

# Final Removal Report Time Critical Removal Action Conway Bombing and Gunnery Range Conway, South Carolina

*Prepared for*

U.S. Army Engineering and  
Support Center, Huntsville

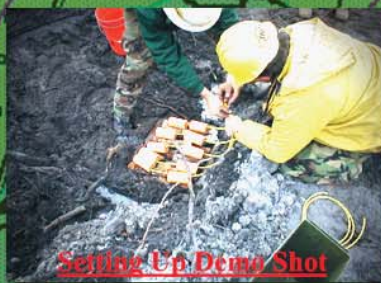


Contract Number: DACA87-95-D0018  
Delivery Order Number: 0039  
Project Number: 734874  
Geographical District: Charleston, S.C.

*Prepared by*

**PARSONS**

December 2002



"The views, opinions, and/or findings contained in the report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation."

# TABLE OF CONTENTS

	Page
TABLE OF CONTENTS.....	i
LIST OF FIGURES .....	v
LIST OF TABLES .....	v
LIST OF PHOTOS.....	vi
LIST OF ACRONYMS .....	vii
LIST OF DEFINITIONS .....	ix
SECTION 1 INTRODUCTION .....	1-1
1.1 Project Authorization.....	1-1
1.2 Reasons for Removal Action.....	1-1
1.3 Purpose and Scope.....	1-4
1.4 Project Team.....	1-6
1.5 Technical Approach.....	1-6
1.6 Probability of Solution/Accomplishment .....	1-8
SECTION 2 DISCUSSION.....	2-1
2.1 Introduction .....	2-1
2.2 Work Performed .....	2-1
2.3 Equipment Procedures.....	2-4
2.3.1 MTADS Procedures .....	2-4
2.3.2 G-858 Procedures.....	2-5
2.3.3 “Mag and Dig” with Digital Geophysical Mapping Procedures.....	2-6
2.3.3.1 Objective.....	2-6
2.3.3.2 Grid Preparation.....	2-6
2.3.3.3 Intrusive Operations.....	2-6
2.3.3.4 Geophysical Mapping .....	2-7
2.3.3.5 Reacquisition of Anomalies.....	2-7
2.3.3.6 Intrusive Operations (2 <sup>nd</sup> Pass).....	2-7
2.3.3.7 Quality Control Surveys .....	2-7
2.3.3.8 COE QA Check .....	2-7
2.3.4 Intrusive Procedures.....	2-7

## TABLE OF CONTENTS (CONTINUED)

	Page
2.3.5 UXO Disposal Procedures .....	2-8
2.3.5.1 Demolition .....	2-8
2.3.5.2 Demolition Materials .....	2-9
2.3.5.3 Scrap Management .....	2-11
2.3.6 Air Monitoring .....	2-11
2.4 Equipment.....	2-11
2.4.1 Multi-sensor Towed Array Detection System.....	2-11
2.4.2 Trimble 4700 RTK Differential Global Positioning System (GPS).....	2-12
2.4.3 Geometrics G-858 Magnetometer (G-858).....	2-13
2.4.4 Geometrics G-856 Base Station (G-856) .....	2-14
2.4.5 Schonstedt GA-52CX Magnetometer (Schonstedt) .....	2-14
2.4.6 Intrusive Equipment.....	2-15
2.4.7 Facilities .....	2-15
2.4.7.1 Site Trailer .....	2-15
2.4.7.2 Explosive Magazine.....	2-16
2.5 Results (Expected and Unexpected) .....	2-16
2.5.1 General .....	2-16
2.5.2 MTADS Results.....	2-17
2.5.3 DGM with G-858 Results.....	2-18
2.5.4 Intrusive Investigation Findings.....	2-18
2.5.5 Recovered OE Items .....	2-20
2.5.5.1 1.1-inch AA Projectile .....	2-20
2.5.5.2 100-lb Practice Bomb .....	2-20
2.5.5.3 20-lb Practice Fragment Bomb .....	2-21
2.5.5.4 AN-M54 and M50 4-lb Incendiary Bombs.....	2-22
2.5.5.5 5-Inch Practice HVAR Warhead .....	2-24
2.5.5.6 M16 Components.....	2-24
2.5.5.7 M57 250lb (Old Style) HE Bomb.....	2-26
2.5.5.8 M69 6-lb Incendiary Bomb.....	2-26
2.5.6 Scrap.....	2-27
2.5.7 Air Monitoring .....	2-29
2.6 Public Relations.....	2-29
2.7 Site Security.....	2-29
2.8 Avoided Areas .....	2-29
2.9 Construction support .....	2-29

