there are no plans to disrupt the service of site utilities during the digital geophysical survey.

It should be noted that Geonics® offered a modification to the EM61-MK2 that would allow the instrument to be used closer to the power lines without interference. This EM61-MK2 modification was recently tested in OE-15SEA.1 near the power lines along General Jim Moore Boulevard, and the test results indicate that the EM61-MK2 can be used as close as approximately 200 ft away from power lines (instead of 600 ft). This modification will therefore be implemented for operations in the Ranges 43–48 IA site. A white paper describing the results of the testing conducted with the modified EM61-MK2 is included in the 2002 OE-15SEA.1-4 Status Report [Ref. 26].

5.11 MANMADE FEATURES POTENTIALLY AFFECTING GEOPHYSICAL INVESTIGATIONS

Range targets that are not removed/relocated before the digital geophysical surveys will prevent the areas underneath and adjacent to the targets from being surveyed. Furthermore, as a result of being heavily fired upon, the areas around the range targets, as well as other portions of Ranges 43, 44, 45, and 47, may be saturated with large amounts of OE/metallic clutter that could also interfere with the anomaly selection and investigation process of surveyed areas. During the analog OE removal and digital geophysical surveys, areas identified as being saturated with large amounts of OE/metallic clutter will be delineated, and Parsons will make recommendations to USACE for the cleanup of these delineated areas. USACE and the Army will then consult with the regulatory agencies regarding those recommendations. The recommendations may include marking the area for a future action or investigating it. Tentatively, special-case area investigations will be conducted per section 5.6.4.2 of the PWP as amended by any applicable FVFs.

There are several structures near the perimeter of the original Ranges 43–48 area boundary (approximately six range towers, eight latrines, two break area structures, and five wooden buildings). Some of these structures were relocated to asphalt range pads during the 2002 preparatory action and therefore will not affect the geophysical surveys. Other structures, however, were not moved (instead they will be prepped by cutting vegetation and spraying foam around and over them) and therefore may affect the anomaly selection and investigation process.

5.12 OVERALL SITE ACCESSIBILITY AND IMPEDIMENTS

The site can be easily accessed via Eucalyptus Road. Four-wheel-drive vehicles will be used on existing dirt roads, paths, or trails within the site in order to access the survey areas.

5.13 POTENTIAL WORKER HAZARDS

No additional hazards are present in the Ranges 43–48 IA site other than those discussed in the PWP. Section 6 contains a site-specific hazard analysis.

5.14 GEODETIC SURVEYING

A Parsons subcontractor will perform geodetic surveying per section 2.3.4 of this SSWP. Chapter 7 of the PWP [Ref. 8] provides additional mapping and surveying information.

5.15 GEOPHYSICAL INVESTIGATION METHODS

Section 5.15 summarizes the equipment and methods that will be used to perform the geophysical investigations in the Ranges 43–48 IA site.

5.15.1 DIGITAL GEOPHYSICAL INSTRUMENTS

The digital geophysical instruments that may be used are the Geonics EM61-MK2 (0.5m by 1m) electromagnetic time domain metal detector (TDMD) and the Geometrics G-858 magnetometer. Section 5.6.1 of the PWP describes these instruments.

5.15.1.1 Selection Criteria

The selection of these geophysical instruments was based on four factors: the site-specific information summarized in sections 5.3–5.12, the results of ODDS [Ref. 16], the types of OE expected in the site, and Parsons' experience with previous geophysical surveys at Fort Ord.

The ordnance types anticipated to be present in the Ranges 43–48 IA site range in size and penetration depths (Table 5-1). The ODDS Receiver Operating Characteristic (ROC) curves for the various field trial sites indicate that several instruments would be best for the ordnance and conditions that are anticipated at this site (ODDS, Appendix D, Tab 5). The reasons for selecting these geophysical instruments are therefore as follows:

(1) Some of the OE items that were found during previous investigations in Ranges 43–48 were large items that had penetration depths greater than 24 in. (Table 5-1). During ODDS, the EM61 and G-858 were determined to be the best tools in detecting larger items at greater depths.

(2) Because the anticipated types of OE do not include any items that are completely nonferrous, electromagnetic or magnetic geophysical instruments can be used.

(3) The EM61 and the G-858 are commercially available instruments that are durable and rugged enough to be used in the field.

5.15.1.1.1. Evaluation of EM61 Models

Several models of the EM61 were evaluated during the selection process. The 0.5m-by-1m EM61 was determined to have a greater ability to detect the smaller and shallower items than the 1m-by-1m EM61. Furthermore, the results of the ODDS seeded test proved that the 0.5m-by-1m EM61 could still detect the larger, deeper items that the handheld EM61 could not detect. Since ODDS, the standard EM61 was upgraded to the EM61-MK2, which can directly link GPS and instrument data in the instrument data recorder. A towed array (multiple EM61 systems linked together and hauled by an all-terrain vehicle [ATV]) may be used over the Ranges 43–48 IA site. A towed array was recently tested over field-trial sites, and the results indicate that it might be an effective tool for mapping Ranges 43–48. The suitability of the towed array for this site will be determined further by its performance during actual digital geophysical work in the ongoing OE-15SEA.1–4 project and the field conditions observed (amount of unburned vegetation remaining) during the geophysical walk-through (section 2.3.7).

5.15.1.2 Instrument Selection and Use

The EM61-MK2 was selected as the primary digital geophysical instrument for the site surveys over the G-858. The G-858 will be the secondary digital geophysical instrument, and it may be used in areas containing OE items with ferrous components or in areas where site utilities or terrain preclude the use of the EM61-MK2.

Selecting the EM61-MK2 is further supported by the following:

(1) In previous work at the former Fort Ord, the EM61 has been more durable than the G-858 and less prone to equipment failures and data download problems.

(2) The EM61-MK2 is less sensitive to nearby structural interferences (e.g., fences and buildings) than the G-858.

(3) Data “dropouts” are far less frequent with the EM61-MK2 data than with the G-858 data.

(4) Data processing takes less time with the EM61-MK2 data.

