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May 22, 2003

DEPARTMENT OF THE ARMY
Mr. Karl Blankinship
US Army Corps of Engineers
Attn: CESAM-PM-ME
Building 4488, Room A317A, Martin Road
Redstone Arsenal, Alabama 35898

802829-ITCHO-0436

Contract: Total Environmental Restoration Contract
Contract DACA21-96-D-0018, Delivery Order 0018

Subject: Submittal of Final Time-Critical Removal Action Close Out Report, Fencing and
Trench Marker Installation, Select Sites in Operable Units 4 through 8, 12, 15,
and 17, Redstone Arsenal, Madison County, Alabama

Dear Mr. Blankinship:

The Final *Time-Critical Removal Action Close Out Report, Fencing and Trench Marker Installation, Select Sites in Operable Units 4 through 8, 12, 15, and 17*, Redstone Arsenal, Madison County, Alabama (Shaw, May 2003) is published on ActiveProjects.

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If you have any questions or need additional information regarding this submittal, please do not hesitate to call me at 865-694-7433.

Respectfully submitted,

A handwritten signature in blue ink that reads "Don C. Burton".

Don C. Burton
Project Manager
Shaw Environmental, Inc.

A Shaw Group Company



Mr. Karl Blankinship

Page 2

May 22, 2003
802829-ITCHO-0436

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REPLY TO
ATTENTION OF

AMSAM-RA-DES-IR

MAY 21 2003

MEMORANDUM FOR Federal Facilities Branch (Ms. Julie Corkran), US Environmental Protection Agency, Waste Management Branch, 61 Forsyth Street, SW, Mail code 4WD-FFB-10th Floor, Atlanta, GA 30303-34013
Government Facilities Section (Mr. Tom Birks), Hazardous Waste Branch, Land Division, Alabama Department of Environmental Management, PO Box 301463, Montgomery, AL 36130-1463

SUBJECT: Final Time-Critical Removal Action Close-out Report, Fencing and Trench Marker Installation, Select Sites in Operable Units 4 through 8, 12, 15, and 17

1. Reference the Installation Restoration Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
2. This letter transmits one hard copy of subject document for your review/approval.
3. Any questions or concerns regarding this report may be directed to Ms. Terry de la Paz, Installation Restoration Division (AMSAM-RA-DES-IR), e-mail terry.delapaz@redstone.army.mil, 256-955-6968.

Encl


TERRY W. HAZLE
Director, Directorate of Environment
and Safety

CF:

Ground Water Division (Mr. David Lovoy), Alabama Department of Environmental Management, PO Box 301463, Montgomery, AL 36130-1463 (1 hardcopy & 1 CD)
Gannett Fleming, Inc (Mr. J.E. "Ben" Bentkowski), Suite 700, Peachtree Center Tower, 230 Peachtree St, N, Atlanta, GA 30303 (2 hardcopies & 1 CD)
US Army Environmental Center, Installation Restoration Division, (SFIM-AEC-IRP, Mr. Derek Romitti), Bldg. #E4480, Aberdeen Proving Ground, MD 21010-5401 (1 CD)
US Army Environmental Center (SFIM-AEC-ERA, Ms. Laurie Haines), Bldg. #E4460 Aberdeen Proving Ground, MD 21010-5401 (1 CD)
US Army Center for Health Promotion and Preventive Medicine, (MCHB-TS-REH, Mr. Dennis Druck), Bldg #E1675, Aberdeen Proving Ground, MD 21010-5401 (1 CD)
Environmental Compliance Group (Mr. Jack Milligan), Tennessee Valley Authority, 1101 Market St, CST 17B, Chattanooga, TN 37402-2801 (1 CD)

AMSAM-RA-DES-IR

SUBJECT: Final Time-Critical Removal Action Close-out Report, Fencing and Trench Marker Installation, Select Sites in Operable Units 4 through 8, 12, 15, and 17

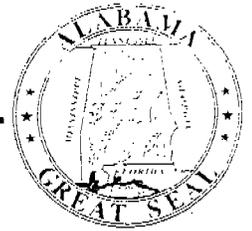
CF (continued):

**Wheeler National Wildlife Refuge (Mr. Dwight Cooley), US Fish and Wildlife Service, 2700
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**Alabama Department of Public Health (Mr. Kenneth Calhoun), 201 Monroe Street, Suite 1450
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**Marshall Space Flight Center, Mr. Farley Davis, Bldg 4200, Mail Code AD-10, Marshall
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DIRECTOR