## TABLE OF CONTENTS (CONTINUED)

	Page
SECTION 3	DOCUMENTATION ..... 3-1
	3.1 Introduction ..... 3-1
	3.2 Daily Safety Briefing and Daily Reports..... 3-1
	3.3 Weekly Reports ..... 3-2
	3.4 Digsheets ..... 3-3
	3.5 Geophysical Survey Forms..... 3-3
	3.6 CEHNC Form 948 (Form 948)..... 3-3
	3.7 DD Form 1348-1 ..... 3-3
	3.8 Chain of Custody Forms..... 3-4
	3.9 Geophysical Data Packages..... 3-4
	3.10 Laboratory Analytical Results ..... 3-4
SECTION 4	TESTS ..... 4-1
	4.1 Introduction ..... 4-1
	4.2 Tests Conducted ..... 4-1
	4.3 Test Results ..... 4-2
SECTION 5	FINANCIAL BREAKDOWN..... 5-1
	5.1 Introduction ..... 5-1
SECTION 6	SUMMARY..... 6-1
SECTION 7	REFERENCES ..... 7-1
APPENDIX A:	GEOPHYSICAL EQUIPMENT PROVE-OUT FOR MTADS AND G858 AND QC RESULTS
APPENDIX B:	ADDENDUM TO THE IRA WORK PLAN * CADMIUM SAMPLING PLAN * GENERAL PROCEDURE FOR UXO REMOVAL IN THE IMPACT AREA
APPENDIX C:	SCRAP DISPOSAL RECORDS
APPENDIX D:	WASTE CHARACTERIZATION REPORT AND MANIFEST FOR HAZARDOUS SCRAP DISPOSAL
APPENDIX E:	CADMIUM TESTING RESULTS

**TABLE OF CONTENTS  
(CONTINUED)**

	Page
APPENDIX F: DAILY SAFETY BRIEFINGS	
APPENDIX G: WEEKLY STATUS REPORTS	
APPENDIX H: CD CONTAINING PHOTOS AND FINDINGS SUMMARY	
APPENDIX I: QUALITY CONTROL DOCUMENTATION SUMMARY (948 FORMS)	

## LIST OF FIGURES

No.	Title	Page
1.1	Site Location Map .....	1-2
1.2	Project Areas .....	1-3
1.3	Removal Action Property Boundary .....	1-5
1.4	Project Organization Chart.....	1-7
2.1	Interim Removal Action.....	2-2

## LIST OF TABLES

No.	Title	Page
2.1	Digital Geophysical mapping Systems used for the Removal Action.....	2-3
2.2	Clearance Methods.....	2-3
2.3	Explosive Usage Summary .....	2-10
2.4	Types and Amount of UXO Items Discovered .....	2-16
2.5	Total UXO and OE Scrap Recovered by Grid .....	2-28
5.1	Financial Breakdown By Company .....	5-2
5.2	Labor Hours by Category .....	5-3