(5) The EM61-MK2 is generally not as sensitive to construction materials used in the roads and range pads, which are often composed of source material containing rocks with high-ferrous mineral content.

The EM61-MK2 will primarily be used with 2-ft line spacing with the 1.0m (3.28-ft) edge of the instrument oriented perpendicular to the direction of travel. The G-858 will also be used with 2-ft line spacing.

Because of the known presence of sensitively-fuzed OE items in the Ranges 43–48 IA site, digital instruments will be operated IAW the CENHC February 2002 Safety Advisory [Ref. 27]. This safety advisory reiterates the January 1999 CENHC Interim Safety Alert that provided safety recommendations for operating digital geophysical instruments in areas suspected of containing UXO with electronic fuzing. Table 6-1 (site hazard analysis) lists the safety precautions that will be taken by digital geophysical instrument operators.

5.15.2 GEOPHYSICAL NAVIGATION METHODS

Parsons may use two navigational methods for the site surveys: the primary method will be using a GPS; the secondary method, local (fiducial-based) navigation, may be used in areas covered by trees. These methods are described in Section 5.6.3 of the PWP.

5.16 DIGITAL GEOPHYSICAL SURVEY PROCEDURES

The following subsections summarize the procedures that will be used for the digital geophysical surveys (these procedures supplement the general procedures outlined in the PWP, which includes all QC procedures).

5.16.1 EM SURVEYS

EM61-MK2 surveys will be performed using the two methods that are detailed in sections 5.16.1.1 and 5.16.1.2.

5.16.1.1 Local Grid Coordinate System with EM61-MK2

The first method of data collection is to use a local grid coordinate system and collect parallel paths of data through each grid and recording data in an Allegro™ portable data logger. Data points will be collected at approximately 10 readings/sec. All the surveys will begin in the southwest corner of an area to be surveyed, and the southwest corner will be assigned a local coordinate of (0,0). The operator will then begin the data collection process by starting the instrument with the Allegro and, depending on the survey direction, walking in a straight line toward the northwest or southeast corner of the survey area. Survey tapes, marked ropes, and traffic cones will be laid down at 25-ft intervals, perpendicular to the direction of travel to help the operator walk in a straight path. Also, as the EM61-MK2 tires cross the survey tapes or ropes, a fiducial mark will be inserted into the data using a manual marker switch attached to the polycorder. Metallic spikes will be placed within a grid block and the locations will be recorded on the PDA form. The reported locations of these spikes will be compared with the measured anomaly locations as a QC check. The area around the spikes will be scanned with the survey instrument prior to placing the spike, and spikes will not be placed on or near any observed anomalies. The anomalies caused by the QC spikes will not be selected for intrusive investigation. These points will be used later to adjust the survey data positioning.

At the opposite edge of the survey area, the operator will stop the data collection process as the EM61-MK2 tires cross the end line. The operator will then turn around; face the opposite edge of the survey area; depending on the survey direction, move 2 ft east or north of the centerline of the last lane; input the new direction; start inputting coordinate information into the polycorder; and begin surveying a new path. This process will be repeated until the entire grid has been covered. The second survey team member will record survey information on a PDA.

When a tree, gully, or other obstruction is encountered, the operator will pause the instrument, add “dummy” data points into the polycorder for the distance that cannot be surveyed, and restart the survey on the opposite side of the obstruction. The second survey team member will record the approximate obstruction location and the start and stop points of data collection on the field survey form. These data gaps will be logged in the database and investigated using a Schonstedt GA-52/Cx magnetometer to perform a “mag and dig” operation during intrusive investigations.

Generally, up to five 100-ft by 100-ft grids will be grouped together for the individual surveys. Using these "gridblocks" reduces the number of times across the site that operators need to stop at line ends and input data into the Allegros.

A "lag" test will be conducted at the start of the survey day to correct time delays between data collection and the transfer of data to the data logger. The "lag" test entails placing a standard metallic item in or on the ground outside the survey grid and passing over it from opposite directions. The processing team will adjust the data until the high-amplitude response from passing over the metallic item lies in the same location.

5.16.1.2 Link GPS and EM61-MK2 Data

The second method of EM61-MK2 data collection will be to link the EM61-MK2 data with the GPS data. A GPS rover will be attached to the EM61-MK2 directly above the center of the instrument using a tripod. The GPS and EM61-MK2 data will be streamed into the same data recorder and linked immediately. Parsons may link several EM61-MK2 systems together on a nonmetallic cart-array system to increase the footprint of the survey path.

GPS data will be collected at 1 sec. intervals, while EM61-MK2 data points will be collected at approximately 10 times/sec. With an operator speed of approximately 3 ft/sec., this data collection yields a sample interval of approximately 1 sample per 0.3 ft traveled.

The method that will be used to ensure that the GPS and EM61-MK2 data are linked correctly will be a "lag" test. The "lag" test entails placing a standard metallic item in or on the ground outside the survey grid and passing over it from opposite directions. The processing team will adjust the data until the high-amplitude response from passing over the metallic item lies in the same location.

In those grids where a GPS is used, a QC spike will not be placed within the grid. Instead, each team will use a QC spike that will be placed on a wooden QC stand that is left in place for the duration of the gridblock survey. Using the wooden QC stand eliminates the need for QC spikes to be placed in a grid and the possibility that a QC spike will be interpreted as an anomaly selected for digging or that it will mask another nearby anomaly.

5.16.2 G-858 SURVEYS

G-858 surveys will be performed using the two methods detailed below. To avoid potential interference with data collection, G-858 operators will wear as little ferrous material as possible, and they will remove all nonessential metallic objects from their pockets. The G-858 field data collection teams will not wear steel-toed and/or steel-shanked boots.

5.16.2.1 Local Grid Coordinate System with G-858

This method is the same as the process described in Section 5.16.1.1 for the EM61-MK2 local grid coordinate system survey.

