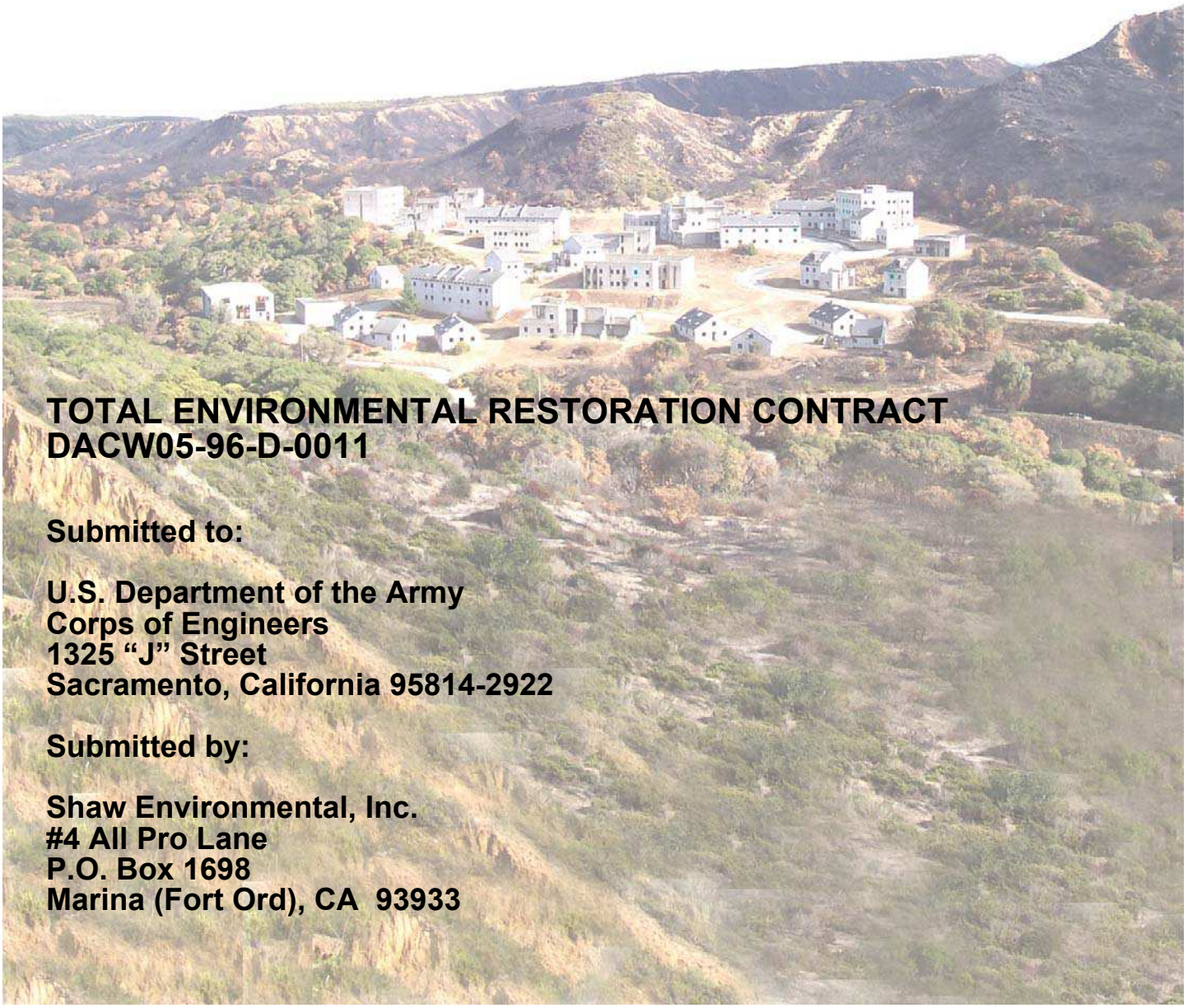
FINAL AFTER ACTION REPORT
TIME CRITICAL REMOVAL ACTION
AND MILITARY MUNITIONS RECONNAISSANCE
EUCALYPTUS FIRE AREA
FORMER FORT ORD, CALIFORNIA
REVISION 0



TOTAL ENVIRONMENTAL RESTORATION CONTRACT
DACW05-96-D-0011

Submitted to:

U.S. Department of the Army
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

Submitted by:

Shaw Environmental, Inc.
#4 All Pro Lane
P.O. Box 1698
Marina (Fort Ord), CA 93933

Final After Action Report
Time Critical Removal Action
and Military Munitions Reconnaissance
Eucalyptus Fire Area
Former Fort Ord, California

Total Environmental Restoration Contract
Contract No. DACW05-96-D-0011, DO 0016
Task Order No. 016

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Revision 0
January 2005

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January 2005

Approved by: Signature on File Date: _____
Tim Mathisen
Senior Unexploded Ordnance Supervisor

Approved by: Signature on File Date: _____
Peter Kelsall
Project Manager

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Acronyms and Abbreviations

Army	U.S. Department of the Army
ASR	Archives Search Report
BLM	Bureau of Land Management
BRA	Basewide Range Assessment
CESPK	Sacramento District USACE
DID	Data Item Description
DOD	U.S. Department of Defense
EOD	explosive ordnance disposal
ER	Engineer Regulation
ESS	Explosives Safety Submittal
FADL	Field Activity Daily Log
FWV	Field Work Variance
GIS	Geographic Information System
GPS	Global Positioning System
HMP	Habitat Management Plan
mm	millimeter
MEC	Munitions and Explosives of Concern
MGS	Master Grid System
MOUT	Military Operations in Urban Terrain
MRS	Military Response Site
MSD	minimum separation distance
OE	ordnance and explosives
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
SOP	Standard Operating Procedure
SUXOS	Senior Unexploded Ordnance Supervisor
TERC	Total Environmental Restoration Contract
TCRA	Time Critical Removal Action
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

Definitions[1]

Discarded Military Munitions (DMM) - Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

Military Munitions - Military munitions means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof.

The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, except that the term does include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 2710(e)(3)(A) and (B))

Munitions Constituents (MC). Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710 (e)(4))

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

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means:

[1] Official definitions provided in the October 28, 2003, memorandum from the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health), "Definitions Related to Military Response Actions".

(A) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710 (e) (9);
(B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e) (2); or
(C) Explosive munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

Munitions Response (MR) – Response actions, including investigation, removal and remedial actions to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO) or discarded military munitions (DMM), or by munitions constituents (MC).

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

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

Range-related Debris – Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g. targets).

Unexploded Ordnance (UXO) - Military munitions that:

a. (A) have been primed, fuzed, armed, or otherwise prepared for action;
b. (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and
c. (C) remain unexploded either by malfunction, design, or any other cause. (U.S.C. 2710 (e) (9))

1.0 Introduction

This report presents the results of a Time Critical Removal Action (TCRA) and military munitions reconnaissance at the Eucalyptus Fire Area at the former Fort Ord. Shaw Environmental, Inc. (Shaw) conducted the project for the U.S. Department of the Army (Army) under the Total Environmental Restoration Contract (TERC) No. DACW05-96-D-0011. The work was conducted in accordance with the *Final Work Plan, Time Critical Removal Action and Ordnance and Explosives Reconnaissance, Eucalyptus Fire Site, Former Fort Ord, Rev. 0* (Shaw 2003).