## LIST OF PHOTOS

Photo 2.1.	“Mag and Dig” Operations.....	2-4
Photo 2.2.	Demolition Operations .....	2-7
Photo 2.3	MTADS .....	2-9
Photo 2.4	Trimble 4700 RTK GPS.....	2-10
Photo 2.5	GPS Base Station .....	2-10
Photo 2.6	G-858.....	2-11
Photo 2.7	Backhoe Operations .....	2-12
Photo 2.8	Site Trailer.....	2-12
Photo 2.9	Explosive Storage Magazines .....	2-13
Photo 2.10	1.1” AA Rounds .....	2-17
Photo 2.11	100 lb Practice Bomb .....	2-18
Photo 2.12	100 lb Practice Bomb Spotting Charge Fuze w/Igniter Tube.....	2-18
Photo 2.13	20 lb Practice Fragment Bomb.....	2-19
Photo 2.14	Two 4-Lb Incendiary Bombs .....	2-20
Photo 2.15	4-lb Incendiary Fuze.....	2-20
Photo 2.16	5-inch Practice HVAR and Components.....	2-21
Photo 2.17	M16 M157 Fuze with a Burster .....	2-22
Photo 2.18	M16 White Phosphorous Fire Bomb Igniter .....	2-22
Photo 2.19	M57 250lb HE Bomb .....	2-23
Photo 2.20	M-69 6-lb Incendiary Oil Filled Bomb Expended .....	2-24
Photo 2.21	M-69 6-lb Incendiary Oil Filled Bomb M1 Fuzes .....	2-24
Photo 2.22	UXO Scrap .....	2-25
Photo 2.23	4-lb Incendiary Scrap .....	2-25
Photo 4.1	Suspect Cadmium 4-lb Incendiaries.....	4-2
Photo 4.2	Intrusive Operations around Suspect Cadmium 4-lb Incendiaries .....	4-2

## LIST OF ACRONYMS

BGR	Bombing and Gunnery Range
Blackhawk	Blackhawk Geometrics
bls	Below Land Surface
CD	Compact Disc
CESAC	U. S. Army Corps of Engineers, Charleston District
CS	Construction Support
DAS	Data Analysis System
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DID	Data Item Description
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
ESS	Explosives Safety Submission
FUDS	Formerly Used Defense Sites
G-856	Geometrics G-856 Base Station
G-858	Geometrics G-858 Magnetometer
GPS	Global Positioning System
HE	High Explosive
HVAR	High Velocity Rocket
IRA	Interim Removal Action
lb	Pound
MAG MTADS	Magnetic Array of the Multi-Sensor Towed Array System
MPM	Most Probable Munition
MSD	Minimum Separation Distance
MTADS	Multi-Sensor Towed Array Detection System
NIOSH	National Institute for Occupational Safety and Health
nT	nanotesla
ODCs	Other Direct Costs
OE	Ordnance and Explosives
OSHA	Occupational Safety & Health Administration
PEL	Permissible Exposure Limit
PM	Project Manager
QA	Quality Assurance
QC	Quality Control
QCS	Quality Control Specialist
Schonstedt	Schonstedt GA-52CX Magnetometer



## LIST OF ACRONYMS (CONTINUED)

SCDOT	South Carolina Department of Transportation
SM	Site Manager
SOW	Statement of Work
SUXOS	Senior UXO Supervisor
SW	Solid Waste
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time Critical Removal Action
TM	Technical Manual
TSD	Team Separation Distance
USA	USA Environmental Inc.
USAESCH	United States Army Corps of Engineers, Engineering and Support Center, Huntsville
UXO	Unexploded Ordnance
WP	Work Plan

## LIST OF DEFINITIONS

### TCRA TERMS AND DEFINITIONS

**Unexploded Ordnance (UXO)** – Military munitions that have been primed, fuzed, armed, or otherwise prepared for action and have fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and have remained unexploded either by malfunction, design, or any other cause.

**Unexploded Ordnance Constituents (UXO)(C)** - Potentially hazardous chemicals that are released from munitions or UXO

**Ordnance and Explosives (OE)** – OE consists of ammunition, ammunition components, chemical or biological warfare materiel or explosives that have been abandoned, expelled from demolition pits or burning pads, lost, discarded, buried, or fired. Such ammunition, ammunition components and explosives are no longer under accountable control of any DOD organization or activity.

**Ordnance and Explosives scrap (OES)** – Inert munitions and related material recovered during the course of an OE removal. Examples are fragments, empty cartridge, cases, expended smoke grenade, packing materials, dunnage, etc.