5.16.2.2 Link G-858 and GPS Data

The second method of G-858 data collection will be to link the G-858 data directly with the GPS data. A GPS rover will be attached to the G-858 directly above the center of the instrument (approximately 3 ft) using an aluminum pole, or the rover will be placed on the operator's back. GPS data will be input directly into the G-858 data recorder and stamped immediately to the G-858 data. GPS data will be collected at 1-sec. intervals, while G-858 data points will be

collected at 10 times/sec. (approximately 1 sample per 0.3 ft traveled). Data positioning for the geophysical points collected between the 1-sec. GPS data point intervals will be interpolated by the Geometrics® MagMap2000 software. Lag bars or clovers will be used in the same manner as during the EM61-MK2/GPS surveys.

Parsons may link several G-858 systems together on a nonferrous cart-array system to increase the footprint of the survey path.

A Geometrics G-856 or a separate G-858 will be used to collect static magnetic readings to provide diurnal total field corrections for possible use by the geophysical processors. Consideration will be given to setting up the base station magnetometer in areas that are free of cultural interferences. Where traveled roads exist near grids, the base station magnetometer will be set up at least 200 ft from the road. The base station magnetometer will be programmed to record magnetic data once every 5 seconds.

5.16.3 GLOBAL POSITIONING PROCEDURES

Parsons will use a real-time kinematic (RTK) GPS for a portion of the geophysical survey to acquire coordinates to geo-reference data points. The RTK base station will be set up each day by the geophysical teams before beginning survey activities (until a permanent base station is established). Each rover receiver will be taken to a QC positioning location with known coordinates, and the accuracy of the GPS reading will be determined and recorded in a PDA.

GPS and geophysical data will be collected and digitally recorded over the course of the day. The data will be combined in a data recorder that is attached to the equipment. The data will be transferred to the Parsons geophysical processing team at the end of the day.

Geo-referencing for the geophysical data that is collected without a GPS will be accomplished using information manually recorded in personal digital assistants (e.g., start and end of line stations, lane spacing and fiducial mark intervals) and information digitally recorded in each geophysical survey data file. The geodetic coordinates of the grid corners will be used to geo-reference the geophysical data collected without the GPS (i.e., translation from local grid system to California State Plane Zone 4 system).

A Dell™ Axim™ X5 PDA may be used to receive and display GPS data during geophysical surveys. The data is displayed on the PDA screen using ArcPad™, a mobile mapping and geographic information system (GIS), and the field geophysicists use this to determine when complete coverage of a surveyed area has been attained. Use of this system has greatly reduced the amount of the survey area that needs to be revisited to collect missing or improperly spaced data.

5.16.4 SPECIAL-CASE AREAS

Special-case areas will be subject to the digital geophysical surveys. Although the metallic clutter may prevent individual anomalies from being selected from the collected data, the survey will map and help further define the special-case areas. If individual anomalies cannot be discerned from the data in an area previously not marked as a special-case area, that area may be marked as a special-case area.

5.17 PERSONNEL

It is estimated that the digital geophysical surveys for this IA will be executed by six survey teams (each consisting of two instrument operators and a data processor) that will be managed by the Parsons project geophysicist.

5.18 PRODUCTION RATES

Table 5-2 lists the estimated geophysical mapping production rates for the EM61-MK2 and the G-858, which are based on previous Fort Ord investigation activities.

Table 5-2—Estimated Daily Production Rates

Activity	Daily Rate/Team (with EM61-MK2 or G-858)
Digital geophysical survey	1 acre
Anomaly reacquisition	150 anomalies

5.19 GEOPHYSICAL DATA PROCESSING AND RECORDS MANAGEMENT

Field data forms and field notes will be kept in the PDAs. Geophysical data collected in the field will be processed and managed using the procedures outlined in the following sections.

Data will be delivered as specified in Section 5.11 of the PWP except the following changes:

(1) Data will be grouped into gridblocks, as opposed to by grid, so that the data can be transferred easily and processed by both Parsons and USACE—information regarding the individual grids within the gridblocks will be included with each delivery. The data will not include the local Cartesian grid coordinates. The data will be delivered in an ASCII text file instead of DBASE format. FVFs SEA006, SEA007, and SEA008 address these changes to the delivery of the geophysical data.

(2) If unexpected changes such as changing site priorities, scope changes, or large quantity changes in the types of instrument surveys occur, the data delivery schedule will be revised from the one outlined in the PWP. A revised schedule revision will be developed by the Parsons and USACE project geophysicists, and it will replace the PWP data delivery schedule.

5.20 METHODOLOGY FOR SELECTING ANOMALIES

Sections 5.20.1 and 5.20.2 detail the methods for selecting anomalies from EM and magnetic data. Appendix G of this SSWP includes a summary of the QA procedures that will be performed by USACE on this process.

5.20.1 EM DATA

The following method will be used by Parsons geophysical data processors to select anomalies from the EM data. Once a data set has been leveled, lagged, gridded and mapped, a low-pass filter (FVF SEA011) will be applied. The low-pass filter uses a short wavelength cutoff, allowing longer wavelengths to pass through but attenuating shorter wavelengths—anomalies in the data associated with wavelengths less than approximately 12 data points in length have been found to frequently represent noise in the data. Once the filter has been applied, targets will be selected with a peak-picking algorithm using a cutoff determined from the ODDS results for the 2.36-in.

and 75mm projectiles (background signals are expected to be 1 to 3 mV). The selected targets will be stored in the database and displayed as symbols on the color-contour map, and these targets will be overlain on the map. It should be noted that the low-pass filter is used as a tool by the data processors to highlight anomalies that have the strong potential to be representative merely of noise in the data—the low-pass filter is not used to eliminate anomalies automatically from consideration as an intrusive investigation target.

The processors will then examine each of the target locations by looking at the color contour map (created using the raw data), the raw and filtered data values, and the profiles of the raw and filtered data (both Channel 1 and Channel 3 [FVF SEA022]). The processor will then evaluate the data to verify whether the anomaly selection was appropriate and to determine whether there are additional anomalies that could be interpreted as subsurface metal.