On July 17, 2003, an accidental fire started in the Military Operations in Urban Terrain (MOUT) and burned approximately 644 acres in the east-central portion of the former Fort Ord. The fire area includes approximately 367[2] acres in the northeastern corner of the Impact Area (formerly known as the Multi Range Area, or MRA), and 270 acres on adjacent property that has been transferred to the Bureau of Land Management (BLM). Typical views of the fire area, showing burned vegetation and steep terrain are shown in Photos 1-1 through 1-6. Photos 1-4 and 1-5 show the "Impossible City" training area within the MOUT.

The fire removed vegetation, which provided access for military munitions activities. A TCRA for the Impact Area was approved so that removal of Munitions and Explosives of Concern (MEC) could be completed before the vegetation was regenerated during the winter rainy season. Also to take advantage of the removed vegetation, a military munitions reconnaissance survey was conducted in the BLM part to provide confirmation of previous military munitions investigations conducted in this area.

The main element of the scope involved a surface sweep in the area that was burned. The objective was to locate and remove MEC and munitions debris (2 inches or larger) from the surface of the burned area. The fieldwork for the TCRA and military munitions reconnaissance was conducted mostly between October and December, 2003. Follow-on fieldwork for the TCRA was then conducted in March and May, 2004. As documented in this report, 114 MEC items were removed, together with approximately 25,000 pounds of munitions debris.

1.1 Site Location

Fort Ord is a former military installation that comprises approximately 46 square miles in northwestern Monterey County, California (Figure 1-1). Monterey Bay forms the western boundary of the former Fort Ord, and the Santa Lucia Range bounds the former Fort Ord to the

[2] The areas quoted in the Final Work Plan were 373 acres for the Impact Area and 271 acres for the BLM portion. The differences consist of unburned vegetation around the edges.

south. The cities of Marina and Seaside are northwest and southwest of the former Fort Ord, respectively.

The Eucalyptus Fire Area is located in the east-central portion of the former Fort Ord and includes the northeastern corner of the former Fort Ord Impact Area (Figure 1-2). The Eucalyptus Fire Area comprises approximately 637 acres and includes 367 acres in the eastern part of the Impact Area and 270 acres on adjacent property that has been transferred to the BLM. The Impact Area portion is bounded by Eucalyptus Road to the north, Wildcat Canyon to the west, Barloy Canyon Road to the east, and Wildcat Ridge to the south. The BLM portion is bounded to the north by Eucalyptus Road, Barloy Canyon Road to the west, Jack's Road and Picnic Canyon Road to the east, and BLM Trail 13 to the south.

The whole area is mostly undeveloped with predominantly maritime chaparral habitat and scattered patches of annual grasses. The BLM portion was transferred in 1996 and is being maintained as habitat reserve (Mactec, 2003). The land is open to the public for recreational use such as hiking, biking, and horseback riding. A portion of the Eucalyptus Fire Area includes the former MOUT training area.

1.2 Site History

The Eucalyptus Fire Area includes portions or all of several former Military Response Sites (MRS) and ranges (MRS-12, MRS-21, MRS-27J, MRS-27K, MRS-27O, MRS-28, Range 34, Range 35, Range 35A, and the Submachine Gun Range) (Figure 1-2). For the purposes of this discussion these areas are grouped by those sites within the Impact Area and the sites in the BLM portion. The military munitions information is based on historical documents, previous military munitions sampling, and site walks performed within the Eucalyptus Fire Area. Table 1-1 lists the prior use of the sites that are wholly or partly within the site and the items found during site sampling or site walks. Table 1-2 summarizes the previous military munitions sampling or investigation activities performed within the Eucalyptus Fire Area. All MEC items found during the investigations were removed. Table 1-3 provides additional details on specific items found in previous work.

1.2.1 Eucalyptus Fire Area (Impact Area portion)

The Impact Area portion of the Eucalyptus Fire Area includes Range 34, MRS-28, Ranges 35 and 35A, and MRS 27J.

1.2.1.1 Range 34

Records indicate that Range 34 was used as a Close Combat Course from the late 1950s through the late 1960s. Range Standard Operating Procedures (SOPs) from 1973 indicate that it was a Machine Gun Assault Course at that time (Army, 1973). By 1980, the range was used as a

mortar range to support Range 31 (Army, 1980). Range SOPs from June 1991 indicate that the range was inactive. Reconnaissance of this area was conducted in July 1999 as part of the Basewide Range Assessment (BRA), indicating areas with greater-than-10 percent spent small arms ammunition. The range runs east to west, sloping upwards to a hill in the center of the range. This range is bordered by hills to the south, north and west, and is heavily vegetated with few open areas. The eastern slope of the ridge in the center of the range appears to be heavily impacted with spent small arms ammunition and munitions debris. MEC items, such as 40 millimeter (mm) practice grenades and rifle grenades (model not specified) were also observed. An area of 10 percent spent small arms ammunition was mapped at the top of the ridge. A pile of scrap metal from 55-gallon drums and three man-made depressions or ponds were also present near the top of the ridge. The former use of the depressions is unknown. The 55-gallon drum lids that were observed in the scrap pile were convex in shape indicating an explosion originating from within the drums. Follow-up discussions with U.S. Army Corps of Engineers (USACE) ordnance safety specialists indicate that hydrocarbons may have been used for fougas training at this range. Fougas typically consists of a gasoline-gel discharged explosively from a drum using TNT. Additional drum fragments and partial drums were observed elsewhere at the site. The reconnaissance located two berms on the lower eastern slope of the range. The lower berm, which was the larger of the two, was impacted with spent small arms ammunition.

1.2.1.2 MRS-28

MRS-28 includes Impossible City, which is a mock city within the MOUT. According to the Archives Search Report (ASR), several buildings within the city were live fire small arm sites. Also, a tire house with sand-filled tires was constructed for live small arms fire. During a telephone interview conducted as part of the ASR, an interviewee stated that "Site MOUT contains a lot of ordnance, including torpedoes that were removed from the site." (The type of torpedoes was not specified but it is suspected that they were Bangalore Torpedoes.) The ASR also notes that there are reports of 40mm high explosive grenades and bazooka rounds being fired into Wildcat Canyon, somewhere south of Impossible City (*USAEDH, 1997*). Live small arms fire and use of high explosives were authorized in this area. Thus, this area might have been used as an explosive ordnance disposal (EOD) area. Based on review of 1964 through 1972 training maps it appears that the area may have also been used as a rocket launcher range.

In 1998, USA Environmental, Inc., conducted 100 percent grid sampling in 16 sample grids and SiteStats/GridStats sampling in 14 sample grids to a depth of 4 feet at MRS-28. A total of 67 MEC items including 42 hand grenade fuzes, 16 mine fuzes, 2 practice grenades, one blast simulator, one ignition cartridge, one 3.5-inch practice rocket, one 40mm parachute signal, and 3 feet of detonating cord were found (USA, 2001).