**Quality Control (QC)** – Contractor's system to manage, control, and document his/her activities to comply with the contract requirements.

**Quality Assurance (QA)** – The procedures by which the Government fulfills its responsibility to be certain that QC is functioning and the specified product is realized.

# **SECTION 1**

## **INTRODUCTION**

### **1.1 PROJECT AUTHORIZATION**

1.1.1 Parsons Corporation (Parsons) received Contract No. DACA87-95-D-0018, Delivery Order No. 0039, from the United States Army Corps of Engineers, Engineering and Support Center, Huntsville (USAESCH) to conduct an Engineering Evaluation/Cost Analysis (EE/CA), to perform a Time Critical Removal Action (TCRA) (formerly known as Interim Removal Action [IRA]), and to provide construction support as needed at the former Conway Bombing and Gunnery Range (BGR), Conway, South Carolina.

1.1.2 In order to fulfill the requirements of the delivery order, Parsons conducted an EE/CA at 10 project areas located within the former Conway BGR to characterize the presence of ordnance and explosives (OE), analyze risk management alternatives, and recommend feasible OE risk reduction alternatives. The results of the EE/CA investigation were presented in the Final Draft EE/CA Report (Parsons, April 2002). Also, according to the requirements of the delivery order, Parsons performed an TCRA on approximately 40 acres of land in Range III of the former Conway BGR to reduce OE risk to the public. The TCRA was conducted as a result of change in ownership and use of the property. Construction support was also provided for a period of 52 weeks during the property owner's borrow activities and at the South Carolina Department of Transportation (SCDOT) construction site where the borrow material was used as fill. All work adhered to the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS) and relevant U.S. Army regulations and guidance for OE programs.

1.1.3 As specified in the delivery order, this report is prepared to summarize the work performed during the TCRA, present OE discovered during the TCRA, and provide the costs incurred to perform the TCRA. This report is prepared in accordance with the Data Item Description (DID) OT-030.

### **1.2 REASONS FOR REMOVAL ACTION**

1.2.1 The former Conway BGR is a former U.S. Army installation located northwest of Myrtle Beach, South Carolina (Figure 1.1). The former Conway BGR contained Ranges II, III, IV, VII, XX, a moving target range, two turret ranges, a machine gun range, and a rifle range as designated when it was part of the Myrtle Beach General Bombing and Gunnery Range. Figure 1.2 shows the locations of the ranges and the