March 26, 2003

BOB RILEY

GOVERNOR

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(AMSAM-RA-DEM-IR)
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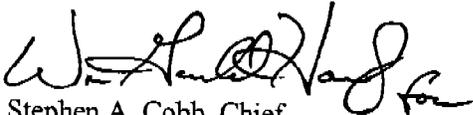
RE: **Notice of Concurrence:**
Time-Critical Removal Action Closure Report, Fencing and Trench Marker Installation, Select Sites in Operable Units 4 through 8, 12, 15, and 17, Dated April 2002
Redstone Arsenal
DSMOA Environmental Restoration Program
Facility ID AL 7210020742
DSMOA Fund Code: 1535-223-5545

Dear Mr. Hazle:

The Alabama Department of Environmental Management (ADEM or the Department) has completed its review of the referenced closure report. The document presents information and as-built drawings related to the implementation of the activities described in the *Installation-Wide Work Plan, Fencing and Trench Marker Installation, Operable Units 4 through 8, 12, 15, and 17, Draft Final* dated May 2000. The Department agrees that the referenced document adequately describes the actions taken and offers no comment.

If you have any questions please contact Tom Birks at 334/271-7967 or by e-mail at wtb@adem.state.al.us

Sincerely,


Stephen A. Cobb, Chief
Governmental Hazardous Waste Branch

cc: Terry de la Paz/RSA
Tom Birks/ADEM
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File: Land Division/Hazardous Waste/DSMOA/Redstone/Correspondence/2003

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May 15, 2003

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Terry Hazle
Department of the Army
Directorate of Environmental Management
(AMSAM-RA-DEM, Mr. Terry Hazle)
U.S. Army Aviation and Missile Command
Redstone Arsenal Support Activity, Building 4488
Redstone Arsenal, AL 35898

SUBJ: Redstone Army Arsenal, AL
AL7 210 020 742
*Time-Critical Removal Action Close Out Report, Fencing and Trench Marker
Installation, Select Sites in Operable Units 4 through 8, 12, 15, and 17.
Draft-Final, May 2003.*

Dear Mr. Hazle:

EPA Region 4 has reviewed the subject document. No additional comments were generated as a result of this review and the document is approved as submitted. If you have any questions regarding this correspondence, please do not hesitate to contact me at (404) 562-8547 or via electronic mail at corkran.julie@epa.gov.

Sincerely,

A handwritten signature in cursive script that reads "Julie L. Corkran".

Julie L. Corkran
Senior Remedial Project Manager
Federal Facilities Branch
Waste Management Division

cc: Terry de la Paz, Redstone Arsenal
Tom Birks, ADEM
David Lovoy, ADEM
Ben Bentkowski, Gannett Fleming



Final

**Time-Critical Removal Action Close Out
 Report, Fencing and Trench Marker
 Installation, Select Sites in Operable
 Units 4 through 8, 12, 15, and 17**

**Redstone Arsenal
 Madison County, Alabama
 U.S. EPA ID No. AL7 210 020 742**

May 2003

**Delivery Order 0011
 Contract No. DACA21-96-D-0018
 Project No. 802829**



Alabama Department
 of Environmental
 Management



**Final
Time-Critical Removal Action Close Out Report
Fencing and Trench Marker Installation, Select Sites in
Operable Units 4 through 8, 12, 15, and 17
Redstone Arsenal, Madison County, Alabama**

Prepared for:

**U.S. Army Corps of Engineers
109 St. Joseph Street
Mobile, Alabama 36602**

Prepared by:

**Shaw Environmental, Inc.
312 Directors Drive
Knoxville, Tennessee 37923**

**Delivery Order 0011
Contract No. DACA21-96-D-0018
Project No. 802829**

May 2003

**Final
Time-Critical Removal Action Close Out Report
Fencing and Trench Marker Installation, Select Sites in
Operable Units 4 through 8, 12, 15 and 17
Redstone Arsenal Madison County, Alabama**

Certification

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

Kenneth J. Hurley
Kenneth J. Hurley
Alabama PE No. 25249

5/20/2003
Date



Table of Contents

Page

List of Tables ii

List of Figures iii

List of Acronyms iv

1.0 Introduction 1-1

2.0 Site Descriptions 2-1

3.0 Construction Activities..... 3-1

 3.1 Initial Survey 3-2

 3.2 Vegetation Removal Activities..... 3-2

 3.3 Fencing and Warning Sign Installation 3-3

 3.4 Trench Marker Installation 3-4

 3.5 Final Survey..... 3-4

 3.6 Maintenance..... 3-4

4.0 Construction Quality Control..... 4-1

 4.1 Preliminary Meetings 4-1

 4.2 Inspections 4-1

 4.3 Submittals 4-2

 4.4 Field Changes 4-2

 4.5 Nonconformances..... 4-3

5.0 Project Costs..... 5-1

6.0 References 6-1

- Appendix A - OE/UXO/CWM Evaluations
- Appendix B - Quality Control Documentation
- Appendix C - Photographs

List of Tables

Table	Title	Follows Text
3-1	Summary of Work Performed at Sites	
4-1	Summary of Construction Quality Control Activities	
4-2	List of Field Changes	
5-1	Project Cost Comparison	