5.20.2 MAGNETICS DATA

The following method will be used by Parsons geophysical data processors to select anomalies from the magnetics data. The data set will have spikes removed and then will be leveled (using high or residual filters), lagged, gridded and mapped. Data with positioning problems (GPS quality or offset errors) will be removed. Profiles of the raw, median, and leveled data will be simultaneously viewed and anomalies will be selected using the data profiles or from profiles overlain on the map. Finally, the selected anomalies will be plotted on the maps, the peaks associated with single anomalies will be merged, and final determinations on anomaly locations are made.

5.21 REACQUISITION OF ANOMALIES

Following the evaluation of geophysical data, Parsons geophysicists will prepare anomaly lists with suspected anomaly locations for the field reacquisition teams. In the areas where a GPS or other location tracking devices can be used, the coordinates of the anomalies that were selected from the geophysical data will be loaded into the tracking instrument. The teams will then use this instrument to guide them to the selected anomaly location. If a tracking system cannot be used, a local coordinate, relative to a surveyed stake location, will be used to reacquire the anomaly location. Parsons geophysicists will generate anomaly lists for groups of anomalies within the general vicinity of each other, whenever possible, thereby minimizing the travel time of the reacquisition teams.

Once the coordinates of an anomaly have been found, a sweep will be conducted within a 3-ft radius of the anomaly location with the instrument initially used for the digital geophysical survey and a static reading will be collected where possible.

If the anomaly is detected using the survey instrument, it will be noted in the PDA reacquisition form. A nonmetallic flag will then be placed at the approximate anomaly location and marked with the anomaly identification (ID) number. The reacquisition team will record the distance and azimuth from the initial reacquired point to the actual anomaly location with a PDA.

If the anomaly cannot be reacquired using the original digital instrument, the reacquisition team will record this result in the PDA and place a nonmetallic flag at the GPS coordinates of the selected anomaly.

Of the unsuccessfully reacquired anomalies, 10% will be randomly selected and excavated. This process will decrease the number of digs, while maintaining confirmation sampling of the reacquisition process. The 10% of the unsuccessfully reacquired anomalies will be assigned in

the anomaly database and appear on the PDA dig forms in the same format as the successfully reacquired anomalies. FVF SEA013 (Appendix F) addresses this change to the PWP anomaly reacquisition process.

Paint will be used to help mark the anomaly locations in those areas where it is suspected that the nonmetallic survey flag will not remain in place (e.g. areas of hard-packed or extremely loose soil).

5.22 EXCAVATION OF ANOMALIES

Section 2.3.9.3 discusses anomaly excavations in the Ranges 43–48 IA site.

5.23 QC

Chapter 11 details the QC procedures that will be performed under this SSWP.

5.24 QA

Chapter 11 describes the QA procedures that will be performed under this SSWP.

5.25 PREPARATION OF GEOPHYSICAL MAPS

The geophysical data processors and GIS staff will use the data from the geophysical investigations to prepare color contour and traverse line maps.

The color contour maps allow a complete presentation of the processed geophysical data across the entire area investigated. The traverse line maps show the coverage of the geophysical instruments over the area.

The color contour maps of the processed geophysical data will also be divided into smaller grid sets and presented as 8½- by 11-in. series. These maps will be included as PDFs on a CD that will be attached to the AAR.

Operation maps will be developed as the site work progresses, and they will show where each geophysical instrument was used and the progress of the digital work being performed under this SSWP.

CHAPTER 6
SAFETY AND HEALTH PLAN

6.1 INTRODUCTION

Appendix E presents the Site Compliance Checklist that will be used by the UXOSO to conduct the project's monthly safety audit. A copy of the checklist will be given to the program manager (PM), the program-certified industrial hygienist (CIH), and the USACE OESS. Noncompliance issues will be corrected promptly and reported to the individuals receiving the compliance checklist.

6.2 HAZARD ANALYSIS

Table 6-1 presents the hazard analysis for this SSWP.

6.3 COMMUNITY SAFETY PLAN

The Monterey County Community Safety Plan (CSP) [Ref. 28] is applicable during the operations described in this SSWP. The Monterey County CSP will be implemented, when necessary, to ensure public safety.

To restrict public access into areas near the site during this IA, Eucalyptus Road and Parker Flats Cut-Off will be closed to the public by Parsons' security subcontractor or the area between the Fitch Park housing area and the MRA will be fenced off. Engineering controls will be used during detonations and during the excavation of items identified as possible UXO in the area along the northern border of the Ranges 43–48 IA site, between Range 48 and approximately 700 ft west of Range 46 (Figure 4-1). Using engineering controls decreases the site's 1,701-ft exclusion zone to 200 ft. This reduced exclusion zone will prevent the OE removal work from affecting residences in the southeast portion of the Fitch Park housing area that fall within the site's 1,701-ft exclusion zone.

6.4 SPECIAL-CASE AREA EXCAVATIONS AND SIFTING

If the selected cleanup solution for special-case areas involves sifting with excavations, then such operations will be conducted IAW HNC-ED-CS-S-96-8 [Ref. 29] to protect equipment operators from OE hazards while excavating and sifting material. This directive outlines barricades to be used to protect personnel from blast and fragmentation while operating equipment within an OE site. The depth of the barricades will be determined by the OE item expected to be encountered in that special-case area (e.g., LAW rockets in Range 44), which may differ from the MPM of the site. Table 6-2 lists the how thick the barricades protecting equipment operators are required to be based on various munition types.

6.5 OE WITH UNKNOWN FILLER

The safety and health plan in Chapter 6 of the PWP has been supplemented by FVFs SEA025 and SEA027 (Appendix F) which provide procedures for when the filler of specific OE items encountered cannot be positively identified.

- FVF SEA025 states that if a Livens projector, 4-in. Stokes mortar, or 4.2-in. mortar is encountered and its filler has not been positively identified, the item is to be left in place to await disposition by a U.S. Army Technical Escort Unit (TEU), who will identify the filler before the item's final disposition.

- FVF SEA027 adds a SOP to the PWP for the step-by-step procedures and applicable safety and health requirements for when a Livens projector, 4-in. Stokes mortar, or 4.2-in. mortar is encountered and its filler has not been positively identified.