# Site Location Map Conway Bombing and Gunnery Range Conway, South Carolina

Figure 1.1

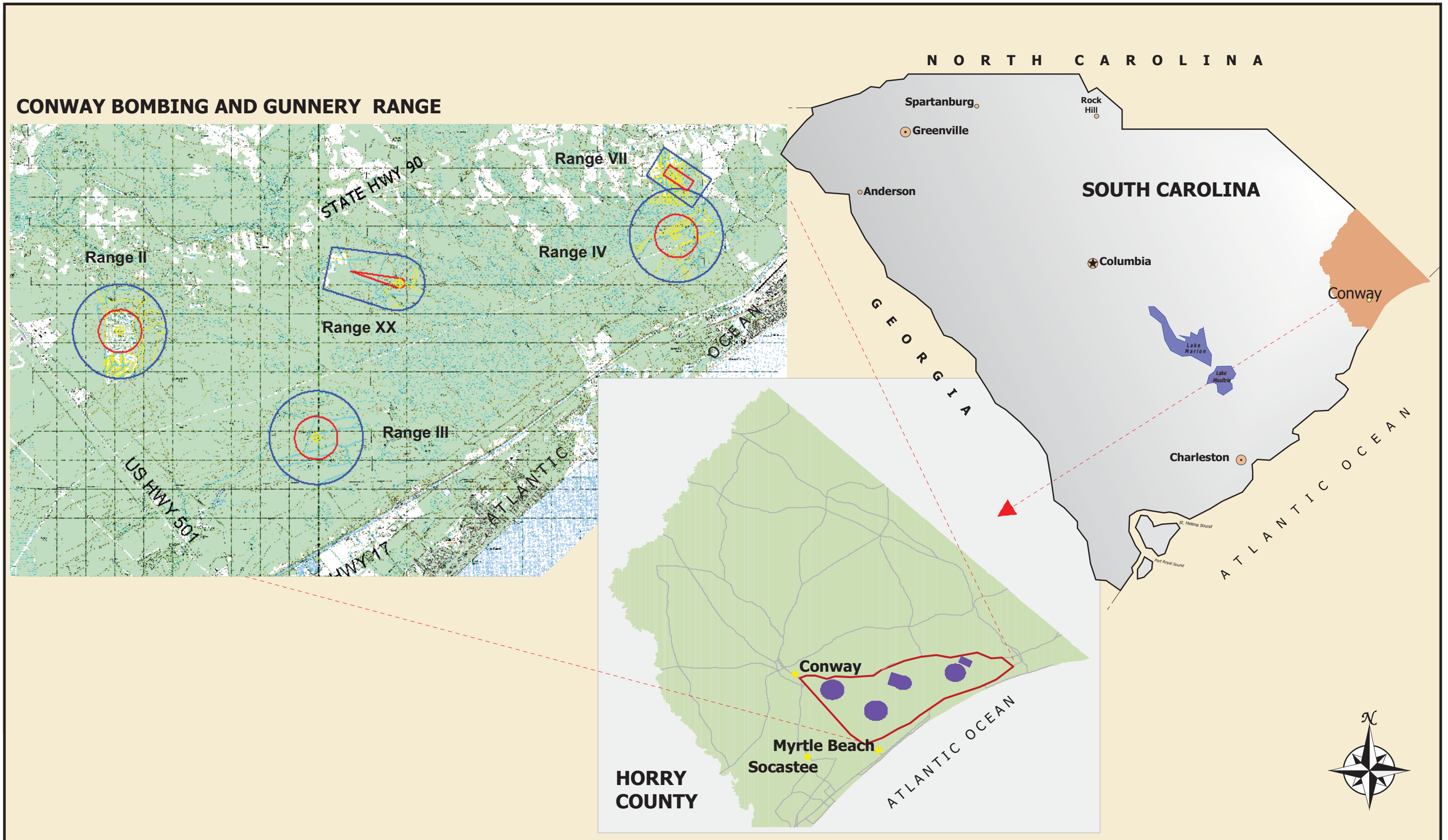
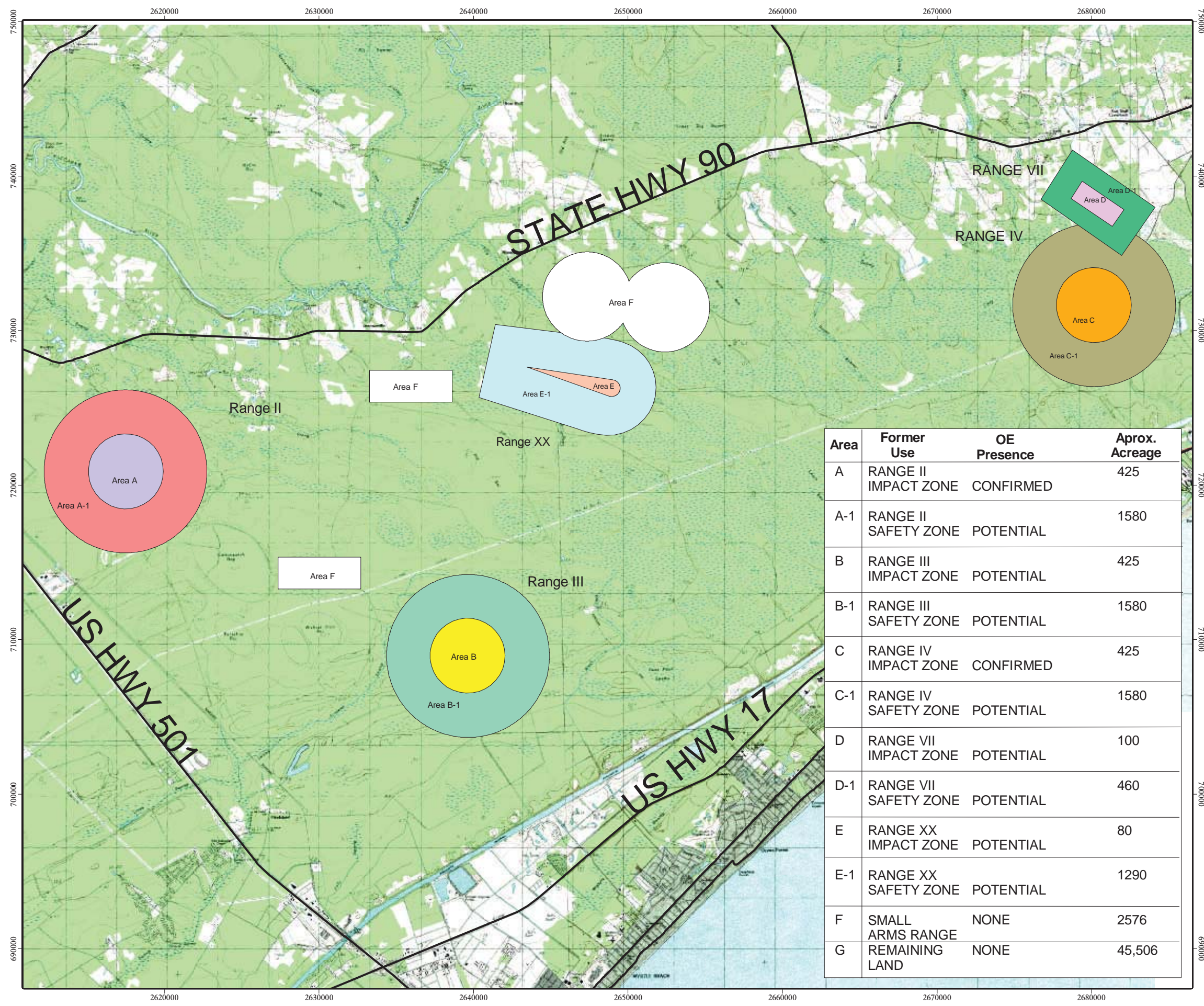