List of Figures

Figure	Title	Follows Text
1	Fencing and Trench Marker Installation Sites	
2	RSA-114 As-Built Site Perimeter Fencing	
3	MSFC-27 As-Built Site Perimeter Fencing	
4	RSA-53 As-Built Site Perimeter Fencing	
5	RSA-56 and RSA-139 As-Built Site Perimeter Fencing	
6	RSA-126 As-Built Site Perimeter Fencing and Trench Marker Installation	
7	RSA-54/55 As-Built Site Perimeter Fencing	
8	RSA-112 and RSA-128 As-Built Site Perimeter Fencing	
9	RSA-113 As-Built Site Perimeter Fencing and Trench Marker Installation	
10	RSA-52 As-Built Site Perimeter Fencing and Trench Marker Installation	
11	RSA-61 and RSA-62 As-Built Site Perimeter Fencing and Trench Marker Installation	
12	RSA-64 As-Built Site Perimeter Fencing	
13	RSA-66 As-Built Site Perimeter Fencing	
14	RSA-67 As-Built Site Perimeter Fencing	
15	RSA-68, -69, -70 and -110 As-Built Site Perimeter Fencing	
16	RSA-63 As-Built Site Perimeter Fencing and Trench Marker Installation	
17	RSA-51S As-Built Trench Marker Installation	
18	Chain-Link Security Fence Details	
19	Barbed Wire Security Fence Details and Trench Identification As-Built	
20	Sign and Bollard Details	

List of Acronyms

ADEM	Alabama Department of Environmental Management
AHA	activity hazard analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQC	construction quality control
CQCP	construction quality control plan
CQCSM	construction quality control site manager
CWM	chemical warfare materiel
DDT	dichlorodiphenyltrichloroethane
DQCR	data quality control report
EPA	U.S. Environmental Protection Agency
IT	IT Corporation
MSFC	Marshall Space Flight Center
NCR	non-conformance report
OE	ordnance and explosives
OU	Operable Unit
PCB	polychlorinated biphenyl
RFI	request for information
ROD	record of decision
RSA	Redstone Arsenal
SAP	sampling and analysis plan
Shaw	Shaw Environmental, Inc.
SSHP	site-specific safety and health plan
SVOC	semivolatile organic compounds
TCRA	time-critical removal action
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance

1.0 Introduction

Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) has recently completed a time-critical removal action (TCRA) for 26 sites at Redstone Arsenal (RSA), Madison County, Alabama in response to the Scope of Services dated November 1, 1999 for the Total Environmental Restoration Contract Number DACA21-96-D-0018, Task Order Number 0011. This report presents information and as-built drawings related to the implementation of the TCRA described in the *Installation-Wide Work Plan, Fencing and Trench Marker Installation, Operable Units 4 through 8, 12, 15, and 17, Redstone Arsenal, Madison County, Alabama* (IT, 2000). The fencing activities described in the work plan were first termed an interim remedial action for the purpose of obtaining Army funding. However, after publishing the work plan and subsequent discussions with the U.S. Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management (ADEM), the fencing and trench marker activities have been reclassified as a TCRA under §§104(a)(2) and 104(c)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The overall purpose of the TCRA was to reduce exposure risks from unexploded ordnance (UXO), chemical warfare materiel (CWM) components, chemical contaminants, and physical hazards that have been identified at or near the surface at the 26 sites. The most efficient and cost-effective method to reduce the exposure risks was to physically restrict access to these sites by the installation of fencing and warning signs. In addition to fencing, permanent markers were also constructed at several of the sites to mark the ends of burial trenches for identification of large underground potential UXO and CWM hazards if future work is planned near those areas. Many of these sites were previously fenced in the 1940s, but the fencing had significantly deteriorated over the years. The actions documented in this close out report are expected to be consistent with the final actions anticipated for the various sites. Figure 1 shows the location of all sites at RSA where fencing and trench markers were installed as part of this work.

The TCRA was performed in accordance with the fencing work plan (IT, 2000), which also serves as the action memorandum for the TCRA. The TCRA activities included an initial UXO and civil survey, vegetation removal, fencing and warning sign installation, trench marker installation as applicable, and final civil survey. The field activities for the TCRA were performed between May 2000 and November 2001.

Site access control for the sites contained within this TCRA will be monitored and enforced by the Army. The Army has developed an environmental site access control program that protects

human health and the environment from potential exposure to UXO, CWM, chemical contaminants, and physical hazards that have been identified during the investigative stage of the CERCLA process (U.S. Army, 2003). Specifically, this site access control program includes the following key elements as they apply to ensuring that appropriate administrative and physical controls are in place for fencing:

- Army organization roles and responsibilities
- Training requirements for individuals who require site access (e.g., fence repair and inspection/maintenance)
- Procedures for control of persons entering a site as well as for conducting routine monitoring and maintenance/repair activities.
- Schedules for required inspections and maintenance (e.g., fence repair, vegetation removal).