Table 6-1—Hazard Analysis by Site Activity

Activity	Hazards	Control Measures
Operating heavy equipment/earth moving machinery; grading, excavating, and backfilling	1. Vehicle accident 2. Potential OE/UXO 3. Wildlife, insects, poison oak, and hazardous plants 4. Slips, trips, and falls 5. Scrapes and cuts 6. Heat/cold stress 7. Windburn/sunburn	1. Allow only trained experienced personnel to operate heavy equipment 2. Allow only a qualified UXO technician to excavate ordnance 3. Look before backing, be aware of personnel in area 4. Use ground guides when needed 5. Be aware of terrain 6. Dress appropriately for weather 7. Wear sunscreen as necessary 8. Wear Level D personal protective equipment (PPE), including hard hat, hearing protection, and safety-toed boots 9. Wear air monitors, setup area air monitors, and have water truck present to water down area (for dust during sifting operations) 10. Use appropriate depth for barricades IAW HNC-ED-CS-S-96-8 [Ref. 29] to protect equipment operators from blast and fragmentation
Geophysical survey operations	1. Potential OE/UXO 2. Slips, trips and falls 3. Wildlife, insects, poison oak 4. Heat/cold stress 5. Sunburn/windburn 6. Unintentional detonation of electrically-fuzed UXO items	1. Watch for mark, and report all OE located 2. Watch for wildlife, snakes, and insects 3. Wear insect repellant and barrier creams 4. Change clothing daily 5. Dress for weather, use buddy system monitoring 6. Use sunscreen as needed 7. Be aware of terrain, footing, and overhead hazards 8. Do not operate EM61-MK2 at heights less than 0.4m or let it contact ground (electronics/battery) IAW CENHC 2002 Safety Advisory [Ref. 27] 9. Do not operate G-858 at heights less than 1m or let it contact ground (electronics/battery) IAW CENHC 2002 Safety Advisory [Ref. 27]

Table 6-1—contd

Activity	Hazards	Control Measures
Range target removal	1. Potential OE/UXO 2. Crush and pinch hazard 3. Insects 4. Heat illness	1. Clear path of UXO to target to be removed 2. Perform a thorough visual inspection for UXO in and around target prior to removal activities 3. Perform initial movement of target remotely 4. Inspect target after initial movement has been completed 5. Inspect and certify target free of UXO and energetic materials prior to removal from the OE site 6. Observe UXO precautions in SSWP and SSHP 7. Keep clear of moving equipment 8. Use ground guides when attaching cables or shackles. Use radio or proper hand signals to provide instructions between operator and ground guide 9. Do not allow personnel under a suspended load 10. Keep all personnel clear of wire ropes or chains during pulling or lifting of targets 11. Do not exceed the equipment lifting capacities 12. Check targets for insect nests prior to any removal activities 13. Observe heat illness precautions in SSWP and SSHP 14. Increase fluid intake 15. Use buddy system

Table 6-2—Minimum Thickness of Barricades to Prevent Perforation (in.)

Munition	4000-psi Concrete (Prevent Spall)	Mild Steel	Aluminum	Lexan	Plexi-glass	Bullet-Resistant Glass
Projectile: 40mm, M406	0.79	0.15	0.35	1.80	0.88	0.62
Projectile: 57mm, HE, M306	2.74	0.51	1.11	3.73	2.33	1.84
Projectile: 60mm, mortar, HE, M49 Series	N/A	0.53	1.14	3.85	N/A	N/A
Projectile: 75mm, HE, M48	N/A	0.70	1.45	4.82	3.72	2.69
Projectile: 81mm, mortar, HE, M374	3.68	0.66	1.43	4.26	2.77	2.16
Projectile: 84mm, HEAT, AT4 (case only)	1.56	0.25	0.60	2.22	1.16	0.80
Projectile: 90mm, HEAT M371 and M431 (case only)	4.15	0.76	1.62	4.96	3.41	2.83
Projectile: 105mm, HE, M1	N/A	0.90	1.87	5.44	N/A	N/A
Projectile: 4.2-in., mortar, HE, M3 Series	N/A	0.91	1.93	5.22	N/A	N/A
Projectile: 155mm, HE, M107	N/A	1.27	2.59	6.76	N/A	N/A
Rocket: 66mm, HEAT, M72 series (case only)	1.30	0.22	0.52	2.05	1.05	0.72

CHAPTER 7
LOCATION SURVEYS AND MAPPING PLAN

Chapter 7 of the PWP is the Location Surveys and Mapping Plan for this surface and subsurface OE removal.