Figure 1.2

# Project Areas Conway Bombing and Gunnery Range Conway, South Carolina



## Project Areas

- Area A (Range II - Impact Zone)
- Area B (Range III - Impact Zone)
- Area C (Range IV - Impact Zone)
- Area D (Range VII - Impact Zone)
- Area E (Range XX - Impact Zone)
- Area A-1 (Range II - Safety Zone)
- Area B-1 (Range III - Safety Zone)
- Area C-1 (Range IV - Safety Zone)
- Area D-1 (Range VII - Safety Zone)
- Area E-1 (Range XX - Safety Zone)

Area	Former Use	OE Presence	Aprox. Acreage
A	RANGE II IMPACT ZONE	CONFIRMED	425
A-1	RANGE II SAFETY ZONE	POTENTIAL	1580
B	RANGE III IMPACT ZONE	POTENTIAL	425
B-1	RANGE III SAFETY ZONE	POTENTIAL	1580
C	RANGE IV IMPACT ZONE	CONFIRMED	425
C-1	RANGE IV SAFETY ZONE	POTENTIAL	1580
D	RANGE VII IMPACT ZONE	POTENTIAL	100
D-1	RANGE VII SAFETY ZONE	POTENTIAL	460
E	RANGE XX IMPACT ZONE	POTENTIAL	80
E-1	RANGE XX SAFETY ZONE	POTENTIAL	1290
F	SMALL ARMS RANGE	NONE	2576
G	REMAINING LAND	NONE	45,506

Source: Topographic image from Visicom.  
Date of Topo: 1985

Map Units: NAD 1983 South Carolina State Plane (Feet)