This area was mapped as part of the BRA site reconnaissance conducted in October 2001. Small arms ammunition including blank casings and live blanks were found at the site. MEC found included a projectile simulator. Munitions debris found included signal flares, smoke grenades, mortars (models unknown), three 3.5-inch rockets and three 40mm practice grenades. During the site visit, one firing position and 6 target boards were identified and mapped. Some of the other features mapped during the reconnaissance event include one 55-gallon lid, one trench, 2 ballistics shields (use unknown), 10 range-related debris items, 5 utility poles, sandbags, concrete debris, concertina wire and many pits. The field reconnaissance notes indicated spent small arms ammunition exposed on the ground surface. This site remains an active training area.

1.2.1.3 Ranges 35 and 35A

Ranges 35 and 35A are included within MRS-28. The 1973 SOP showed Range 35 as a quick kill range with up to 20 firing locations. Authorized weapons were the M16 and M14 rifles. In 1977, Range 35 was listed as an indirect fire sub-caliber range. After 1977, the range is listed as either "inactive" or as the "MOUT". Prior to 1972, a rocket launcher range (unnumbered) was in this general location, part of MRS-28.

Range 35A was used as a combat pistol range from at least 1975. SOP information from September 1980 through October 1992 indicated that the range had six small arms firing lanes and was authorized for 38 and 45 caliber pistol fire. The range is currently active.

1.2.1.4 MRS-27J

MRS-27J is identified as a former training site. A portion of this site is within the fire area. As defined in the Fort Ord Regulations, a training site is a training facility located within a training area and used as an overnight bivouac area (Army, 1980). The site is located south of MRS-10A.

MRS-27J was mapped as part of the BRA site reconnaissance conducted in August 2001 in conjunction with the mapping of Range 98. One signal flare was found within the burn area during the site visit.

1.2.2 Eucalyptus Fire Area (BLM portion)

The BLM portion of the Eucalyptus Fire Area includes MRS-12, MRS-21, MRS-27K, and MRS-27O.

1.2.2.1 MRS-12 (Picnic Canyon)

This site was reportedly used as a firing point and target area for mortar, rifle grenades, and shoulder-launched projectiles (*USACE, 1997*). The northeast portion of the site is within the fire area. This site was also used as a live-reaction fire course. Military munitions sampling

conducted in 1994 and 1995 identified 6,960 live small arms rounds, 4 MEC items, and pyrotechnic compounds. Military munitions removal activities conducted in September 1997 removed 400 MEC items and 161 pieces of munitions debris. Site reconnaissance conducted in July 1999 and August 2001 as part of the BRA identified one foxhole, 7 firing points, 18 blank casing sites, 2 MEC items, and 2 soil pits. Two additional firing positions (use unknown), 2 sites of blank casings, and one MEC item were located off the southeastern corner of the site.

1.2.2.2 MRS-21 (Mudhen Lake)

MRS-21 is located south of the East Garrison. On the circa 1954 map, an Artillery Position is shown in the northern portion of the site (Army, 1954). In the ASR, it is suggested that this area might have been a dumping ground because most of the site area is a lake (USAEDH, 1997). UXB International, Inc. performed random military munitions sampling activities in 36 grids down to a maximum of four feet deep. Small arms ammunition encountered included 68 cartridge 30 caliber ball rounds, 1 cartridge 5.56mm ball round, and 3,556 live 5.56mm, 6.72mm or 50-caliber blank cartridges A total of 64 MEC items including 34 surface flares and 10 grenade fuzes, and 34 munitions debris items were discovered (UXB, 1995). USA Environmental performed MEC removal operations on the site in September 1997. No MEC items were discovered during this removal operation (USA, 2000).

MRS-21 was mapped as part of the BRA site reconnaissance conducted in August 2001. Some blank casings were found during the site visit, however, no MEC items were found. In the northeastern portion of the site, broken wood and brush were evident in an area that was shown as an Artillery Position on a circa 1954 training map (Army, 1954). Other items found during the site visit include two buildings, two utility poles, two scrap metal items, and one pit. Items recorded in the reconnaissance notes included an open 55-gallon drum filled with trash, an expended signal illumination flare in the southwestern portion of the site, and a firing point in the northeastern portion of the site.

1.2.2.3 MRS-27K (HA-143)

MRS-27K is identified as a former training site. A portion of this site is within the fire area. As defined in the Fort Ord Regulations, a training site is a training facility located within a training area and used as an overnight bivouac area (Army, 1980). The site is located west of Range 195 (MRS-65); Eucalyptus Road is north of the site and Jack's Road is east. On a 1945 Fort Ord training facilities map, a Demonstration Area appears east of the site in Range 101 (MRS-12) vicinity (Army, 1945). The northwestern portion of the site overlaps Range 101. A 1975 aerial photograph shows a building within the site. This area is identified as a Patrolling Area in a 1972 training map (Army, 1972). On 1976 through 1987 ranges and training maps, this area is identified as Training Site 11 (Army 1976 and 1987). Training Site 11 is visible on the 1982

ranges and training map, however, its location is different and appears just northwest on the 1987 ranges and training map (Army 1982 and 1987).

A USACE ordnance and explosives (OE) Safety Specialist conducted a site walk in March 1996 and found expended small arms blanks and expended pyrotechnic items. This area was later mapped as part of the BRA reconnaissance conducted in January 2002. Blank casings, three expended signal flares, one spent smoke grenade, and one spent training booby trap were found during the site visit, but outside of the fire area boundaries. Several firing positions (use unknown) were mapped; however, no evidence of targets or range features was identified. Other items found include several pits of unknown use, concertina wire, scrap metal, four utility poles, one fence post, one bench mark, two wood structures, four firing points, one wooden marker, one restoration site, one wooden box top, and one empty 55-gallon drum.

1.2.2.4 MRS-27O

Range 147 (MRS-27O) is identified as a former training site. As defined in the Fort Ord Regulations, a training site is a training facility located within a training area and used as an overnight bivouac area (Army, 1980). The site is located east of MRS-15, south of Eucalyptus Road and east of Barloy Canyon Road. On 1950s training maps, a Hand Grenade Training Area is identified just southwest of the site, and an area referred to as "Rifle" is identified just west of the site. The site area is identified as Bivouac Area L on a 1964 training map (Army, 1964). On 1976 through 1987 ranges and training maps, the site is identified as Training Site 15 (Army 1976 and 1987).

A USACE OE Safety Specialist performed a site inspection in March 1996 and found expended small arms blanks and expended pyrotechnic items. This area was later mapped as part of the BRA reconnaissance conducted in January 2002. Expended blank casings were found during the site visit; however, no other MEC related items were identified. Other items mapped include two utility poles, one 6-inch water main, and one wood structure.