Upon completion of the final record of decision (ROD) for a site, any long-term access control requirements will be specified in the ROD and land use control implementation plan.

Public involvement activities were conducted with this TCRA. A public meeting held on July 29, 2000 presented the details of the proposed fencing and trench marker installation via a manned poster display. A fencing fact sheet was also prepared and made available at the meeting (U.S. Army, 2000). This public meeting was advertised in local newspapers in advance of the meeting. The meeting was held at the Arsenal (Rocket Auditorium) and addressed a number of topics including the proposed fencing activities and the ongoing investigation and cleanup activities at the Redstone Arsenal Rocket Engine North Plant area.

The remainder of this close out report describes the sites and associated field activities. Chapter 2.0 presents the specific TCRA sites with a summary of site history and potential hazards present at the sites. Chapter 3.0 discusses the specific construction activities. Chapter 4.0 describes the quality control aspects of the TCRA and Chapter 5.0 lists the applicable references for this work. Each site was surveyed by a licensed surveyor in the State of Alabama upon completion, and as-built figures for each of the sites are included in this report (Figures 2 through 17). Appendix A presents the ordnance and explosives (OE)/UXO/CWM evaluations prepared for each site prior to conducting the TCRA. Appendix B contains the quality control documentation. Construction photos are presented in Appendix C.

2.0 Site Descriptions

The 26 sites addressed by the fencing and trench marker TCRA are located within several operable units across RSA as shown on Figure 1. As a result of past site activities, all 26 sites are in various stages of environmental investigation under CERCLA. The following briefly describes the past activities and potential hazards associated with each site.

Operable Unit (OU), Site	Description
OU-4, RSA-114	RSA-114 is an abandoned limestone rock quarry located on the south side of Madkin Mountain. The area was formerly open to the public for recreational uses. The rectangular shaped, water-filled quarry is approximately 4 acres in size. Approximately 3 acres of the surrounding areas have been added as part of the site. The quarry was closed in the mid-1990s. Surplus materials (e.g., soldier gas mask canisters, mustard chemical production plant filters) were discovered in the quarry. Potential UXO has been observed at the bottom of the quarry and CWM breakdown products have been detected in small amounts in the water.
OU-5, MSFC-27	Marshall Space Flight Center (MSFC)-27 is a former waste accumulation area that was active from the 1960s to 1987. Various materials were stored in the area including scrap metal, waste oils, solvents, and sludges. The site is approximately 5 acres in size.
OU-6A, RSA-53	RSA-53 is a closed, unlined landfill that occupies approximately 43 acres and is comprised of trenches and pits. It was active from 1963 to 1973 and received household, administrative, sanitary, and industrial wastes. In the northern area of the site are several closed waste oil pits, a closed pesticide burial pit, and a closed acid pit. A soil layer approximately 2 feet thick covers the refuse in most of the trenches. A cap extension was completed in 2001.
OU-6B, RSA-56	RSA-56 consists of two surface impoundments designated as the acetylene generator sludge pit and the arsenic sludge pit. In the 1960s, debris from the demolition of lewisite manufacturing facilities that was not considered salvageable was bulldozed into the lagoons. A clay cap was constructed over both surface impoundments under a previous TCRA in 1995. The cap was extended under a second TCRA in 2001.
OU-6B, RSA-139	RSA-139 is north of RSA-56 and was an open, unlined surface impoundment that received arsenic-contaminated industrial waste sludge and wastewater from arsenic trichloride manufacturing facilities in the early 1940s. The lagoon was capped and fenced under a previous TCRA completed in 1995. The cap was extended under a second TCRA in 2001.