PARSONS

U.S. ARMY CORPS  
OF ENGINEERS  
HUNTSVILLE CENTER

DESIGNED BY: BT  
DRAWN BY: BT  
CHECKED BY: MG  
SUBMITTED BY: PARSONS

CONWAY BOMBING  
AND GUNNERY RANGE  
CONWAY, SOUTH CAROLINA

SCALE: 1 inch equals 6,500 feet  
DATE: 9/02  
FILE: X:\gis\734874\AV\maps\Sectors\_rev.apr

PROJECT NUMBER:  
734874

PAGE NUMBER:



designated areas located within the former Conway BGR. These ranges were used for a variety of bombing and air to ground gunnery training purposes during World War II. A detailed description of the historical use of the former Conway BGR is presented in the Final Draft EE/CA Report (Parsons, April 2002). Today, most of the former Conway BGR is owned by private entities and is used mainly for timber harvesting, agricultural, residential, and recreational purposes. A detailed description of the current land use for each of the ranges is also presented in the Final Draft EE/CA Report.

1.2.2 The Goodson Construction Company (a local developer) purchased a parcel of land located within Area B (impact area) of Range III for residential and commercial development. The land was purchased from International Paper Company. As part of a community development effort, the Goodson Construction Company planned to develop a 65-acre lake with residential subdivision within their parcel of land. Also, they proposed to use the excavated material from the lake as a borrow material for the SCDOT's Carolina Bay Parkway expansion project. Figure 1.3 shows the property owned by Goodson Construction Company and the boundaries of the proposed lake area.

1.2.3 While clearing and removing trees in the proposed lake area for excavation, the construction workers encountered a live high explosive (HE) 100-pound (lb) bomb. The UXO item was destroyed by the Fort Jackson Explosive Ordnance Disposal Unit. The owner of the Goodson Construction Company contacted U. S. Army Corps of Engineers, Charleston District (CESAC) regarding discovery of the UXO item. On the basis of historical use, OE findings during the EE/CA investigation in this area, and use of the property, the CESAC contacted USAESCH to implement action to reduce risk from potential OE hazards. Because of the time critical nature of the borrow material contract with the SCDOT, the Goodson Construction Company hired USA Environmental, Inc. (USA) to conduct a removal action on 20 acres north of the proposed lake area and subsequently began excavation work in this area. Meanwhile, USAESCH completed contractual negotiations with Parsons to perform TCRA and provide construction support on 40 acres of the proposed lake area. In accordance with the requirements of the Statement of Work (SOW), Parsons then prepared and submitted TCRA scoping documents (Work Plan and Explosives Safety Submission) to USAESCH for review and approval.