1.3 Topography and Natural Resources

Elevations above mean sea level in the Eucalyptus Fire Area range from approximately 900 feet in the southern part of the site to approximately 150 feet in the northeast. Much of the area includes narrow, moderately to steeply sloping canyons. The site consists of central maritime chaparral habitat with scattered patches of annual grassland habitats. The natural resources of concern include Habitat Management Plan-listed (HMP) species associated with central maritime chaparral habitat or are considered threatened, rare, or species of concern by the federal government or the state of California including: Hooker's manzanita (*Arctostaphylos h. hookeri*), Toro manzanita (*Arctostaphylos montereyensis), s*andmat manzanita (*Arctostaphylos pumila*), Monterey ceanothus (*Ceanothus cuneatus rigidus*), Monterey spineflower (*Chorizanthe p.*

pungens), seaside bird's beak (*Cordylanthus rigidus littoralis*), Eastwood's goldenbush (*Ericameria fasciculata*), coast wallflower (*Erysimum ammophilum*), sand gilia (*Gilia tenuiflora arenaria),* Contra Costa goldfields (*Lasthenia conjugens*), and California black legless lizard (*Anniella pulchra nigra*).

Wetland and vernal pool pond areas are scattered throughout the site in areas containing annual grasslands. HMP species associated with wetlands and vernal pool habitat include California red-legged frog (*Rana aurora draytoni*), California tiger salamander (*Ambystoma californiense*), California linderiella (*Linderiella occidentalis*), southwestern pond turtle (*Clemmys marmorata pallida*), and tricolored blackbird (*Agelaius tricolor*).

1.4 Climate

The area's climate is characterized by warm, dry summers and cool, rainy winters. The Pacific Ocean is the principal influence on the climate at the former Fort Ord, causing fog and onshore winds that moderate temperature extremes. Daily ambient air temperatures typically range from 40 to 70 degrees Fahrenheit (°F), but temperatures in the low 100 °F have occurred. Thick fog is common in the morning throughout the year. Winds are generally from the west. The average annual rainfall of 14 inches occurs almost entirely between November and April.

2.0 Investigation Methods

This section describes the approach, methods, and operational procedures employed during the TCRA and military munitions reconnaissance at the Eucalyptus Fire Site. The results of the work are presented in Sections 3.0 and 4.0. Supporting documentation is provided in several appendices:

- Appendix A – Approval Documents
- Appendix B – Geographic Information System (GIS) Data Tables
- Appendix C – Quality Control (QC) Documentation
- Appendix D – Field Activity Daily Logs (FADLs)
- Appendix E – Photographs of MEC
- Appendix F – Biological Inspections
- Appendix G – Disposition of Munitions Debris

A chronology of the work performed from October 2003 through May 2004 is included in Table 2-1. Figure 1-2 is an overview of the work area. Figure 2-1 shows the locations of photographs referenced in the text.

2.1 Technical Scope

On July 17, 2003, an accidental fire started in the MOUT and burned approximately 644 acres in the east-central portion of the former Fort Ord. The fire area includes approximately 367 acres in the northeastern corner of the Impact Area, and 270 acres on adjacent property that has been transferred to the BLM.

The fire removed vegetation, which provided access for military munitions activities. A TCRA was conducted to remove military munitions in the Impact Area part of the fire area. The justification for the TCRA was to complete the work before the area began to regenerate the vegetation, which would occur rapidly once the winter rainy season began. Also to take advantage of the removed vegetation, a military munitions reconnaissance survey was conducted in the BLM part. This provided confirmation of previous military munitions investigations conducted in this area.

Work procedures were generally the same in the Impact Area and BLM parts of the fire area, and were defined in the *Final Work Plan* (Shaw, 2003). The surface removal required the following military munitions tasks:

- Unexploded ordnance (UXO) technician support during the definition of the site boundaries and grid surveying

- Surface removal of MEC to include disposal by detonation
- Surface removal of munitions debris over two inches
- Certification, verification, demilitarization and disposal of munitions debris
- UXO technician support during erosion protection

The MEC and debris removal involved surface removal only. As described in Section 2.8, procedures were modified for 22 grids in the Impact Area where the surface removal had found several high explosive 40mm grenades. Procedures were modified in these grids to allow use of metal detectors and subsurface investigation of anomalies to a depth of six inches.

2.2 Approval Documents

The work was conducted in accordance with the *Final Work Plan,* (Shaw 2003), which was developed in accordance with Huntsville MCX Data Item Description (DID) OE-005-1.01, Type II Work Plan. The *Final Work Plan* incorporated the Safety and Health Plan.

As the work progressed, the work plan was amended by field work variances (FWV) as follows:

FWV T16-001	minor changes to forms used by UXO teams
FWV T16-002	minor changes to personal protective equipment
FWV T16-003	change sweeping in 100 feet width rather than 50 feet
FWV T16-004	backup systems for communications
FWV T16-005	blow in place procedures for 40mm grenades
FWV T16-006	revised Fire Department approval procedures for blow in place
FWV T16-007	demilitarization procedures
FWV T16-008	use of X-ray to identify inert items
FWV T16-009	use of shredder for disposition of certified inert munitions items
FWV T16-010	work plan addendum for 40mm grids
FWV T16-011[3]	procedures for removing scrap pile in grid B3F0D2 within 40mm grids
FWV T16-013	procedures for removal of 3-5-inch rockets from burial pits

Army approval for the TCRA was provided by the *Action Memorandum, Ordnance and Explosives Time Critical Removal Action* approved October 15, 2003. A copy of the Action Memorandum is included in Appendix A. Public notifications for the TCRA were published in the Monterey Herald and Californian newspapers on October 24, 2003.

[3] FWV 12 was issued for a separate project conducted outside the Eucalyptus Fire Area

The *Explosives Safety Submittal* (ESS) was approved by the Department of Defense Explosives Safety Board on October 28, 2003. Copies of the approval memorandum and the ESS are included in Appendix A.

2.3 Project Personnel and Subcontractors

Shaw conducted the work with qualified UXO technicians who met or exceeded the requirements of DID OE-025.01. The key UXO personnel were:

Senior Unexploded Ordnance Supervisor (SUXOS): Tim Mathisen
UXO Quality Control Specialist (UXOQCS): Charles Thomas
UXO Safety Officer (UXOSO): Bruce Tincknell
GIS Manager: Trisha Smith

The Project Manager was Peter Kelsall.

Shaw mobilized 11 UXO qualified individuals. Staffing included the SUXOS, UXOSO, UXOQCS, plus eight UXO Technician III or UXO Technician II personnel. The UXO technicians operated in two teams of four, supported by sweep personnel, Global Positioning System (GPS) technicians, and general laborers. The composition of the sweep teams and the work procedures are described in Section 2.7.

Most of the personnel used on the task order were Shaw employees, including all UXO Technicians. The following tasks were subcontracted:

- Mactec Environmental and Consulting of Petaluma, California, provided a qualified biologist to perform biological clearances and inspections.
- Timberline Environmental Services of Cold Springs, California, provided shredding equipment used for demilitarization of munitions debris.

2.4 Health and Safety

There were no accidents or safety incidents during the course of the work.