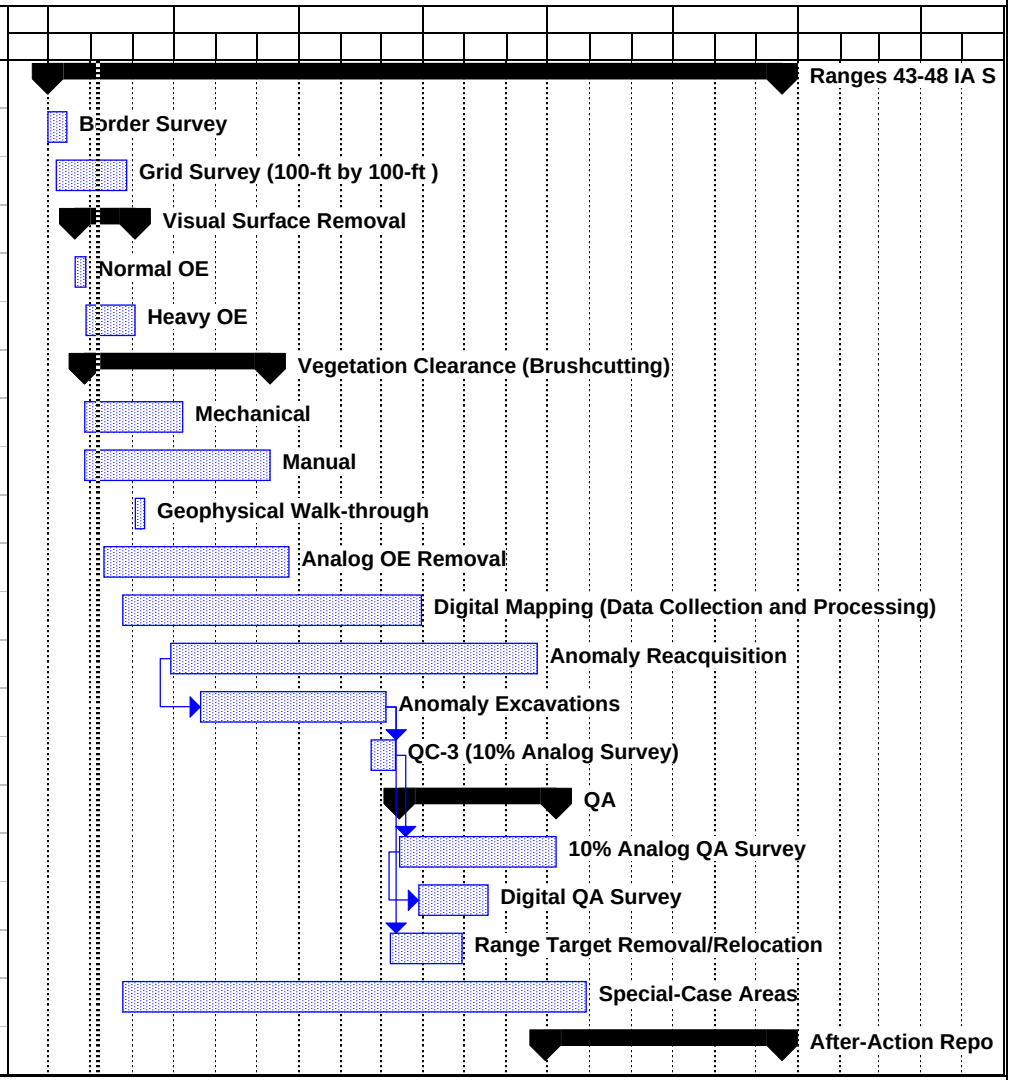
CHAPTER 8
WORK DATA COST MANAGEMENT PLAN

8.1 INTRODUCTION

The anticipated schedule for the surface and subsurface OE removal has been revised to reflect the updated removal process. The start date of the removal work depends on when the prescribed burn is conducted (the prescribed burn will occur between August 15 and December 31, 2003); therefore, this schedule outlines the durations of the various site activities rather than specific dates when various activities are expected to occur. This schedule is tentative and subject to change.

Figure 8-1
Ranges 43-48 IA Site Anticipated Schedule

ID	Task Name	Duration
1	**Ranges 43-48 IA Site**	**300.8 days**
2	**Border Survey**	**7 days**
3	**Grid Survey (100-ft by 100-ft)**	**31 days**
4	**Visual Surface Removal**	**25 days**
5	Normal OE	5 days
6	Heavy OE	20 days
7	**Vegetation Clearance (Brushcutting)**	**75 days**
8	Mechanical	40 days
9	Manual	75 days
10	**Geophysical Walk-through**	4 days
11	**Analog OE Removal**	75 days
12	**Digital Mapping (Data Collection and Processing)**	120 days
13	**Anomaly Reacquisition**	150 days
14	**Anomaly Excavations**	75 days
15	**QC-3 (10% Analog Survey)**	12 days
16	**QA**	**67 days**
17	10% Analog QA Survey	67 days
18	Digital QA Survey	30 days
19	**Range Target Removal/Relocation**	32 days
20	**Special-Case Areas**	190 days
21	**After-Action Report**	**98.8 days**



edays = elapsed days

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary

CHAPTER 9
PROPERTY MANAGEMENT PLAN

9.1 EQUIPMENT

It is estimated that additional quantities of nonconsumable equipment will not be needed for this investigation and removal work. The equipment acquired for the OE-15SEA.1–4 project will likely be sufficient for this work.

9.2 OFFICE SPACE

The CESPK has provided Parsons with office space in Building 4522 on Joe Lloyd Way and in two trailers that are adjacent to Building 4522.

CHAPTER 10
SAMPLING AND ANALYSIS PLAN

The Sampling and Analysis Plan for this surface and subsurface OE removal is the OE Sampling and Analysis Plan (OESAP) [Ref. 30] that is located in Chapter 10 of the PWP. The final version of the OESAP was distributed in January 2002.

It should be noted that the OESAP will not impact the operations being performed under this SSWP.

CHAPTER 11
QUALITY CONTROL PLAN

11.1 QC PROCESS

Parsons' UXOQCS will conduct a QC survey with a Schonstedt GA-52/Cx magnetometer over 10% of each grid (QC-3) subjected to the analog OE removal and digital mapping processes; QC-1 and QC-2 inspections will not be performed. Per FVF SEA028, any QC issue or grid failure will be addressed by a NCR, which describes the nonconformance issue, lists the cause, recommends a corrective action, and outlines the re-inspection process. Per FVF SEA030, which standardized the QC/QA grid failure criteria for OE removal sites at the former Fort Ord, a grid failure during QC/QA surveys in the Ranges 43–48 IA site will be constituted by the discovery of either a UXO or UXO-like item sufficient in size to represent a 37mm projectile (or larger) or five non-selected anomalies that should have been selected during the initial survey.

11.2 QC CHECK ON OE SCRAP AND EXPENDED ORDNANCE ITEMS

A QC check will be conducted on the sorted OE scrap and the expended ordnance items. Any item containing energetic materials will be marked for disposal or removed, as described in the SOP for range residue removal [Ref. 18] as amended by the December 2002 CEHNC interim guidance regarding range residue inspection, certification, and final disposition procedures, which has been included as Appendix J.

11.3 FVF-BASED CHANGES

11.3.1 QC SEEDED ITEMS

Before the analog OE removal, at least one item will be seeded for every 4 acres within the site; the limit of 20 seeded items per site listed in the QC Seeding SOP in the PWP has been removed. FVF SEA017 addresses this change.