Operable Unit (OU), Site	Description
OU-6B, RSA-126	RSA-126 contains a surface burn area and two trenches that were formerly used for open burning. The trenches are approximately 200 feet long and 10 to 12 feet wide. A long, narrow mound of soil is located at the west end of the trenches, which is presumably the soil excavated from the trenches, and which also contains unknown waste materials and metallic objects. The site occupies approximately 6 acres and it is not known when the site operated or the types or origins of materials burned in the trenches
OU-6C, RSA-54 and RSA-55	RSA 54/55 is a single landfill comprising 33 acres that was used during the 1960s and 1970s for disposal of household and industrial waste. Wastes were disposed in trenches that were later covered with a thin layer of soil. Wastes containing dichlorodiphenyltrichloroethane (DDT) were buried at various locations in the landfill between 1968 and 1973; these wastes were later excavated and moved to the DDT waste soils landfill at RSA-107.
OU-6D, RSA-59	RSA-59 is a landfill that received rubble, construction debris, and industrial waste. The materials were placed directly on the ground surface and covered with a thin layer of soil. The landfill was intermittently active from the late 1940s to the mid-1970s. Originally, the site was a fill-borrow area for early construction activities. The 15-acre site has not been capped and no remediation has occurred at RSA-59. Only a portion of the site has been fenced due to swampy conditions. The fencing is planned to be completed at a later date once an alternate route has been identified, or the conditions change.
OU-7, RSA-58	RSA-58 is an inactive rubble fill area that occupies approximately 32 acres and is bordered by McDonald Creek to the east and by Huntsville Spring Branch to the south. The site was used for disposal of ashes from ordnance demolition in the 1940s and 1950s. During the 1960s and 1970s, this landfill received incineration ash from demilitarization operations, rubble, damaged polychlorinated biphenyls (PCB) transformers, and building materials from a nearby Olin DDT manufacturing site. Previous investigations revealed semivolatile organic compounds (SVOC) and pesticides in soil, and metals, SVOCs, and pesticides in groundwater. No capping or remediation has occurred at RSA-58.
OU-7, RSA-112 and RSA-128	RSA-112 is believed to have been used for demilitarization and disposal of conventional and chemical ordnance, including mustard gas. Explosives and metals have been detected in the soil at this site. A trench feature was observed in historical photographs northeast of the demilitarization area. Adjacent to RSA-112 is RSA-128 which was active in the 1950s and is believed to have been used for demilitarization of conventional and/or chemical ordnance, including mustard gas. No visual site evidence has been identified as a location where previous activities were conducted.

Operable Unit (OU), Site	Description
OU-7, RSA-113	<p>RSA-113 is a 10-acre site that consists of two inactive disposal trenches, each approximately 300 feet long by 20 feet wide, that were believed to have been used as burn and disposal pits. A former burn area containing steel plates, piping, ash pile, and associated fuse related kickout components was also identified at this site during the course of the work. The remedial investigation revealed metals and low levels of SVOCs in the soil at RSA-113.</p>
OU-8, RSA-52	<p>RSA-52 occupies approximately 63 acres and consists of a burn pad and 30 trenches that were used to demilitarize and dispose of chemical munitions, including mustard and lewisite. This former site was active in the 1940s and 1950s. Numerous metals at elevated concentrations have been found in the soil. Trench lengths range from approximately 275 to 650 feet. The trenches have been identified from geophysical surveys and existing army railroad ties. The site was also reportedly used to store arsenic-contaminated scrap. Ordnance and metal fragments are evident at the surface throughout the site.</p>
OU-8, RSA-61 and RSA-62	<p>RSA-61/62 is approximately 65 acres and was a demilitarization and disposal site used during the 1940s and 1950s for the disposal of white phosphorus and chemical munitions. It is believed that RSA-61 and RSA-62 was once a continuous disposal site that was later split by an access road to reach an Army facility to the south. The materials were reportedly incinerated in 23 disposal trenches and the residue was left in-place and covered. Some trenches were marked by the Army with vertical railroad ties in the past, but many of these markers were missing or appeared to have been moved. A recent geophysical survey has been conducted to locate and permanently mark the trench ends. Burn pads exist at the sites presumably to burn grenade fuses. Numerous metals are present at elevated concentrations in the soil. Ordnance and metal fragments are evident at the surface throughout the site.</p>
OU-12, RSA-64	<p>RSA-64 is an inactive mustard gas disposal site. Disposal occurred at ground surface without any release controls in place. The circular site, situated on less than 1 acre, was active in either 1955 or 1956, when 200 to 300 leaking mustard gas shells were reported to have been demilitarized through burning and disposed at the site. A positive detection of mustard was found in the shallow soil in 1984.</p>
OU-15, RSA-66	<p>RSA-66 was initially used for the demilitarization of chemically filled ordnance. The 21-acre site was active from the 1950s until the early 1980s. Bunkers, old detonation lines, and a safety shower identified at the site indicate that open burning of chemical ordnance components occurred west of the site access road. In early 2000, ordnance was discovered at the ground surface. The site was also used as a disposal site for ash, residue,</p>