2.5 Site Preparation

2.5.1 Training and Orientation

A project orientation was conducted for "all hands" on October 14, 2003. This covered training on the work plan, Safety and Health Plan, military munitions procedures and hazards, habitat management plan requirements, community relations, and administrative requirements.

2.5.2 Temporary Facilities

Shaw used the existing trailer complex on All Pro Lane as a field office. This field office was the central command location for direction and coordination of military munitions activities. Personnel reported to the field office at the beginning of each workday for the daily health and safety briefing.

Temporary break and sanitation facilities were established at the work site.

2.5.3 Grid Surveys

The work was referenced to the existing Fort Ord Master Grid System (MGS) which consists of large, medium, and small grids (10,000 by 10,000, 1,000 by 1,000, and 100 by 100 feet respectively). Grid boundaries were established in advance of the sweep crews by GPS and the corners were marked with stakes (Photo 2-1). UXO personnel accompanied the GPS personnel during the definition of the grids.

2.5.4 Biological Clearances

The work was conducted in accordance with a biological clearance prepared by a qualified biologist and approved by the Army (Appendix F). Vehicle access was restricted to existing trails and only very limited vegetation trimming was allowed. The biologist performed an inspection at the completion of field work to verify that work plan procedures had been followed and that erosion potential was minimized.

2.6 Geographic Information System

Shaw used GPS methods to document fieldwork and survey locations of MEC found. Positional information was captured through the use of Trimble's highest mapping-grade real-time instrument, the GPS Pathfinder® Pro XR receiver with a TSCe data collector. Data was referenced to the existing Fort Ord MGS. Data collected and added to the GIS included:

- Location/description of MEC
- Munitions debris recorded by weight by grid
- Inaccessible areas
- Areas not burned
- Path walked (as documentation of area covered)
- Other/unusual features (targets, drums, small arms, etc)

Shaw collected the following information for each grid:

- Grid name or identification
- Grid dimensions
- UXO team personnel

- Location/description of MEC
- Location of any detonations
- Identification of munitions debris versus non munitions debris
- Total weight of munitions debris removed
- Hours worked each day performing various tasks
- Other/unusual features (targets, drums, small arms, etc)

The GIS was used to produce project reports and to document physical progress, shown visually on maps and in tabular form.

GIS support was provided for the duration of the project by one full time GIS Manager, supported by two GPS technicians; one assigned to each sweep team.

ArcGIS 8.0 was the primary GIS software used to manage the data. Microsoft® Access was used to manage the project database. The data workflow and data management scheme were developed in conjunction with the USACE Sacramento District (CESPK) GIS Manager. Standardized naming conventions were used so all field observations and measurements are consistent with the site-wide relational database. At the completion of the project, all military munitions removal and reconnaissance data, including grid data, MEC, inaccessible areas, and 40mm 200-foot exclusion zones, was provided to the CESPK GIS Manager in a standardized GIS and Access database file format. This will be added to the Fort Ord Military Munitions Response Program Database.

2.7 Surface Removal Procedures

Two teams working concurrently conducted the surface removal. Each team generally included the following personnel:

- Team leader (UXO Technician III)
- Three UXO technicians (UXO Technician II or III personnel)
- GPS specialist
- Nine Sweepers (laborers)
- Two general laborers (support and errands)

The sweep was referenced to the existing 100 by 100 and 1,000 by 1,000 feet grids in the Fort Ord GIS. The general procedure was to sweep across a designated area with the technicians and sweepers spread apart across a line. The team leader and GPS technician followed behind the center of the line and inspected and recorded items found. The GPS technician recorded the

center of the path walked, as well as items found and other features. A UXO technician or laborer at one end of the line marked the perimeter with flags or paint. Initially, the sweepers were spaced approximately 4-feet apart and the width of the line was 50 feet. As approved by FWV T016-003, the sweepers were spaced approximately 8-feet apart and the width of the line was 100 feet. This allowed a 100 by 100 foot grid to be covered with one pass.

Photos 2-2 through 2-5 show the typical arrangement of the sweep teams.

The sweep located and removed MEC and munitions debris (2 inches or larger) from the surface of the burned area. The *Final Work Plan* allowed for the use of Schonstedt GA-52CX magnetometers to supplement visual inspection in areas where surface ordnance could be hidden by vegetation. In general, no areas were identified that required the use of Schonstedt magnetometers. The exception was in the 40mm grids (Section 2.8) where magnetometers were used in some of the outer grids before they were replaced with metal detectors.

Material was collected in buckets that were labeled by grid number for later weighing. MEC locations were surveyed by GPS.

2.8 Modified Procedures for Surface Removal, 40mm Grids

On November 14, 2003, a high explosive 40mm grenade was found in Grid B3E9J8, located in the Impact Area south of the MOUT (Figure 2-2). A second 40mm grenade was found on November 17. Two more 40mm grenades were found after work procedures were modified as described in this section.

The 40mm grenades are inherently hazardous because they have a point-detonating fuse that can be initiated by physical disturbance. Also, because of the sandy soil in the areas where they were found, it is possible that additional live items could be buried at shallow depth below the ground surface. One of the 40mm grenades is shown in Photo 2-6. The typical terrain is shown in Photo 1-6.

The OE Safety Specialist established an exclusion zone of 200 feet around each 40mm grenade location and determined that revised procedures should be developed for MEC removal within the exclusion zone. Surface clearance was then completed in some of the grids in the restricted area using MEC avoidance techniques. Magnetometers and metal detectors were used to identify geophysical anomalies, which were marked and avoided by the sweep team. No excavation of anomalies was allowed during this work. Some grids could not be completed because there were too many geophysical anomalies to avoid.

Revised procedures were developed and approved for surface clearance and munitions debris removal in the 22 grids that were not swept by the standard procedures described in the *Final*

Work Plan. These revised procedures, issued as FWV T16-010 on March 8, 2003, followed the MEC procedures defined in the *Final Work Plan* except as described below:

- Work in the exclusion zone, including GPS survey, was conducted by qualified UXO technicians. Sweep personnel were not used.
- Metal detectors (White Classic I, Model 800-0303) were used for detection of non-ferrous 40mm grenades. Two non-ferrous items simulating 40mm grenades were buried in the geophysical test plot (Section 2.9.1) for testing the instruments.
- Metal detectors were used to clear a safe path for the UXO technicians into the restricted zone.
- Sweep lanes were established with stakes and the metal detectors were used for MEC avoidance during the surface sweep (Photo 2-7).
- Subsurface anomalies identified with the metal detector were investigated by manual excavation to a depth of approximately six inches.
- The exclusion zone was 1,395 feet.

All of the grids that were placed in a restricted zone were swept and passed QC using a combination of surface sweep and avoidance methods. Figure 2-2 shows the locations of the 40mm grids and the methods used to sweep each grid.

2.9 Munitions Response Procedures

This section discusses the general procedures that were performed by UXO-qualified personnel during the surface sweep operations. The modified procedures used in the 40mm area are discussed in Section 2.8.