11.3.2 OE DETECTION

The distances between profile lines greater than 4 ft will require additional data collection. The locations of such data gaps between lines will be identified using the Geosoft processing package to grid data with a blanking distance of 2 ft. All areas within the grid that are not covered by the gridded image will indicate that additional data may need to be collected. If the data gap is caused by unmovable objects or terrain (e.g., buildings or trees), the data gap will be considered acceptable. FVFs SEA004 and SEA022 address this modification to the data gap criteria listed in section 5.5.1 of the PWP, which states that the deviation between designated survey lines will not exceed 50% of the line spacing.

The total length of all segments along data transects that are more than 0.35 ft from a data point may not exceed 2% of the total transect length in a given gridblock. FVF SEA003 (rev 1) addresses this modification to the along line data point spacing criteria.

11.3.3 INSTRUMENT STANDARDIZATION

The daily standardization test on digital geophysical instruments will be performed before and after every gridblock survey. A standardization test will also be conducted at the end of a workday if the survey over a gridblock has not been completed (changed from section 5.16.4 of the PWP). No standardization tests will be performed when batteries are changed in the middle

of a gridblock. If the tests indicate a QC problem (the end test result is more than 20% different from the start test result), the process outlined in section 5.12.1 of the PWP will be followed. FVF SEA002 addresses this change in procedures.

The 6-pass QC test described in the second paragraph of PWP section 5.12.1 will not be performed prior to surveying every set of grids. Instead, this standardization test will only be conducted when entering a new type of terrain—the terrain will be considered "new" if the slope, surface roughness, or vegetation is significantly different from what has been encountered in the past. FVF SEA001 addresses this change in procedures.

11.4 QA

11.4.1 DIGITAL QA

The USACE geophysicist will conduct QA of the digital geophysical aspects of operations, which will entail five major procedures that are each detailed in Appendix G of this SSWP:

(1) Monitoring the clearance of surface clutter
(2) Monitoring the acquisition of digital field data
(3) Monitoring the management of the digital data
(4) Surveying portions of the site where the digital geophysical survey was conducted.
(5) Seeding OE-scrap targets

11.4.2 ANALOG QA

The government will perform an analog QA inspection with a Schonstedt GA-52/Cx magnetometer on at least 10% of each grid over the entire Ranges 43–48 IA site. Section 11.15.8 of the PWP [Ref. 8] includes other QA activities that will be conducted.

CHAPTER 12
ENVIRONMENTAL PROTECTION PLAN

12.1 INTRODUCTION

This Environmental Protection Plan (EPP) outlines the procedures that will be implemented to protect natural resources. The EPP will comply with the HMP [Ref. 17] during removal activities in Ranges 43–48. This EPP incorporates the programmatic Fort Ord OE Cleanup EPP and defines additional site-specific elements.

12.2 DESCRIPTION OF SITES AND NATURAL RESOURCES

The Ranges 43–48 IA site is located in the northern portion of the MRA. The site is mostly covered by maritime chaparral with patches of annual grassland habitats along the site's western and southern boundaries (Figure 1-4). The natural resources of concern include several HMP-listed species that are associated with maritime chaparral and are considered endangered, threatened, or rare by the federal government or the state of California. These HMP-listed plant species include sandmat manzanita, Monterey Ceanothus, Eastwood's golden fleece, sand gilia, Monterey spineflower, and seaside birdsbeak; the HMP-listed wildlife includes the California black legless lizard. The locations of these species are displayed in the Flora and Fauna Baseline Study of Fort Ord, California [Ref. 31] and the 2000 Annual Monitoring Report [Ref. 32]. Wetland or vernal pond areas are not present in the site.

12.3 PROTECTION OF NATURAL RESOURCES

The majority of the Ranges 43–48 IA site is designated in the HMP for habitat reserve. Therefore, measures to reduce impacts to natural resources will be implemented IAW HMP guidelines. In addition, all guidelines that minimize activities that could degrade lands through soil erosion or invasive weed problems will be followed. These considerations will be addressed in this section.

The Parsons field biologist will conduct a preliminary environmental survey of the sites to identify locations of sensitive species. Parsons will assume a policy of minimizing and avoiding disturbances to areas with sensitive species as much as possible without unreasonably disrupting removal activities. The Parsons field biologist will be regularly present on work sites to ensure that these environmental directives are being followed and document and address any unforeseen environmental concerns, as they may occur. Parsons will coordinate with DENR on any environmental issues that are not addressed in the HMP and on any environmental issues that may unreasonably disrupt removal activities. It should be noted that this EPP only addresses the measures to be taken under normal circumstances and does not consider special-case areas, which will be reevaluated to determine if additional habitat protection or restoration requirements are required.

12.3.1 VEGETATION CLEARANCE

To facilitate the surface and subsurface OE removal, a prescribed burn will be performed in Ranges 43–48 IA site. One of the goals of the prescribed burn is to clear as much vegetation as possible in order to reduce the need to cut maritime chaparral; however, there may be some unburned brush and leftover standing burnt stems and branches from the maritime chaparral that will need to be cleared so geophysical instrument operators can access the ground.

The extent of the maritime chaparral cutting will be limited to 50 acres—the maximum amount of chaparral cutting per each site under the current agreement with the USFWS. However, if there are more than 50 acres of unburned chaparral, DENR will get an approval from the USFWS to clear the remaining unburned chaparral. The leftover dead wood from the burned shrubs may need to be cut using mechanical equipment (e.g., TAZ® [or equivalent]) and/or manual equipment (e.g., chainsaws, loppers, and weed whackers), as necessary.

Environmental impacts and the safety of personnel will be considered for selecting the feasible cutting method(s) for clearing the unburned maritime chaparral and leftover deadwood in a given area. Depending on the amount of unburned brush in an area, Parsons may seek guidance from DENR to determine the appropriate cutting method for that area.

The dead wood that is cut will be removed from the site and chipped in another location. Although the HMP states that wood chips may be spread onsite, it has since been determined that the accumulation of chip piles may degrade the habitat by encouraging weed growth and eliminating open, sandy areas, which are ideal for the germination of rare plants. The location of chipping will depend upon the volume of dead wood in given areas and whether it is feasible to haul the dead wood offsite.