Operable Unit (OU), Site	Description
OU-15, RSA-67 and RSA-65	and metal debris from open burning of propellants, explosives, and solvent-contaminated wastes. Disposal of ash, residue, and metal debris was reportedly to have been confined to pits or small trenches in the eastern part of the site.
OU-15, RSA-68	RSA-67 is an inactive drum storage area that was used in the 1940s and 1950s for aboveground storage of mustard gas. The 45-acre site may also have been used for explosives storage. Originally, the site was separated into storage cells by earthen berms, railcar tracks, and/or trails. Several piles of manganese ore are present at the site, and several metals are present in the marshy water at the site. Changes to the proposed fencing alignment during the course of the work resulted in the inclusion of adjacent site RSA-65, which is also a former chemical drum storage area used in the same time period as RSA-67. Mustard gas and lewisite were stored in drums within distinct cells. Water has been impounded on the approximately 136-acre site by beavers.
OU-15, RSA-69 and RSA-70	RSA-68 was used as a demilitarization area for explosives during the mid-to late-1940s. During the 1950s until 1980, the site was used as a disposal area for toxic waste and laboratory chemicals, as well as ordnance and munitions. High explosives were also detonated or burned on the bare ground, and various chemicals were neutralized and disposed in trenches and pits along the eastern and southern margins of the site. Recent geophysical investigations have identified approximately 40 disposal trenches/pits at RSA-68. UXO is present at the site. Just north of RSA-68 is Igloo Pond that has recently been closed to the public. Numerous contaminants including chemical agent breakdown products have been detected in the surface water and sediment. The disposal area, Igloo Pond, and the wetlands areas encompass approximately 39 acres.
OU-15, RSA-110	RSA-69 occupies approximately 80 acres and was used for the storage of mustard gas canisters during the 1940s and 1950s. The canisters were stored on the bare ground within bermed storage cells. The mustard gas has been removed and shipped offsite via rail car system and/or demilitarized at RSA. Minor concentrations of metals, pesticides, and volatile organic compounds have been detected in the soil. RSA-70 is also an abandoned chemical storage and disposal area. Currently, there is no distinction between RSA-69 and RSA-70. The site investigation confirmed minimal metals contamination in soil.
OU-15, RSA-110	RSA-110 is a 24-acre site that was used for rail car storage of chemical ordnance in the 1940s-1950s. A gravel base was present for the offloaded ordnance. The ground surface has areas containing scattered small surface debris, including ordnance. Metals and SVOCs have been detected in the soil.

Operable Unit (OU), Site	Description
OU-17, RSA-51S	RSA-51S is a former demilitarization and disposal site that consists of 12 ordnance disposal trenches in an area of approximately 2.5 acres. The trenches, each approximately 150 feet long, are believed to have been used in the 1950s for the demilitarization of white phosphorus rounds. Minor metals contamination has been detected in the soil.
OU-17, RSA-63	RSA-63 occupies about 7 acres within the active firing zone for Test Area 1. RSA-63 was used during the 1940s-1950s as a former disposal site for materials contaminated with mustard gas and lewisite, including several 800-pound cement containers that contain leaking mustard shells. The cement containers and demilitarization debris were buried at RSA-63 in two large trenches that are 265 and 340 feet in length. The site was covered with 2 to 4 feet of topsoil. Metals and CWM breakdown products have been detected in the soil.

3.0 Construction Activities

Tasks performed during implementation of the fencing TCRA are described in this section. Field activities were comprised of the following general tasks:

- Initial survey
- Vegetation removal
- Fencing and warning sign installation
- Trench marker installation
- Final survey.

The presence of UXO was considered a potential risk at most sites where fencing and trench markers were to be installed. Extensive UXO was found at many of the sites, resulting in larger than anticipated fenced areas. In addition to the requirements stated in the work plan, potential UXO and other health and safety-related issues were addressed in the site-specific health and safety plan (SSHP) which is an appendix to the work plan (IT, 2000). The UXO support objective was to identify clear access paths to and from work areas; provide point monitoring for subsurface anomalies of sampling/digging locations; and perform downhole monitoring during digging for the installation of fence support posts and permanent trench markers. Specific OE/UXO/CWM evaluations were performed for 16 of the sites where OE, UXO, or CWM issues were a potential concern to assess the potential hazards from these elements. The evaluation forms are presented in Appendix A.

UXO support elements included, at a minimum:

- Initial UXO avoidance sweeps over the proposed fence path during vegetation clearing
- Downhole UXO clearance for the intrusive efforts associated with installing the fence and gate support posts and permanent trench markers

Methods and procedures for UXO avoidance sweeps and downhole clearance were presented in Section 4 and Appendices E and F of the installation-wide sampling and analysis plan (SAP) (IT, 1999). Specific requirements for UXO personnel and detailed descriptions of the geophysical equipment to be used (Schonstedt GA-52CX magnetometers) were also provided in the SAP, Section 4.1. Removal, transportation, or disposal of UXO/CWM or other hazardous material was not performed by Shaw.

3.1 Initial Survey

The initial survey was conducted by surveyors licensed in the State of Alabama, to locate the first fence corner and establish line of sight to each subsequent fence corner. UXO avoidance and vegetation removal activities were performed concurrently with the initial survey, generally following the procedure described below:

- UXO technicians surface cleared an area 30 feet in diameter around the first fence corner location and subsurface cleared the corner post location to a depth of 2 feet. The corner post location was then staked and labeled.
- The surveyor established the line-of-sight for the first portion of the fence and the UXO team cleared the ground surface in a 30-foot wide path along that line, 15-foot on both sides of the line.
- If suspected UXO was not identified, the surveyor continued to shoot the next line for a UXO surface sweep. If suspected UXO was identified at or near the surface along any line, the surveyor offset and shot a new line that avoided the area where suspected UXO was found, while maintaining a fairly straight fence line.
- Upon completion of establishing the fenceline, the surveyor staked fence corners and gate post locations. UXO teams cleared a 30-foot surface area at each corner and gate post, and to a depth of 2 feet prior to those locations being staked.