2.9.1 Geophysical Test Plot and Magnetometer/Metal Detector Check-Out Procedures

A test plot was used to provide a consistent environment where hand held magnetometers and metal detectors could be evaluated. The test plot was developed in conjunction with the project conducted at the First Tee site (Shaw, 2004). The plot was located in a clear area near the administrative office area, and contained inert items that simulated MEC items that might be found in the project area. Simulated items were approximate the size and weight of an 81mm mortar projectile and a 3.5-inch rocket projectile. Seeded items were painted and identified by a unique number so that they could not be mistaken for actual field items. Documentation that the magnetometers and metal detectors met performance requirements is included in the project files.

No geophysical instruments were used on the project except in the 40mm grid area, where Schonstedt GA 52CX magnetometers and White Classic I, Model 800-0303 metal detectors were

used (Section 2.8). Prior to field use, the magnetometers and metal detectors were set up following the guidelines in the manufacturer's operating manual for the specific instrument used. All equipment was operated in a manner consistent with instructions contained in the appropriate operator's manual. All equipment was function-tested prior to use. Checkout procedures included:

- Once the instrument was determined to be working according to the manufacturer's operating manual, the operator performed a function test using the detection methods described in the manual. A function test consisted of using the instrument over a minimum of two test sources. The same sources were used during each function test to ensure consistency. The instrument detection indication, as described in the operator's manual, were noted in the instrument logbook.
- Instruments that failed to reproduce a detection indication consistent with previous tests were checked to ensure that the power supply or batteries were sufficient. If the power supply was determined to be sufficient and the operator could find a fault in accordance with the operator's manual, the instrument was tagged and removed from service.
- Function tests were performed each morning before the equipment was put into service.
- If an instrument was determined to be working improperly, the SUXOS was notified. Any activities performed using that instrument since its last positive test procedure were considered invalid and required reevaluation.
- Upon completion of the function test, the results of the function test were recorded in the operator's FADL.
- After an instrument had been function-tested at the beginning of each day, the instrument was checked at least once during every hour of use or each time the instrument was turned on after having been turned off. The instrument indication was compared to the indication produced during the morning function test. Instruments that failed to produce a consistent indication were checked and removed from service as required.

All instruments used at the Eucalyptus Fire site were shown to be performing satisfactorily.

2.9.2 Discovery, Notification, and Reporting of Munitions or Explosives of Concern

The discovery of all MEC was immediately reported to the appropriate on-site personnel, accurately documented and communicated to USACE. MEC items were tracked using forms provided in the *Final Work Plan*, and were recorded in the GIS using standardized terminology.

2.9.3 Exclusion Zone

During the sweep activity, an exclusion zone was established as defined in the *Final Work Plan*. The most probable munition was the M43 81mm Projectile with a minimum separation distance (MSD) of 1,395 feet. Because of the low probability of encountering MEC materials, an exclusion zone of 230 feet was calculated in accordance with the 1/600 calculation. This distance was computed using HNC-ED-CS-S-98-1 by Michelle Crull, USACE Engineering and Support Center, Huntsville, October 2, 2003, (presented in Appendix G in the *Final Work Plan*).

For intentional detonations, the exclusion zone was 1,395 feet.

2.9.4 Disposal of Munitions and Explosives of Concern

The surface sweeps removed 114 MEC items that required disposal. Disposition of each of these items is documented in Sections 3.2 and 4.2. Depending on the type of MEC and its condition, items were transferred to USACE, detonated in place by Shaw or collected for a consolidation detonation by Shaw. Detonations of MEC were performed by Shaw on three occasions for items found in the Impact Area (Section 3.2). No detonations in place were required for items found in the BLM area. Items transferred to USACE were destroyed by Parsons in consolidation detonations together with MEC collected from other Fort Ord projects.

Prior to each detonation, the appropriate notification and approval procedure were initiated, as defined in the *Final Work Plan* and modified by FWV T16-006. Notification procedures were conducted as follows:

- The appropriate UXO Disposal Checklists and notifications were completed for each disposal operation.
- Determined requirements for Fire Department risk assessment. Demolition shots may proceed without individual shot assessment except for the following condition:
  - Any shot within 100 feet of any vegetation along the perimeter of the burn site.
  - Any shot 50 feet of any large areas of vegetation within the burn.
  - If either of these conditions applied, the Fire Department came to the site and performed a fire risk assessment. All requests for risk assessment required a 3-day notification and all demolition shots required a 5-day notification.
- Completed a Detonation Approval Checklist/risk assessment and submitted to the Army OE Project Manager for approval by the Garrison Commander.

The following technical procedures were followed for all disposals by detonation:

- Explosive materials were ordered from Parsons and delivered to the site for use on the day designated.
- The UXO Team comprised of the UXO Technician III and a UXO Technician II inspected the location, condition, and net explosive weight of the UXO to be disposed of.
- The UXO Technician III ensured that permission to detonate explosives had been obtained from the SUXOS and coordinated with the USACE OE Safety Specialist.
- It was the responsibility of the SUXOS to schedule the detonations and to ensure that all project personnel are accounted for before disposal operations begin.
- The UXO Team then prepared enough explosive charges and shock tube initiating systems materials to perform the planned detonations. The transportation vehicle was then be loaded with the explosives, shock tubing initiating systems, and other equipment required. Initiators were always transported in a separate container from the main-charge explosives.
- An MSD of 50 feet was observed for initiators and main-charge explosives while at the disposal site.
- If several UXO were located in close proximity to each other a mainline/branchline shot was used to destroy the MEC simultaneously to increase the efficiency of the operation.
- The UXO Technician III observed the UXO Technician II position the explosive charge against the MEC. The disposal shot was tamped, except for 40mm grenades, to minimize the effects of the detonation. The initiators (caps) were not buried.
- The UXO Technician III then inspected the disposal shot and return to the safe firing point.
- Prior to initiation, the UXO Technician III ensured that guards were stationed at the roadblocks, scanned the exclusion zone for personnel, and sounded three distinct blasts on an air or vehicle horn. He then scanned the area again and initiated the demolition charge if all was clear.
- In the event of a misfire, a 60-minute wait time was enforced for both Shock Tube Initiating Systems and electric misfires. A Misfire Checklist was completed by the UXO Technician III and filed with the daily logs.

After successful initiation of the explosive charge, the UXO Team conducted an inspection of the shot to ensure complete destruction of the MEC. After verification that no more detonations would be required, an "all clear" notification was sent out to all parties on the notification list.

The UXO Team then collected for disposal all sandbag fragments, large munition fragments, and other debris, and cleaned and restored the site.

Typical demolition procedures are shown in Photos 2-8 through 2-11.

2.10 Disposition of Munitions Debris

Shaw used a systematic approach for collecting and inspecting munitions debris. In accordance with the scope of work, range related debris (formerly "non-OE scrap") and items less than two inches maximum dimension were not collected. According to Department of Defense (DOD) 4160.21-M, all debris collected is classified as Group 1b.