12.3.2 OE REMOVAL

During excavations, the top 3 to 4 inches of soil will be replaced at the surface after backfilling holes, where feasible, to preserve the seedbank of rare annual plants. The feasibility of replacing soil will be determined by the type of soil and whether rare plant species are present. All OE removal activities will be monitored to minimize impacts to HMP-listed species to the greatest extent feasible.

12.3.3 VEHICLE ACCESS

Vehicle access will be restricted to the existing roads and fuel breaks as much as possible, except during mechanical brush removals.

12.3.4 AVOIDING IMPACTS TO BLACK LEGLESS LIZARDS

During excavations, the established protocol for avoiding impacts to the black legless lizard will be followed if it is encountered.

12.3.5 EMPLOYEE ENVIRONMENTAL TRAINING

The Parsons field biologist will conduct site-specific environmental training for all new personnel.

12.3.6 SITE RESTORATION AND MONITORING FOR INVASIVE WEEDS

The Parsons field biologist will assess the need for any site restoration and will coordinate the work. Site restoration will likely be limited to basic erosion control measures (e.g., straw application and straw crimping). The field biologist will also perform informal follow-up monitoring of the site for erosion or invasive weed problems throughout the surface and subsurface OE removal.

CHAPTER 14
REFERENCES

[1] Draft Final, Basewide OE Remedial Investigation/Feasibility Study Work Plan, Fort Ord, CA, Harding Lawson Associates, May 2000.

[2] Superfund Proposed Plan, Interim Action is Proposed for Vegetation Clearance, Ordnance and Explosives Remedial Action, and Ordnance and Explosives Detonation, Ranges 43–48, Range 30A, and Site OE-16, Former Fort Ord, California, United States Army, March 2002.

[3] Final, Record of Decision, Interim Action for Ordnance Explosive Sites Ranges 43–48, Range 30A, and Site OE-16, Former Fort Ord, California, September 2002.

[4] Final, Prescribed Burn Plan of Ranges 43–48, Fire Stop, October 2002.

[5] Final Voluntary Relocation Plan, Former Fort Ord, Monterey, California, Interim Action Remedial Investigation/Feasibility Study, Creighton & Creighton Inc., September 2002.

[6] Final, Prescribed Burn Air Sampling and Analysis Plan, Ranges 43–48, Former Fort Ord, California, Harding ESE, October 2002.

[7] Technical Memorandum, Air Emissions from Incidental Ordnance Detonation During a Prescribed Burn on Ranges 43 through 48, Former Fort Ord, California, November 2001.

[8] Final Programmatic Work Plan, Former Fort Ord, Monterey, California, Ordnance and Explosives Cleanup, prepared for U.S. Army Corps of Engineers, Sacramento District, Parsons, May 2001.

[9] Final Interim Action Ordnance and Explosives, Remedial Investigation/Feasibility Study For Ranges 43–48, Range 30A, Site OE-16, Former Fort Ord, California, Harding ESE, March 2002.

[10] Amendment 3 to the 1994 Land Disposal Site Plan (LDSP) for Base Realignment and Closure (BRAC) of Fort Ord, CA, U.S. Department of the Army, March 2003.

[11] Final Technical Information Paper, Surface Removal, Ordnance and Explosives Site Ranges 43–48, Parsons, February 2002.

[12] Archives Search Report, U.S. Army Corps of Engineers, St. Louis District, December 1993.

[13] Archives Search Report (Supplement No. 1), U.S. Army Corps of Engineers, St, Louis District, November 1994.

[14] Revised Archives Search Report, U.S. Army Corps of Engineers, St. Louis District, 1997.

[15] 4' OE Removal After Action Report, Inland Range Contract, Former Fort Ord Fuel Breaks, prepared for U.S. Army Corps of Engineers, Sacramento District, USA Environmental, November 2001.

[16] Final, Ordnance Detection and Discrimination Study, prepared for U.S. Army Corps of Engineers, Sacramento District, Parsons, January 2002.

[17] Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, CA, U.S. Army Corps of Engineers, Sacramento District, April 1997.

[18] Standard Operating Procedure for Range Residue Removal and Management, Final Revision, Parsons, October 2001.

[19] HNC-ED-CS-S-98-1, Methods for Predicting Fragmentation Characteristics of Cased Explosives, U.S. Army Engineering and Support Center, Huntsville Division, January 1998.

[20] EM-1110-1-4009, U.S. Army Corps of Engineers, Engineering and Design, Ordnance and Explosives Response, June 2000.

[21] HNC-ED-CS-S-98-7, Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions, U.S. Army Engineering and Support Center, Huntsville Division, August 1998.

[22] HNC-ED-CS-S-98-8, Miniature Open Front Barricade, U.S. Army Engineering and Support Center, Huntsville Division, November 1998.

[23] HNC-ED-CS-S-00-3, Use of Water for Mitigation of Fragmentation and Blast Effects Due To Intentional Detonation of Munitions, U.S. Army Engineering and Support Center, Huntsville Division, September 2000.

[24] Final, Engineering Evaluation/Cost Analysis—Phase 2, Former Fort Ord, Monterey County, California, Army, April 1998.

[25] Final, Basewide Remedial Investigation/Feasibility Study, Fort Ord, CA, Harding Lawson Associates, October 1995.

[26] Final, OE-15SEA.1–4 Status Report, prepared for U.S. Army Corps of Engineers, Sacramento District, Parsons, October 2002.

[27] Safety Advisory 02-1—Geophysical Instrument, U.S. Army Engineering and Support Center, Huntsville Division, February 2002.

[28] Final, Monterey County Community Safety Plan, Parsons, March 2002.

[29] HNC-ED-CS-S-96-8, Guide for Selection and Siting of Barricades for Selected Unexploded Ordnance and Guidance for Blast and Fragmentation, U.S. Army Engineering and Support Center, Huntsville Division, September 1996.

[30] Final, Ordnance and Explosives Sampling and Analysis Plan, prepared for U.S. Army Corps of Engineers, Parsons, January 2002.

[31] Flora and Fauna Baseline Study of Fort Ord, California, U.S. Army Corps of Engineers, Sacramento District, 1992.