3.2 Vegetation Removal Activities

Vegetation removal was required at most sites to provide access for UXO avoidance teams, fencing installers, and land surveyors. Vegetation removal teams were tasked to create a 30-foot wide path (15-foot clearance on each side of the established fence line) along the proposed fence lines, removing all undergrowth, trees of various diameter, and tree limbs overhanging the path. Vegetation types and thickness varied from site to site, but all vegetation within the 30-foot wide path, including tree stumps, were cleared to ground level in accordance with the work plan (IT, 2000).

Specifically, vegetation removal consisted of clearing brush/undergrowth, saplings and other small diameter trees, and larger diameter trees and any overhanging limbs to allow access by mowing and maintenance equipment along the entire fence line at all sites. Limbs of trees outside the 30-foot path, but overhanging the path, were cleared to a height of 6-feet above ground level throughout the fence path. Deadfall within the 30-foot path was also removed with the cut vegetation. All wood debris was chipped by mechanical chipper and spread evenly along the cleared path; anything not able to be chipped (large tree stumps, etc.) was removed and disposed of at an on post construction landfill.

3.3 Fencing and Warning Sign Installation

Two types of fencing were used, 5-strand barbed wire or 6-foot chain link fence, depending on the expected activities at or near the site (Figures 18 and 19). The type and surveyed length of fencing installed is listed by site in Table 3-1. Existing fencing was used when it was present and in good repair along the proposed fence path. Any existing fencing determined to be in disrepair or otherwise unusable was removed where necessary to facilitate installation of the new fence.

Fencing installation was performed with UXO avoidance support, generally following the procedure described below:

- Once the brush was cleared, the fencing contractor began by drilling and setting the corner posts. The corner posthole location, having already been cleared by UXO avoidance personnel, was drilled only to a depth of 2 feet. Downhole UXO screening was then performed to clear the location to a depth of 4 feet. Once UXO-cleared to 4 feet, the posthole was completed to 39 inches below grade. If UXO was identified at the corner post location, that location was offset within the 30-foot cleared path along the established line-of-sight.
- Fence support pole locations were marked at 10-foot centers from the corner post location. These locations were screened for UXO to a depth of 2 feet. For sites fenced with barbed wire, post locations were UXO-cleared to 2 feet, and the “T” posts were driven to that depth. For sites fenced with chain link, the posthole was drilled to 2 feet below grade, then additional UXO screening cleared the location to a depth of 4 feet. Once cleared to 4 feet, the postholes were completed to a depth of 39 inches.
- Where suspected subsurface UXO was found at fence support post locations, that location was offset a minimum of 2 feet back toward the previous approved location, staying along the established fence line. The new location was then cleared of potential UXO. Once cleared, the remaining support post locations were marked at 10-foot centers from the offset location to ensure that the distance between support posts did not exceed 10 feet.

Aluminum signs were installed to identify the general hazards associated with the sites and to plainly state that access is not allowed. The signs were designed to be legible from a 25 foot distance and were placed on all fencing at a spacing of approximately 100 feet. Signs were placed on all access gates, regardless of the 100 foot spacing interval. Signs were attached near the top of the fencing with heavy grade non-corrosive fasteners. Photographs of the actual signs used are shown on Figure 20.

3.4 Trench Marker Installation

Trench markers were installed at the ends of known or suspected burial trenches. The locations of the trenches shown in the work plan were used as a guide for placement of the markers. The actual locations of the trench ends were located in the field, based on field readings by UXO personnel, some former markings (railroad ties, marked trees) by the Army, and additional geophysical support.

With the exception of RSA-51S, the trench markers consist of 4 inch square, galvanized steel posts filled with concrete and set in concrete. A brass disk was set in the tops of the concrete filled posts, showing the name and orientation of the trench. At RSA-51S, the markers consist of a concrete marker, flush with the ground surface, with brass disks set in the top of the concrete.

Trench markers were installed in a similar fashion as the fence posts, with subsurface UXO clearance for each hole. The as-built trench marker locations, as well as the construction details for the markers, are shown on Figures 6, 9, 10, 11, 16, and 17.

3.5 Final Survey

After completion of the fencing and trench marker installation, the final location of the fence corners, gate positions, and trench markers were surveyed by an Alabama registered surveyor for the purpose of creating as-built drawings. Alabama state plane coordinates were used to identify locations. These coordinates are shown on the as-built figures (Figures 2 through 17).