The munitions debris was collected and inspected in three stages as follows:

- Item verified as munitions debris by UXO technician and placed in bucket
- Buckets collected each night, inspected by UXO technician, weighed, and contents transferred to a lockable scrap metal container
- Inspected during demilitarization by the SUXOS

Most of the munitions debris was demilitarized using a trailer-mounted portable Ordnance Shedding System owned by Timberline Environmental Services. Following inspection, each item of debris was placed on the conveyor belt feeding the shredder by a UXO Technician. The shredding system used a series of cutting edges to shred the debris into pieces ranging from less than 1 inch to 3 to 4 inches in length. The shredded material was collected in containers ready for inspection and transport off site. Photos 2-12 through 2-14 show the operation. The certified shredded munitions debris was transported to A&S Metals in Castroville, California, for disposal by melting.

The shredder was used for all of the material collected through January 2004. Subsequently, 352 pounds collected in March 2004 from the 40mm grids was demilitarized using a chop saw (Photos 2-15 and 2-16), and then certified as inert and disposed at A&S Metals. In May, 2004, approximately 8,903 pounds of 3.5-inch rocket debris were collected from a burial pit. This was demilitarized using a chop saw (Photo 2-17). This material was transported to FACT International in Los Angeles, California, for disposal by melting.

The SUXOS and UXOQCS physically inspected the shredded material in the containers to confirm that they were free of dangerous items. The SUXOS signed the DD Form 1348-1A, certifying as follows:

"This certifies that the material listed has been 100 percent properly inspected and to the best of our knowledge and belief, are free of explosives hazards, engine fluids, illuminating dials, and other visible liquid hazardous, toxic, and radioactive waste materials."

The certification was verified (countersigned) by the USACE OE Safety Specialist.

The total weight of material delivered to A&S Metals or FACT International was approximately 29,650 pounds, delivered on the following dates:

Date	Pounds delivered
2/10/04	7,460
2/11/04	12,932
3/24/04	352
6/17/04	8,903
Total	29,647

Documentation of the demilitarization is included in Appendix G.

The weights shown above were recorded at the disposal facility. The total weights recorded in the field were lower, as shown below:

Source	Pounds collected
First Tee	13
BLM	311
Impact Area	26,991[4]
Total	27,315

This discrepancy was probably caused by inaccurate scales used in the field. For purposes of presentation in this report, the much smaller BLM total is assumed to be correct as measured in the field, and the difference between the field and disposal facility weights is attributed entirely to the Impact Area.

[4] The weight for the Impact Area comprises the actual weight recorded at the recycler for 8,903 pounds removed from one grid in the 3.5-inch rocket cache, plus weights recorded in the field for all other grids. The actual weight for the 3.5-inch rocket grid is known because the material from one grid was shipped separately to the recycler.

2.11 Erosion Control

Vehicle access was prohibited except on existing trails. Shaw monitored the work site for potential erosion problems and a final inspection was conducted by a qualified biologist. No erosion control measures were required other than regrading access trails to remove ruts.

2.12 Production Rates

The total hours worked by UXO technicians and sweep personnel (not including mobilization) were 3,621 hours in the BLM area, 7,695 hours in the Impact Area excluding the 40mm grids, and 853 in the 40mm grids.

Production rates using two sweep teams ranged from 100 to 150 grids per day (23 to 34 acres per day) for grids with little or no MEC or munitions debris, to 30 to 50 grids per day (7 to 11 acres per day) for grids with heavy MEC or munitions debris. The average for the whole project, excluding the 40mm grids, was 82 grids (19 acres) per day with two crews.

Production rates were lower in the 40mm grids due to the need to investigate anomalies. The 22 grids were completed in seven working days.

3.0 Time Critical Removal Action in the Impact Area

This section describes the results of the TCRA conducted in the Impact Area portion of the Eucalyptus Fire site. Procedures were as described in Section 2.0 except as described herein.

Grid staking in the Impact Area started on October 24, 2003. Grid sweeps started on November 4 and were completed except for the 40mm grids (Section 2.8) on December 17, 2003. The 40mm grids were completed from March 8 to March 24, 2004.

During the initial work that concluded in November 2003, several burial pits or caches of expended 3.5-inch rockets were located. A decision was made to leave some of the debris in place pending discussion of how much excavation of these pits was appropriate under the scope of work for surface removal. Additional munitions debris was removed in May 2004. As a result, all visible munitions debris was removed from the burial pits.

3.1 Area Covered by the Removal Action

The Impact Area portion of the Eucalyptus Fire site covers an area of 367.2 acres (Figure 3-1). Some complete grids or partial grids were inaccessible due to steep terrain or unburned vegetation and could not be swept. The final disposition of swept and unswept areas was as follows:

Total area (acres)	367.2	
Swept	347.1	94.5%
Unburned	16.6	4.5%
Inaccessible (steep terrain and MOUT buildings)	3.5	1.0%

Table 3-1 provides a more detailed breakdown of the grids.

3.2 Munitions or Explosives of Concern

A total of 91 MEC items were removed from the Impact Area portion of the Eucalyptus Fire. Table 3-2 provides a description of each item and Figure 3-2 shows the location where each item was found. Photographs of each item are included in Appendix E.

Most of the MEC was found as individual items lying on the surface. Shaw detonated 28 MEC items found in the Impact Area. This total included 18 items blown in place and 10 items detonated in consolidation shots. Table 3-3 identifies these items and Figure 3-3 shows the locations.

3.3 Munitions Debris

Approximately 29,300 pounds of munitions debris were removed from the Impact Area portion of the Eucalyptus Fire site. As explained in Section 2.10, this weight is based on the total weight recorded at the metals recycler and is greater than the weight recorded in the field by about 8 percent. Figure 3-4 shows the distribution of the debris, and Table B-3 in Appendix B includes a tabulation of the weight recorded in the field by individual grid. Most of the debris was removed from the southern part of the MOUT complex, on the western side of the work area (Figure 3-4).

Photo 3-1 shows a cache of buried 3.5-inch rockets found near Impossible City. These rockets were removed in May 2004. Photos 3-2 through 3-5 show a scrap pile found in the 40mm grid area (Figure 2-2). This scrap was moved to an adjacent grid to allow completion of the surface sweep for MEC.

Most of the recovered debris was certified as inert and shredded on February 11, 2004, along with munitions debris removed from the BLM area. Material removed from the 40mm grids was demilitarized in March 2004, and additional material removed from a 3.5-inch rocket burial pit was demilitarized in May 2004 (Section 2.10). Typical munitions debris is shown in Photo 2-13.

4.0 Military Munitions Reconnaissance in the BLM Area

This section describes the results of the military munitions reconnaissance conducted in the BLM portion of the Eucalyptus Fire site. Procedures were as described in Section 2.0 except as described herein.

Grid staking in the BLM area started on October 8, 2003. Grid sweeps started on October 14 and were completed on November 4, 2003.

4.1 Area Covered by the Reconnaissance

The BLM portion of the Eucalyptus Fire site covers an area of 270.3 acres (Figure 4-1). Some complete grids or partial grids were inaccessible due to steep terrain or unburned vegetation and could not be swept. The final disposition of swept and unswept areas was as follows:

Total area (acres)	270.3	
Swept	223.9	83%
Unburned	31.6	12%
Inaccessible (steep terrain or Mudhen Lake)	14.8	5%

Table 4-1 provides a more detailed breakdown of the swept and unswept areas. Table B-1 in Appendix B provides a complete description of all the grids.