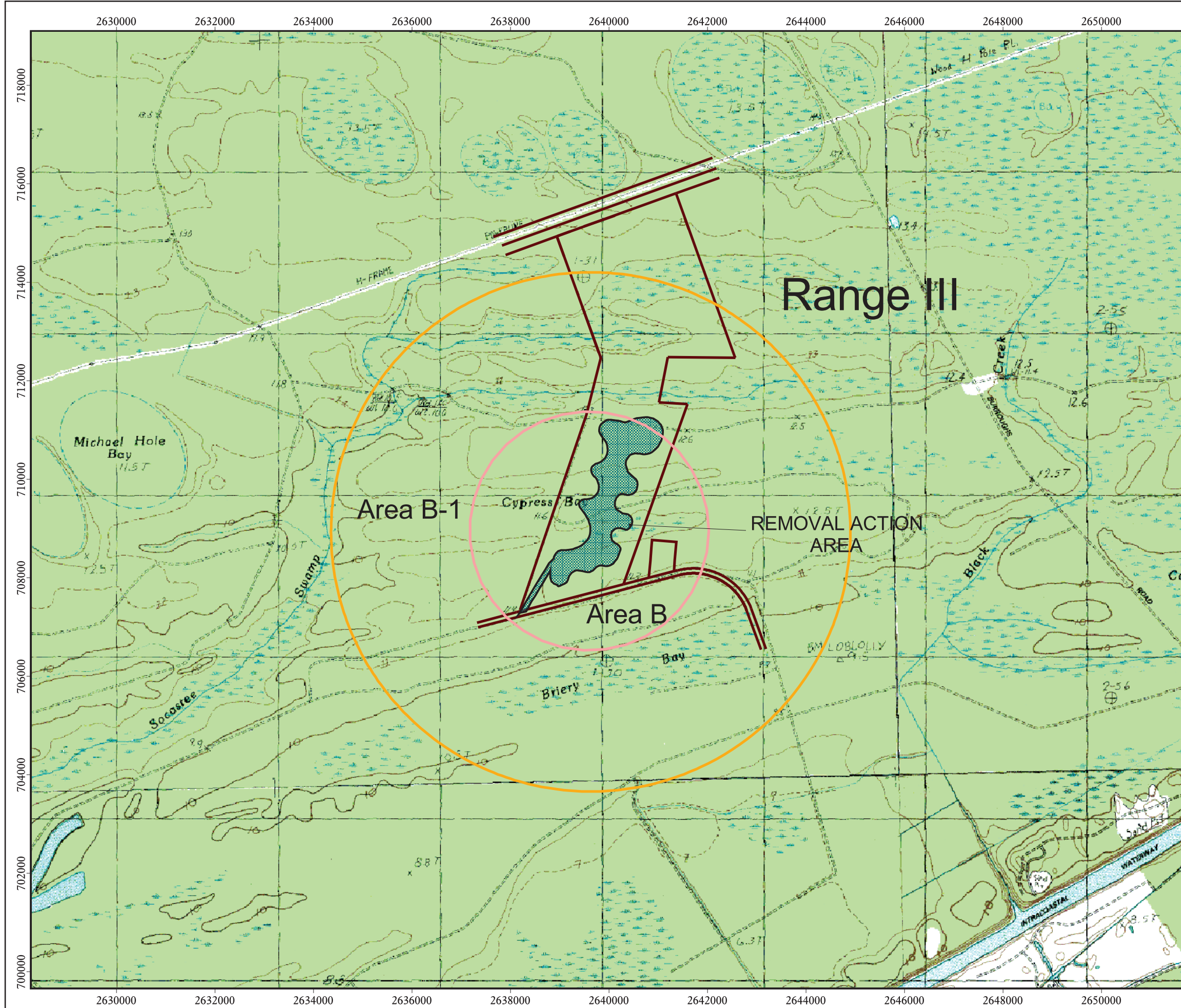
### **1.3 PURPOSE AND SCOPE**

The purpose of the TCRA was to remove all OE (unexploded ordnance [UXO] and inert ordnance) from the proposed lake area within Range III of the former Conway BGR. The scope of the TCRA included the following:





- preparation of TCRA and Construction Support Work Plan (WP) (submitted as an addendum to the EE/CA Work Plan, May 2000);
- preparation of an Explosives Safety Submission (ESS) (submitted on August 2000 and approved on September 11, 2000);

Figure 1.3

Removal Action Property Boundary  
 Conway Bombing and Gunnery Range  
 Conway, SC

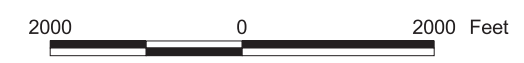


**LEGEND**

-  Boundary of Goodson Property
-  Proposed Lake
-  Area B (Range III - Impact Area)
-  Area B-1 (Range III - Safety Zone)

Source: Topographic image from Visicom.  
 Date of topo: 1985

Map Units: NAD 1983 South Carolina State Plane (Feet)



**PARSONS**

U.S. ARMY CORPS  
 OF ENGINEERS  
 HUNTSVILLE CENTER

DESIGNED BY: BT	<b>CONWAY BOMBING AND GUNNERY RANGE CONWAY, SOUTH CAROLINA</b>		PROJECT NUMBER: 734874
DRAWN BY: BT			PAGE NUMBER:
CHECKED BY: MG	SCALE: 1 inch equals 2,000 feet	FILE: X:\gis\734874\av\maps\MA_general.apr	
SUBMITTED BY: PARSONS	DATE: October 2002	