3.6 Maintenance

Shaw is tasked with inspecting and maintaining the newly installed fencing for a period of one year after acceptance of the work. Fence posts, gates, and fencing fabric or barbed wire will be repaired or replaced as needed. Routine clearing of vegetation within a 20 foot wide clear area will be performed semi-annually. This clearing has already been performed in October 2002 and is planned to occur again in May 2003.

4.0 Construction Quality Control

Construction quality control (CQC) consisted of various meetings and inspections as required by the U.S. Army Corps of Engineers (USACE) and described in the Construction Quality Control Plan (CQCP) for fencing and trench marker installation. Changes to the original plans were documented in Requests for Information (RFI), and contractor daily reports. CQC activities are described in greater detail in the following sections. A summary of these activities is presented in Table 4-1.

4.1 Preliminary Meetings

Quality control meetings specific to this work effort included a preconstruction conference, a coordination meeting, and two preparatory meetings. The preconstruction conference was held on April 18, 2000 to establish and/or review funding, general rules and procedures, safety expectations, and working conditions for this work. The meeting was attended by representatives of the USACE Mobile District and Shaw.

The coordination meeting was held on May 19, 2000 to discuss specific safety and quality control requirements in greater detail. Topics included safety related communications, quality control documentation, preparatory meetings, submittals, and testing and storage of materials. The meeting was attended by representatives of the USACE Mobile District, Shaw, and the fencing subcontractor.

Two preparatory meetings were held prior to the start of work to review the submittals, specifications, and activity hazard analyses (AHA) for the definable features of work. The first meeting was held on May 30, 2000 to discuss the initial work of UXO avoidance sweeps, vegetation clearing, and initial surveying. The second meeting was held on October 10, 2000 to discuss the fencing and trench marker installation work.

4.2 Inspections

Routine and formal inspections were performed throughout the duration of the work. Routine inspections consisted of a daily quality control report (DQCR) prepared by the construction quality control site manager (CQCSM) responsible for the fencing and trench marker work. The DQCR was completed for each day of work at the project site and, at a minimum, for every 7 days of site activities when no work was performed on the TCRA project. The DQCR included the following information:

- Type and number of control activities
- Results of inspections and tests
- Type of defects/causes for rejection
- Corrective actions, proposed and taken
- Trades/subcontractors personnel type and numbers working
- Weather conditions
- Delays and causes
- Verbal instructions, given and received
- Submittal information
- Equipment on site/hours worked
- Material/equipment received
- Off-site surveillance activities
- Health and safety information
- Certification statement.

Additional documentation such as test reports, inspection reports, and subcontractor reports were included as attachments to the DQCR, which were submitted to the USACE on a regular basis.

More formal inspections were conducted by the CQCSM, the USACE Mobile District, and representatives of Redstone Arsenal upon completion of work at the individual sites.

4.3 Submittals

Submittals were transmitted on form ENG FORM 4025. Two transmittals were prepared: Transmittal #1 was submitted on May 4, 2000, and included the CQCP, SSHP, AHA, and the workplan. The submittals were approved with some comments on the workplan, SSHP, and CQCP on May 22, 2000, and comments were resolved at the first preparatory meeting held on May 30, 2000. Transmittal #2 was submitted on September 15, 2000, and included submittals for the materials and procedures for installation of the fencing as required by the specifications. The submittals were approved with comments on the concrete and grounding on October 3, 2000, and comments were resolved at the second preparatory meeting held on October 10, 2000.

4.4 Field Changes

Field changes were implemented when necessary due to unexpected conditions (widespread UXO, etc.), identification of cost saving measures or potential problems, and/or by the request of the client or sponsor. Field changes were documented using RFI forms. Table 4-2 summarizes the changes that were made to the original plans, or other modifications, and the associated RFI.

4.5 Nonconformances

Non-conformances were documented using non-conformance reports (NCR). Two NCRs were issued over the course of the work. The first NCR was issued on December 4, 2000, after it was discovered that many of the "T" posts installed at RSA-114 were bent, twisted, or installed too shallow. The subcontractor removed and replaced the deficient posts at no cost to the government. The second NCR was issued on March 5, 2001, after the results of concrete compressive strength tests for some of the fence posts failed to meet the specified requirement. Due to difficult access, 8 fence posts were set in Sakcrete[®] which was mixed in the field. The 28-day compressive strength for this concrete was less than the specified 3000 pounds per square inch (psi). These posts were removed and reset in a 5000 psi concrete mix, at no cost to the government.

5.0 Project Costs

Table 5-1 present a summary of the actual project costs for the TCRA compared to the original cost estimate. Only the costs for the fencing and associated signage were estimated; installation of permanent trench markers was not included. The total project costs were held well within the -30% +50% reporting criteria.