4.2 Munitions or Explosives of Concern

A total of 22 MEC items were removed from the BLM area. Table 4-2 provides a description of each item and Figure 4-2 shows the location where each item was found. Photographs of each item are included in Appendix E. All MEC items found in the BLM area were transferred to USACE for detonation by Parsons.

4.3 Munitions Debris

A total of 311 pounds of munitions debris were removed from the BLM portion of the Eucalyptus Fire site. Figure 4-3 shows the distribution of the debris, and Table B-1 in Appendix B includes a tabulation of the weight recovered by individual grid. The most debris recovered from an individual 100 by 100 feet grid was 14 pounds. Only 6 percent of the grids swept contained more than 1 pound of debris, and 82 percent contained no debris.

The recovered debris was certified as inert and shredded on February 11, 2004, along with munitions debris removed from the Impact Area.

5.0 Quality Control

The project was conducted in accordance with the Quality Control Plan (QCP) included in the approved work plan. The QCP was developed in accordance with *Huntsville MCX DID OE-11.01, Quality Control Plan*, and where applicable, Engineer Regulation (ER) 1180-1-6, *Construction Quality Management* (USACE, 1995), ER 1110-1-12: *Engineering and Design - Quality Management* (USACE, 1993); and ER 415-1-10: *Contractor Submittal Procedures* (USACE, 1997), and *Total Environmental Restoration Contract II Program Contractor Quality Control Plan* (ICF Kaiser, 1998). There were no revisions to the QCP during the project.

5.1 Standard Quality Control Procedures

Standard QC procedures followed during the project included:

- The designated UXOQCS was Charles Thomas for the entire project. The UXOQCS was physically on-site whenever project-related fieldwork was in progress.
- The UXOQCS established and maintained an on-site project file in accordance with contract requirements and Shaw policies for document control.
- The UXOQCS verified compliance with the QCP through implementation of the three-phase control process.
- The UXOQCS provided surveillance on project activities performed by subcontractors.
- Records of calibration/maintenance activities were provided to the UXOQCS for retention in the project QC file.
- The UXOQCS submitted a Daily QC Report to the Contracting Officer's Representative, USACE OE Safety Specialist, and project file.

Quality Control documentation is included in the Appendix B.

5.2 Variances and Non-Conformances

There were no variances or non-conformances issued during the project.

5.3 Unexploded Ordnance Qualified Personnel

The work was performed by qualified UXO technicians who were graduates of one of the following schools or courses:

- United States (US) Army Bomb Disposal School, Aberdeen Proving Ground, MD
- US Naval EOD School, Indian Head, MD
- EOD Assistants Course, Redstone Arsenal, AL
- EOD Assistants Course, Eglin Air Force Base, FL
- DOD certified equivalent course

The qualifications of the UXO technicians were verified by the USACE OE Safety Specialist

5.4 Quality Control Inspection

Continuous QC inspection was performed to ensure proper execution of all components of the work according to the performance standards as defined in the work plan. The following process was executed by the UXOQCS:

- Each grid was physically walked at least once with a coverage of 10 to 20 percent
- Some grids were walked twice, due to vegetation, with a coverage of 15 to 25 percent
- Observation of field activities to verify conformance to required procedures
- Review of field documentation
- Review of project data from the GIS and verification versus field conditions

Almost all grids (>99.9 percent) were passed on initial QC inspection. Three grids were re-swept due to QC inspections, and then passed by QC. Documentation is provided in Appendix C.

5.5 Quality Assurance Inspections

Quality assurance was provided by the USACE to assure that the Shaw's QC system was functioning as stated. Areas of quality assurance (QA) included:

- Monitor subcontractor field practices including announced and extemporaneous, unobtrusive observations.
- Review and observe field ground control and GPS procedures.
- Independently examine data files and anomaly maps.

- Physically walk each grid at least once with a coverage of at least 10 percent.

All grids passed QA inspection as documented on a Form 948 for each daily group of grids, included in Appendix C.

6.0 References

U.S. Department of the Army (Army), 1945. *Training Facilities, Fort Ord and Vicinity, California.* Revised August.

Army, 1954. *Training Areas That Cannot Be Used At Same Time: (As Presented In Use). Inclusion I to Appendix A to Annex O.* Circa.

Army, 1964. *Field Training Areas & Range Map, Fort Ord. Appendix 2, Annex O*. April 27.

Army, 1972. *Field Training Area and Range Map. Appendix 3 to Annex W, Fort Ord Reg 350-1*. Revised . July 1.

Army, 1973. *Training Range Regulations. Fort Ord Regulation 350-S. Department of the Army Headquarters, 7th Infantry Division and Fort Ord*.

Army, 1976. *Ranges and Training Area Overlay, Fort Ord and Vicinity. Appendix C to Fort Ord Reg 350-1*. Revised as of July.

Army, 1980. *Fort Ord Regulation 350-5, Appendix-B Training Area and Assignment of Training Facilities B-1, Department of Army*. September 9.

Army, 1982. *Ranges and Training Area Overlay, Fort Ord and Vicinity. Appendix B to Fort Ord Reg 350-5*. Revised April 1.

Army, 1987. *Ranges and Training Area Overlay, Fort Ord and Vicinity*. Revised November 15.

ICF Kaiser, 1998. *TERC II Program Contractor Quality Control Plan.*

Mactec, 2003. *Draft Final Track 1 Ordnance and Explosives Remedial Investigation/Feasibility Study, Former Fort Ord, California. Volume 2 of 2*. June 3.

Shaw Environmental, Inc. (Shaw), 2003. *Basewide Site Safety and Health Plan, Rev 7, Fort Ord, California.*

Shaw, 2004. *Draft Field Investigation Report, Military Munitions sampling, First Tee Site, Former Fort Ord, California, Rev C, February*

USA, 2000. *Draft, After Action Report, Surface OE Removal Inland Range Contract, Former Fort Ord, California, Site OE-21 (Mudhen Lake).* December 29.

USA, 2001. *Final, SS/GS and 100 percent Grid Sampling After Action Report, Inland Range Contract Former Fort Ord, California, Site OE-28.* August 17.

U.S. Army Corps of Engineers (USACE), 1993. ER 1110-1-12, *Engineering and Design - Quality Management,* Washington, DC.

USACE, 1995. ER 1180-1-6, *Construction Quality Management,* Washington, DC.

USACE, 1997. *Engineering Evaluation/Cost Analysis – Phase I, Former Fort Ord, Monterey County, California.* Prepared by the U.S. Army Engineering and Support Center-Huntsville and Sacramento District Corps of Engineers. September.

USAEDH, 1997. *Revised Archives Search Report Fort Ord California, Monterey County, California.* Prepared by U.S. Army Corps of Engineers St. Louis Division. December.

UXB International, Inc., 1995. *Final Report for Ordnance and Explosive Removal Action, Fort Ord, California, Site 21*. November 1.